PAM

Water supply & distribution

Ductile iron pipe systems
for water supply and distribution,
irrigation and dedicated applications

2010



NATURAL

CLASSIC

BLUTOP

KAMELEO

PMI
Couplings

IRRIGAL

ALPINAL

URBITAL

SAINT-GOBAIN
PAM



PAM

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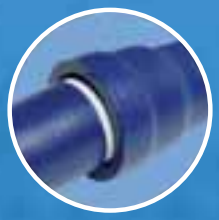
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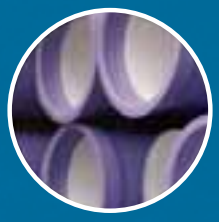
IRRIGAL



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New features for 2010 edition



New products

Drinking water supply and distribution

- **NATURAL range**
  - Extension of the NATURAL range up to DN 600
  - STANDARD Vi anchored joint available up to DN 600
  - Launch of NATURAL UNIVERSAL Vi range for high pressure from DN 80 to DN 600
  - Launch of NATURAL UNIVERSAL Ve range for very high pressure from DN 100 to DN 600
  - Launch of NATURAL PUR range for soft or aggressive waters from DN 100 to DN 600.
- **EXPRESS NEW range**
  - A new mechanical joint, EXPRESS NEW, easier for laying both for anchored and non-anchored systems.
  - A new design for the EXPRESS NEW joint developed for "special insertion" situations.



- **EXPRESS range**
  - A new EXPRESS coupling now available in large diameters from DN 1400 to DN 2000.
- **UNIVERSAL range**
  - UNIVERSAL boltless anchored system for high pressure from DN 700 to DN1200.
- **BLUTOP range**
  - A fully innovative range of small diameters designed to water supply and distribution in DN 90, 110 and 125.
- **KAMELEO range**
  - A range of variable angle fittings available in DN 80, 100 and 150.
- **Flanged fittings range**
  - Several types of new flanged fittings are available.

IRRIGATION

- Launch of IRRIGAL range from DN 100 to DN 1000.

ARTIFICIAL SNOW SYSTEM

- Extension of ALPINAL range to DN 400 and DN 500.

RECYCLED WATER

- Launch of URBITAL range from DN 100 to DN 1000.

REPAIR and MAINTENANCE

- Launch of ULTRA range for wider tolerances.

New features for 2010 edition



And a new organization

A NEW PRESENTATION MORE PRACTICAL

- A new A4 format for an easier printing
- A white background to save ink when printing
- Coloured drawings and pictures for a better reading

A CLEARER ORGANIZATION

- Each chapter is divided into themes gathering all the technical specifications linked to the specific themes.
- On each technical sheet, the chapter name is mentioned at the top and on the external margin, and with the title theme to allow a better navigation.
- Numerous synthesis tables allow better understanding and use of the PAM offer and its field of use.



A RICHER CONTENT

- Extensive presentation of the SAINT-GOBAIN group and the PIPE ACTIVITY
- Presentations of the new products' ranges
- New files on sustainable development, anchoring systems, etc.
- New technical specifications including products' references and more detailed drawings and pictures
- Complete presentation of the joint ranges and their recommended use with the different ranges of pipes and fittings
- Exhaustive presentation of repair and maintenance pieces
- Links to 3D animations of anchoring systems (only on CD ROM)

Energy savings, innovation, protection of the environment.

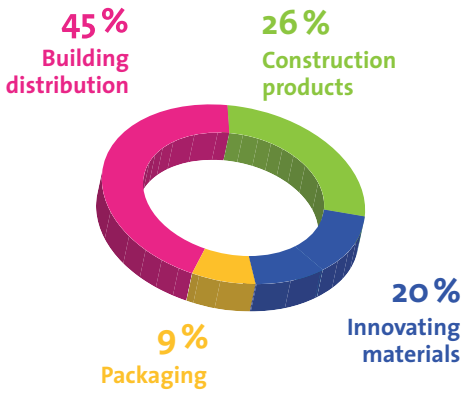


Build with Saint-Gobain

Saint-Gobain PAM, with a unique world brand PAM, is part of the Saint-Gobain Construction Products sector. Saint-Gobain is a world leading industrial group specialized in the production, conversion and distribution of materials for industry and construction.

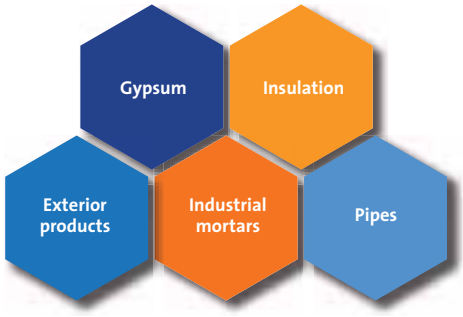
Saint-Gobain, with 209 000 employees in 59 countries, displays a strong, balanced growth strategy. Saint-Gobain is structured around five sectors of activity: building distribution, construction products, glazing, high performance materials and packaging. Apart from glass, Saint-Gobain excels with numerous other materials such as plastics, mortars, gypsum and ductile iron. In phase with the vital challenges of its time, the group's strategy is currently focused on the housing market. Thanks to a unique network of skills, the Group provides innovating and complementary solutions in terms of energy savings and protection of the environment while designing the materials of the future.

Saint-Gobain distribution of turnover by sector of activity in 2009



Focus on the Construction Products Sector

The Construction Products sector includes the Gypsum, Insulation, Exterior Products, Pipe and Industrial Mortars activities. Through the wealth and diversity of the businesses in this sector, whether in interior or exterior design, there is a solution adapted to each requirement.





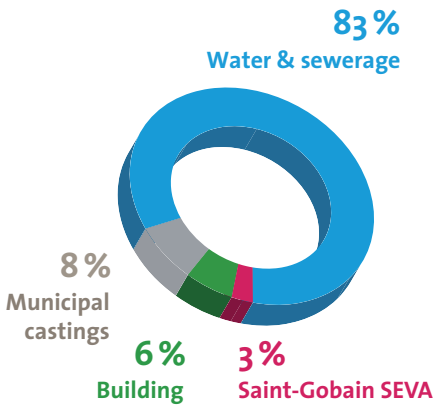
Checking of the cement mortar internal lining of ductile iron pipes.
Saint-Gobain Pam plant at Pont-à-Mousson (France).

Discover PAM

At the service of water and sewerage, the PAM brand of the Saint-Gobain group Pipe Activity is the number one producer of pipe systems in the entire world.

Saint-Gobain PAM designs, produces and commercializes a complete range of solutions dedicated to drinking water supply, sewerage and evacuation of waste water. For over 150 years, its reputation in the pipe professions has been based on its know-how, the reliability of its products, and on the performance of the services offered to customers.
Through a dense sales network, Saint-Gobain PAM currently operates in more than 126 countries.

Pipe Activity turnover distribution by activity





Delivery of ductile iron pipes for the supply of drinking water to Dakar (Senegal).



Handling of ductile iron pipes on the yard of the Saint-Gobain PAM plant at Pont-à-Mousson (France).
PAM pipes of Tag 32 range, in red, are intended for gravity flow systems; pipes of NATURAL range, in blue, are intended for drinking water.

Propose complete systems

Pipes, fittings, valves and accessories: Saint-Gobain PAM offers solutions dedicated to the water and sewerage, municipal castings and building sectors.

With over 50 000 references in the catalogue, Saint-Gobain PAM proposes products of optimum quality in compliance with European and international standards. Reliable, durable products that are easy to lay. Ductile iron pipes, with their adapted coatings and joints adaptable to the various site configurations, withstand all types of incident occurring during transport, handling, installation and operation. With all these advantages, Saint-Gobain PAM is able to comply with its customers' specifications and meet all their requirements.



Blutop pipe: innovation offering ultra-light pipes that are easy to transport and lay



Gate valve *Euro 20* with gate.



Kameleo bend: modular variable angle fitting which adapts to all types of system.



Products for all water network configurations.



PAM brand municipal castings combine excellent strength with very high safety factors



Elancio cover for fire hydrant.



Chemical analyses on polymer materials for the pipe coatings.
Saint-Gobain PAM research centre at Maidières (France).

Innovate for greater performance

Research & Development takes on a strategic dimension for Saint-Gobain PAM. By making major investments in Research & Development, innovation is still the secret behind the quality of its products and its competitiveness on the market.

With its research centre at Maidières (France) and over 150 employees working in Research & Development, Saint-Gobain PAM continuously develops new metallic, polymeric and mineral materials as well as innovating manufacturing processes to propose new products adapted to emerging requirements. Thanks to the work of its scientists and university partners, Saint-Gobain PAM now has more than 150 inventions which have generated 1500 national patents registered throughout the world. In Europe, 40 % of the company's turnover is made with products of less than 5 years old.

Quality analysis of the microstructure of ductile iron using scanning electronic microscope. Saint-Gobain PAM research centre at Maidières (France).



Ductile iron

The term "cast iron" includes a wide range of iron, carbon and silica alloys. Discovered in 1946, ductile iron is produced by adding a small quantity of magnesium to molten iron, a process which leads to exceptional properties in terms of mechanical strength and bending.



Demonstration of the elasticity properties of a ductile iron pipe. Bending strength up to 10 %. Saint-Gobain Pam demonstration space at Pont-à-Mousson (France).



Saint-Gobain PAM advises its customers and provides technical support up to completion of the work site.

Accompany our customers with PAM brand

Always ready to listen to its customers, Saint-Gobain PAM, through its extensive sales and technical network, provides a proximity service to local authorities, public and private operators, design offices, installation contractors, merchants and suppliers.

Present throughout the industrial and commercial process, Saint-Gobain PAM provides its customers with numerous services and performs support and technical expertise missions including, in particular, water analysis, soil surveys as well as hydraulic and mechanical calculations. The company also proposes special equipment when starting work sites together with appropriate training. Numerous assets which, combined with control of the logistics chain, increase customer satisfaction.

The 10 Saint-Gobain PAM assets

- Listening to customer requirements
- Reliability
- Innovation
- Optimization of costs and delivery times
- Professionalism
- Proximity
- Quality
- Compliance with regulations
- Customer service
- Complete systems



The technical and sales department accompanies customers upstream using PAMCAD, a software program to assist with the design of drinking water and sewerage networks.



Transport and logistics at the service of customers: preparing to load a ship. Antwerp port (Belgium).



Construction of a drinking water supply network between the Taksebt dam and Algiers (Algeria).

Projects everywhere for everyone

Saint-Gobain PAM is involved in both major irrigation and sewerage operations at regional scale and on proximity work sites for a city or district. Every year, these work sites are spread on average over more than 120 countries, making a total of more than 40 000 km of pipelines.



Urban installation of ductile iron pipelines with TT PUX polyurethane external coating at Marseilles (France).



Laying of a double ductile iron pipeline for Budapest town sewerage network (Hungary).



For the transport of drinking water from Taweelah, installation of a double ductile iron pipeline with standard coating in desert environment at Abu Dhabi (United Arab Emirates).

Bringing water means bringing life.



A player in sustainable development

Saint-Gobain PAM has always implemented a policy of sustainable development, from product design through to delivery.

Ductile iron is a noble material, 100 % and indefinitely recyclable. Thanks to pipes whose weight has been reduced by one third and whose lifetime has been multiplied by three in ten years, as well as through the development of more ergonomic laying techniques, Saint- Gobain PAM reduced its energy and raw material requirements, while decreasing CO_2 emissions. During the production cycle, all polluting emissions are filtered and waste recycled.

The environmental impact is controlled by two laboratories, one internal, the other independent. To transport the products, diversified and low energy consuming transport means such as rail and ship are used whenever possible. At each step, from product design to delivery, Saint-Gobain PAM strives to promote a development initiative based on responsible and sustainable consumption and production modes.

The 10 Saint-Gobain PAM assets

Working at Saint-Gobain PAM means sharing behaviour and action principles which help develop a human, responsible company.

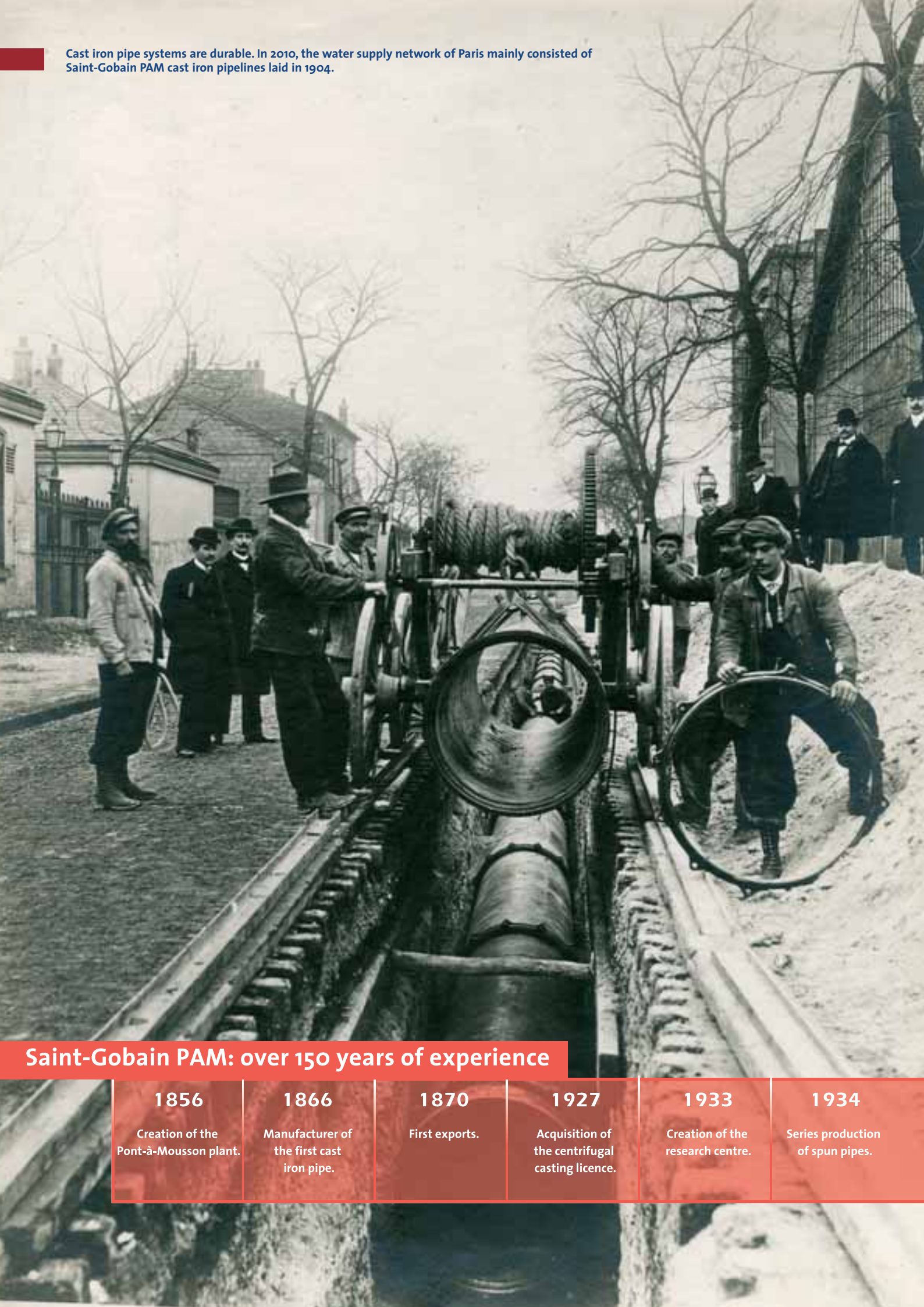
- **Professional commitment**
- **Respect of individuals**
- **Integrity**
- **Loyalty**
- **Solidarity**
- **Respect of the law**
- **Respect of the environment**
- **Respect of health and safety at work**
- **Respect of the rights of employees**



Apart from the management of industrial risks and their impacts on the environment, Saint-Gobain PAM has formalized its commitments in an internal "Environment, Hygiene and Safety" charter. Its 3 objectives are:

1. **zero occupationnal accidents**
2. **zero professional diseases**
3. **zero non-recyclable waste**

Cast iron pipe systems are durable. In 2010, the water supply network of Paris mainly consisted of Saint-Gobain PAM cast iron pipelines laid in 1904.



Saint-Gobain PAM: over 150 years of experience

1856	1866	1870	1927	1933	1934
Creation of the Pont-à-Mousson plant.	Manufacturer of the first cast iron pipe.	First exports.	Acquisition of the centrifugal casting licence.	Creation of the research centre.	Series production of spun pipes.

Share our history

The origins of Saint-Gobain PAM date back to the creation of the Pont-à-Mousson plant in 1856, start of an eventful industrial history.

The company's expansion is based on two constants: technological leaps and significant internationalization of its industrial and commercial development.

In 1887, Saint-Gobain PAM became, in particular, the main supplier of drinking water for Paris.

Also developing its exports, the company set up its first plant in Brazil in 1937.

Adoption of centrifugal casting in 1928, then the discovery of ductile iron in the late 40s, led to the mass production of high quality pipes.

Backed by its major technological advantages, PAM brand became the world reference in pipelines.

Today, still attentive to market requirements, Saint-Gobain PAM continues its development with the same spirit of innovation, growth and industrial excellence.



Personnel gathered to celebrate the 150th anniversary of Saint-Gobain PAM in front of the Pont-à-Mousson plant (France).

1950	1970	1980	2001	2002 - 2010	Today and tomorrow...
Licence agreement for ductile iron.	Industrialization of ductile iron.	International deployment of the Pipe activity.	PAM global brand is launched.	Launches of new products: *Natural, TAG 32, Ivoire, Kameleo, Blutop.*	Innovation at the core of our industrial and commercial strategy in respect of the environment.



PAM

PROJECT DESIGN

Water cycle

Pressure and angular deviation at the joint

Surrounding conditions of the pipeline

Normative references

Sustainable development

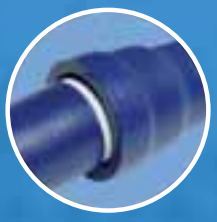
NATURAL



CLASSIC



BLUTOP



KAMELEO



PMI
Couplings



IRRIGAL



ALPINAL



URBITAL



SAINT-GOBAIN

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Water demand

See also: *page*
• Diameter (selection) 31

The design of a system must take into account:

- *the water demand, estimated by statistical or analytical methods,*
- *the water resources, determined from the appropriate hydrogeological and hydrological data for each region.*

Assessment of water demands

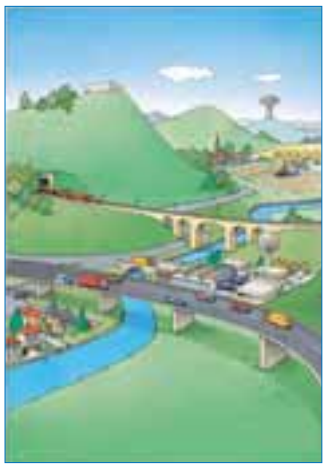
Volume

The volume of water needed to supply a community depends on:
- the size and types of localities being served,
- the municipal, agricultural and industrial demands,
- the practices of the population.



In general, the following mean daily consumptions are assumed per head of population:
- rural communities: 130 to 180 litres (excluding agricultural requirements),
- medium size communities: 200 to 250 litres (including municipal requirements),
- towns: 300 to 450 litres (including municipal requirements), possibly more in urban areas.

It is advisable in all cases to design the water trunk and distribution systems taking into account the prospects for long term urban development in the area.



The presence of communal buildings or industrial type units must be taken into account. The average requirements for common examples are:
- schools: 100 litres per pupil per day,
- slaughter houses: 500 litres per head of livestock,
- dairies, butter and cheese making: 5 litres per litre of processed milk,
- hospitals: 400 litres per bed per day,
- wine making: 2 litres per litre of product,
- fire fighting: a minimum reserve of 120 m3, capable of supplying a DN 100 hydrant for 2 hours (French Standard NF S 62200). Some fire fighting departments may have additional requirements.
- industry: each case has to be studied separately.

It is essential to provide a safety margin, to take into account (a) the oversights and the inaccuracies which may affect the estimates and (b) the effective yield of the system, which is defined as:

$$r = \frac{Volume\ metered}{Volume\ supplied}$$

$$\text{Gross water requirement} = \frac{Net\ requirement}{r} x\ Ksec\ x\ Kcol$$

Water demand

Flow rates

Communities (large number of consumers)
Flow requirements are assessed as daily and hourly peaks. A distribution system is usually designed to carry the hourly peak demand.

$$Q_p = K_j \text{ x } K_h \text{ x } \frac{Vd_{Av.}}{24} (m^3/h)$$

where:

$Vd_{Av.} = \frac{V_{annual}\ (m^3)}{365}$: average daily consumption throughout the year

$K_h = \frac{Vh_{max}}{Vd_{max}} \text{ x } 24$: hourly peak coefficient

$K_j = \frac{Vd_{max}}{Vd_{Av.}}$: daily peak coefficient

Vh_{max} : volume used during hour of greatest consumption on the day of highest consumption (m^3/hour).

Vd_{max} : volume used on the day of highest consumption during the year (m^3/day).



Communal dwellings (small number of consumers)
Flow requirements are not calculated on the basis of the number of consumers but on the basis of the number of items of equipment (washbasins, sinks, W.C's etc), weighted by a coefficient of simultaneous usage:

$$Q = k.n.q$$

where:

q : unit flow of a piece of equipment

n : number of items of equipment ($n > 1$)

$k = \frac{1}{\sqrt{n-1}}$: probability coefficient of simultaneous usage (not significant for large values of n).

Simple example n° 1

Assumptions

- Semi-rural community:
present village: 1 500 inhabitants
future housing developments: 1 000 inhabitants (anticipating next 25 years)
- Annual volume metered: 75 000 m^3
- Estimated system yield: $r = 75$ %
- Estimated peak coefficients: $K_j = 2.5$; $K_h = 1.8$

Calculations and results

- Future annual volume:

$$Va_{future} = 75\,000 + (0.2 \text{ x } 1\,000 \text{ x } 365) = 148\,000 \text{ m}^3$$

(estimated daily consumption per person: 200 l)

Water demand

$$K_{col} = \frac{Va_{future}}{Va_{actual}} = \frac{148\,000}{75\,000} = 1.97$$

- Allowance for uncertainty of data: 20 % ($K_{sec} = 1.2$)
- Gross annual requirement: $B = \frac{Va}{r} \times K_{col} \times K_{sec} = 236\,000$ m^3
- Future average daily flow: $Q_{dAv.f} = \frac{236\,000}{365} = 647$ m^3
- Future peak hourly flow: $Qp = Kj \times Kh \times \frac{Q_{dAv.f}}{24} = 121$ m^3/h

In this example a supply main for the village should be designed to provide a delivery of 121 m^3/h, looking ahead for 25 years.

Simple example n° 2

Assumptions

• Communal dwelling:
10 flats
7 items of equipment / flat
average unit flow per item: 0.1 l/s

Calculations and results

The booster pump supplying this building, for example, must provide a flow $Q = k.n.q$ where :

$$k = \frac{1}{\sqrt{(7 \times 10) - 1}} = 0.12$$

$$Q = 0.1 \times 70 \times 0.12 = 0.84 \text{ l/s}$$

Water resource evaluation



Water can be collected from subsurface sources (aquifers, springs), or surface sources (rivers, lakes, dams etc).

In all cases a precise study needs to be made of the hydrology, hydrography and hydrogeology of the catchment areas, the yield from which may vary very considerably throughout the year.

A series of gauge measurements of springs and rivers, or pumping tests on subsurface waters, carried out over a long period, enables a statistical assessment of changes in flow to be made. From those figures, it is then possible to assess the quantity of available water, particularly during dry seasons.

Where the flow of a river is inadequate (low levels), a reservoir has to be created by construction of a barrage or earth dam.

If no measurements are available, the flow of a river can be estimated at its outlet by various methods related to the morphology and hydrology of its catchment basin.

Drinking water

See also: *page*
- Aggressive or corrosive water 29
- Material in contact with drinking water 99

Directive by the EC Council 98/83/CEE relative to the quality of water for human consumption, dated 3 November 1998.



● This Directive must be incorporated into the regulations of Member States.

It sets two series of criteria:

– threshold values (maximum and minimum depending on the case) that must not be exceeded for water to be considered of potable quality. They are listed under the MAC (Maximum admissible concentrations),

– guidelines representing desirable levels.

These criteria are themselves ranked in five categories:

- organoleptic characteristics,
- physical-chemical characteristics,
- undesirable contents
- toxic substances,
- microbiological characteristics.

According to the Directive, water for human consumption must not be either aggressive or corrosive to any material with which it is in contact.

In particular, the Directive sets the following guidelines:

– 100 mg/l for calcium, ie, 25 French degrees, corresponding to water with an average mineral content,

– 400 µS/cm for conductivity (corrosiveness), ie, 2500 Ω x cm.

The quality of water distributed to consumers, and so its compliance with regulations, is the result of the entire supply chain (source environment, raw water quality, water treatment, pipeline transport, water apparatuses, external installations, etc.). For specific requirements regarding pipes, see MATERIAL IN CONTACT WITH DRINKING WATER chapter.

Aggressive or corrosive water

See also: *page*
- Internal lining (selection) 228
- Drinking water 28
- PUR 233-125

Waters conveyed through pipe systems can have very different physico-chemical properties. A water can be characterized by its corrosivity (propensity to attack exposed metals) and its aggressivity (to cement based materials). PAM *pipes are internally protected with linings which enable them to carry the various types of waters encountered.*

The behaviour of water towards ferrous metals and cement-based products depends on many factors: mineralization, oxygen content, electrical conductivity, pH, calco-carbonic equilibrium, temperature, etc.
Two main types of water are taken into account:
- corrosive water, which can attack uncoated metal,
- aggressive water, which can attack cement-based materials.

Corrosive waters

Definition

Certain waters attack metal pipes which are uncoated internally. In most cases the corrosion is due to the oxygen contained in the water. The chemical reactions produce ferrous, then ferric hydroxides, forming nodules and tuberculation which can eventually reduce the pipe cross section and significantly increase head loss.

Reality of the problem

This phenomenon is encountered in old mains having no cement mortar lining. Now, PAM ductile iron pipes are lined with cement mortar, which eliminates this risk.
It should be noted that corrosion by potable waters is generally a slow process. The potability Standards recommend the distribution of non-corrosive, non-aggressive waters, thus guaranteeing both the permanence of the water quality and the protection of pipelines and public and private installations.
SEE DRINKING WATER.

Aggressive or corrosive water

Aggressive waters

Definition

The aggressivity of a water is defined as its propensity to attack calcium containing substances (e.g. cements). Depending on the chemical analysis, mineral content, pH and temperature of the water, three cases can occur:

- waters in calco-carbonic equilibrium neither cause attack, nor calcium carbonate deposition at a given temperature,
- scale depositing waters have a tendency to deposit calcium salts (carbonates ...) on the pipe inner surface,
- aggressive waters can attack certain components of calcium containing cement mortars (lime, calcium carbonates, calcium silicates or silico-aluminates).

Determination

Aggressivity determination is based on water analysis, either by means of graphs which indicate the position of the water examined in relation to the equilibrium curve, or more simply by a computer program. This method allows rapid characterization of the water, in particular at different temperatures, and allows the free CO_2 content and characteristic indices to be calculated, e.g. the LANGELIER saturation index, which gives the difference between the actual pH value of the water and the saturation pH value.

Reality of the phenomenon

Under applicable regulations, drinking water should be neither aggressive nor corrosive. SEE DRINKING WATER
However, given the wide range of types of waters supplied, it is possible to encounter low mineral content waters (soft waters), which can attack materials in contact with them, just like corrosive and/or aggressive waters.
PAM has computer programs for water aggressivity assessment to help select the best type of internal lining (cement mortar lining or PUR lining).

Diameter selection

See also: *page*
- Water demand/resources 25
- Pipeline profile 37
- Head losses 39
- Head losses (tables) 42
- Water hammer 74

The selection of the diameter of a pressure pipe is based on:

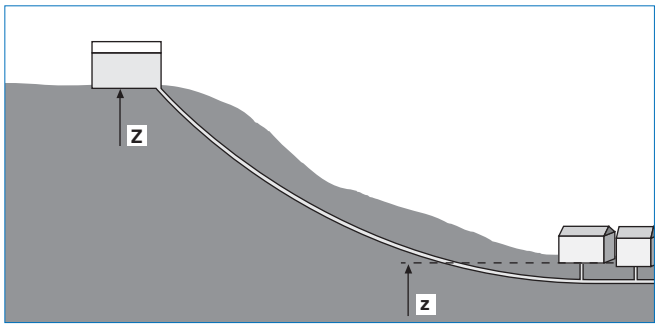
– *hydraulic parameters (flow, head losses, velocities) for gravity supplies,*

– *optimum hydraulic and economic parameters (pumping costs and asset depreciation) for a pumped supply.*

There is a need to quantify the possible risks of water hammer, cavitation, and abrasion, as a function of the operating conditions, and to install suitable protection against them.

Gravity supply

Definition



Gravity supply is the mode of supply which allows water to be fed through a pressure main from a natural or artificial storage area at elevation Z, to all points of supply located at elevations z < Z, without any energy input.

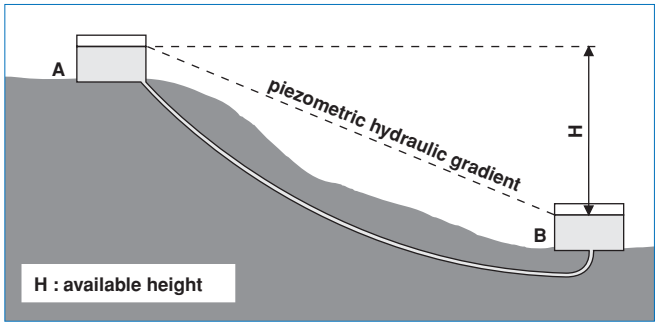
Size selection principle

● **System characteristics**

Q: Required flow (m^3/s)
– Peak distribution or fire hydrant flow
– Mean supply flow
j: Unit head loss (m/m)
V: Water velocity through pipeline (m/s)
D: Diameter of main (m)
L: Length of main (m).

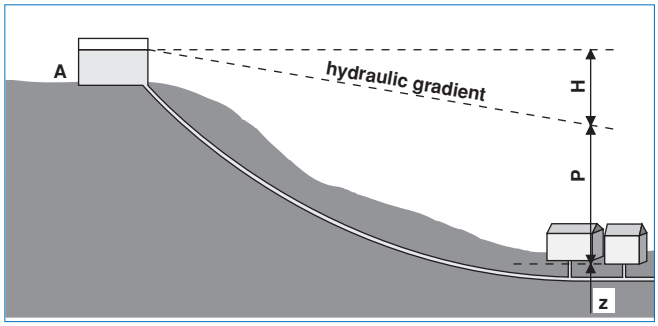
Diameter selection

Topographical features



The most unfavourable case is taken for calculation purposes.

• Supply from reservoir A to reservoir B:
H = Minimum height level in A – overflow height of B
As a safety coefficient, the invert is sometimes taken as the minimum level of A.



• Distribution
H: minimum level of A, reduced by (z + P).
P: minimum required pressure at highest distribution point.
z: elevation of that point.

Formulae

Knowing that: $Q = \frac{\pi D^2}{4} \times V$

the DARCY formula is written as: $j = \frac{\lambda V^2}{2gD} = \frac{8\lambda Q^2}{\pi^2 g D^5}$

λ. a function of (k. υ. D). is deduced from the COLEBROOK formula, where k = 0,1 mm (roughness).
See HEAD LOSSES for further details.

Determination of D

The maximum unit head loss is: $j = \frac{H}{L}$

The DN can be determined:
- by calculation, solving the system of equations constituted by the DARCY and COLEBROOK formulae (iterative calculations, needing use of a computer);
- by direct reading of head losses tables. See HEAD LOSSES (TABLES).

Example

Flow: Q = 30 l/s
Length: L = 4 000 m
Available height: H = 80 m

$$j = \frac{H}{L} = \frac{80}{4\,000} = 0.02 \text{ m/m} = 20 \text{ m/km}$$

The table shows that DN 150 is required, with:
velocity: V = 1.7 m/s
head loss: j = 19.244 m/km.

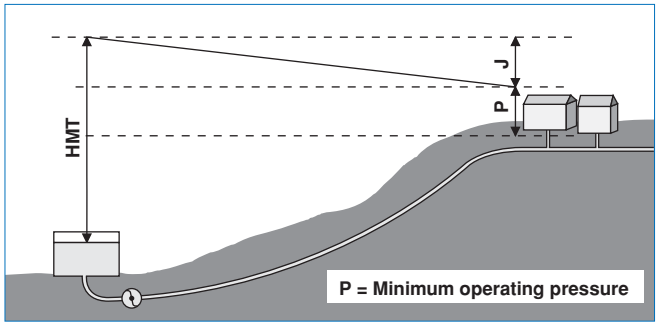
Diameter selection

l/s	DN 150		
	j (m/km)		V (m/s)
	k = 0.03 mm	k = 0.1 mm	
24.00	11.092	12.552	1.36
26.00	12.867	14.627	1.47
28.00	14.766	16.857	1.58
30.00	16.790	19.244	1.70
32.00	18.937	21.787	1.81
34.00	21.208	24.485	1.92
36.00	23.602	27.339	2.04
38.00	26.119	30.348	2.15
40.00	28.758	33.513	2.26
42.00	31.520	36.833	2.38
44.00	34.404	40.309	2.49
46.00	37.409	43.940	2.60

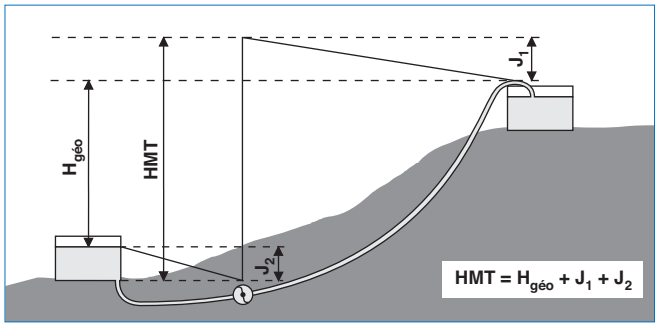
Pumped supply

Definition

Pumped distribution

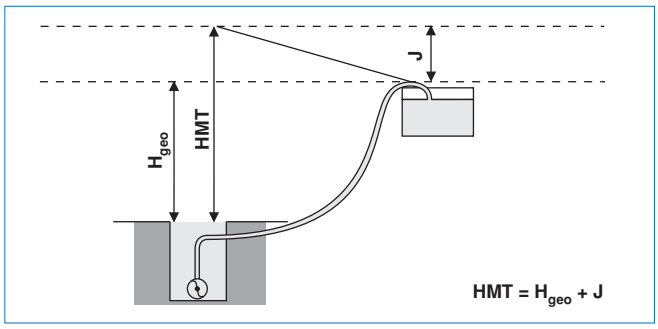


Supply pumped from a reservoir



Diameter selection

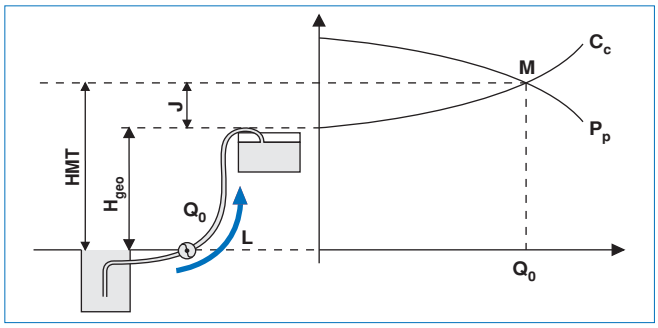
● Borehole pumped supply



Catchment or storage areas are frequently not at sufficient height to meet the required pressurization conditions. Energy therefore has to be imparted to the liquid to make distribution possible.
The following definitions are used:
– **geometric height (H_{geo})** the height difference between the level of the water being pumped and the place supplied,
– **total manometric height (HMT)** the geometric height, plus the total head losses involved in suction and pumping, plus, if warranted by the circumstances, the minimum residual distribution pressure (see example figures opposite).

Dimension selection principle

● Graphical solution



C_c: Pipeline characteristic
H: $H_{geo} + JJ = f(Q^2)$
P_p: Pump characteristic
M: Optimum point
Nota : Method valid for constant levels of suction and pumping.
If this is not the case the envelope formed by the extreme curves has to be examined.

● Hydraulic

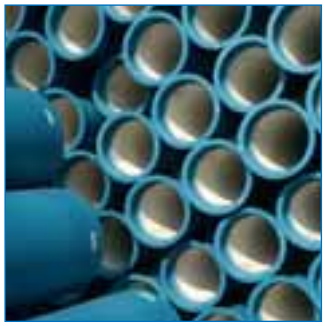
As before:

$$J = j\,L$$

$$j = \frac{\lambda\,V^2}{2\,gD}$$

λ is a function of υ. k. D.
For pumping, the characteristic curves of the pumps and system have to be taken into account, to ensure that as a function of the chosen DN, the optimum point M corresponds to the required flow Q_0.

Diameter selection



NATURAL pipes



PAMLOCK pipes

● Economic

The economic diameter is calculated by taking into account:

– the pumping costs, the power being given by the following formula:

$$P = 0.0098 \times \frac{Q \times HMT}{r}$$

where

P: Power to be supplied to the pump (kW)
Q: Flow (l/s)
HMT: Total manometric height (m)
r: Pump motor efficiency,

– the installation depreciation (pumping station + main).

Both methods are usually used, depending on the size of the project.

Application

● Small projects

The Vibert formula is used, valid for small and medium DN's and short lengths:

$$D = 1.456 \left(\frac{ne}{f} \right)^{0.154} \times Q^{0.46}$$

Where:

D: the economic diameter
f: the laid main cost in €/kg
Q: flow in m^3/s
$n = \frac{Pumping\ time\ in\ h}{24}$
e: Price per kWh en €.

The 1.456 coefficient covers an 8 % depreciation rate over 50 years.
The DN chosen must be identical to diameter D, or the next size up.

Precautions

● Large projects

A detailed economic study has to be made in the case of long lengths and large diameters. The diameter used must be the one giving the minimum annual cost (depreciation + pumping costs).
The flow rate varies significantly with the diameter.
In addition to head losses, it is consequently advisable to check compatibility with the possible phenomena of:

– water hammer,
– cavitation,
– abrasion.


Dubreuilh
10

Pipeline profile

See also: *page*
- Head losses 39
- Water hammer 74

Air is detrimental to efficient functioning of a pressure main. Its presence can cause:
- *a reduction in flow rate,*
- *energy wastage,*
- *the risk of water hammer.*

It can be prevented by taking a number of simple precautions when planning the pipeline profile.

Source of air in pipelines

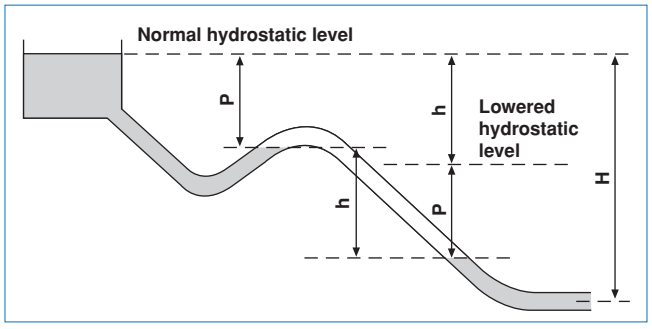
Air can principally be introduced into a main:
- during filling following a hydrostatic test (or main emptying), because of an inadequate number of purging devices,
- through pump strainers, if the suction pipes or pump seals are not leaktight,
- as dissolved air under pressure (the air then accumulates at high spots along the profile).



Effect of air in mains

Air is detrimental to efficient functioning of a main. Air pockets accumulate at high spots and distort under the effect of the upstream pressure.

Condition in a gravity main

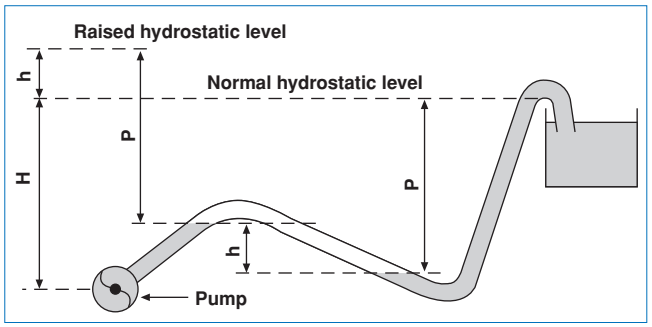


Statically, the air pocket transmits the pressure P on its upstream face to the downstream face; the hydrostatic level drops. The useful pressure H is reduced by a quantity h, corresponding to the difference in level between the extremities of the air pocket and the missing head height.

Dynamically, it can be considered that, neglecting the head loss due to any turbulence at this point, the pressure reduction is also equal to h, and the flow is correspondingly reduced.

Pipeline profile

Pumping main conditions



In the same way as in a gravity main, the presence of a pocket of air is detrimental to good performance of a pumping main. In this case there is a pressure increase h (height h of additional head to be lifted) which the pump must supply in addition to pressure H, in order to compensate for the increased head due to the air pocket, with the hydrostatic level being raised by this value. For the same flow rate, the energy consumption is increased in the same proportions.

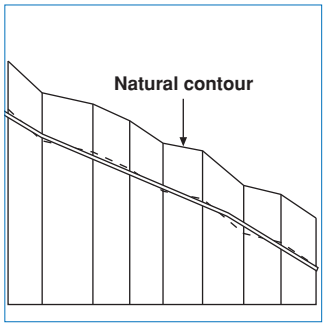
Furthermore, these disadvantages are repeated at every high spot if the main is inadequately vented. The effects are additive and the throughput of the main drops. This drop in throughput is sometimes incorrectly attributed to other causes, such as a drop in pump efficiency or deposition in the pipes. Correct venting of the main is sufficient remedy to restore the normal flow capacity immediately.

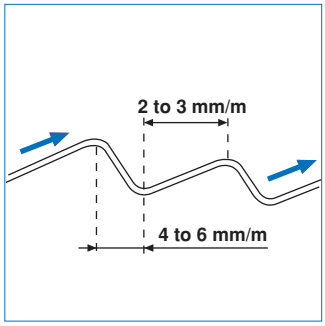
Finally, there is a risk of large air pockets being entrained by the flow and carried to points other than the high spots. Their displacement, compensated for by a sudden rush of water of equal volume, results in violent water hammer.

Summarizing, if high spots are not constantly vented:

- water flow is diminished,
- energy is wasted,
- water hammer can occur.

Practical recommendations





A pipeline layout must be planned in a manner facilitating air accumulation at well defined high spots, where venting equipment must be installed.
The following precautions are advisable:

• Provide the main with a gradient to facilitate upward movement of the air (an ideal pipeline has a steady gradient: the desirable minimum gradient is 2 to 3 mm/m).

• Avoid excessive gradient changes caused by following ground contours, particularly for large diameters.

• If the profile is flat, create as many artificial high and low spots as possible, to give gradients of:

- 2 to 3 mm/m in ascending sections,
- 4 to 6 mm/m in descending sections.

Profiles of this type, with gradual ascents and rapid descents, facilitate air collection at high spots, whilst preventing any air entrainment. The converse profile is inadvisable.

• Install:

- an air vent unit at every high spot,
- a wash-out at every low spot.

Head losses

See also: *page*
- Cement (mortar lining) 229
- Diameter (selection) 31
- Head losses (tables) 42
- DUCTAN 235

Head losses are hydraulic energy losses essentially caused by the water viscosity and its friction against the pipe walls.

The effect is:

- *an overall pressure drop at the lower end of a gravity system,*
- *an increase in energy consumption in a pumping main.*

When choosing a ductile iron main lined with cement mortar a roughness coefficient of k = 0.1 mm is generally taken.



Formulae

DARCY formula

Head losses are calculated with the DARCY formula:

$$J = \frac{\lambda}{D}\,\frac{V^2}{2g} = \frac{8\,\lambda\,Q^2}{\pi^2\,g\,D^5}$$

J: head losses (in m of fluid head per m of pipe)
λ: head losses coefficient
D: internal pipe diameter (m)
V: fluid velocity (m/s)
Q: flow rate (m^3/s)
g: gravitation constant (m/s^2)

COLEBROOK-WHITE formula

The COLEBROOK-WHITE formula is now universally used for determining the head losses coefficient:

$$\frac{1}{\sqrt{\lambda}} = -2\log\left(\frac{2.51}{\mathrm{Re}\sqrt{\lambda}} + \frac{k}{3.71\,D}\right)$$

$$\mathrm{Re} = \frac{VD}{\mu}\ \text{(REYNOLDS number)}$$

μ: kinematic viscosity of the fluid at the operating temperature (m^2/s)

k: the equivalent pipe surface roughness (in m); note that k is not equal to the height of the surface imperfections: it is a theoretical concept relating to the surface roughness, hence the term "equivalent".

The two terms in the logarithmic function correspond:

– in the first term $\left(\frac{2.51}{\mathrm{Re}\sqrt{\lambda}}\right)$. to the portion of head losses due to the liquid's own internal friction acting upon itself;

Head losses

– in the second term $\left(\frac{k}{3.71\ D}\right)$, to the portion of head losses caused by the friction of the liquid against the pipe wall; for an ideally smooth pipe (k = 0), the head losses are only due to the internal friction of the fluid.

● **HAZEN-WILLIAM formula**

$$V = 0.355\ C D^{0.63}\ J^{0.54}$$

C: a coefficient dependent on the roughness and pipe diameter.

Surface roughness of cement mortar linings

Spun cement mortar linings have a smooth, regular surface. A series of tests have been carried out to determine the roughness value k of the surface of freshly spun mortar. An average value of 0.03 mm was obtained, corresponding to an extra head loss of 5 to 7 % (depending on pipe diameter), when compared to a perfectly smooth pipe having a value of k = 0 (calculated for a velocity of 1 m/s).

However, the equivalent surface roughness of a pipeline depends not only on the regularity of the pipe surface, but also, and especially, on the number of bends, tees and service connections present, as well as irregularities in the pipeline profile. Experience has shown that k = 0.1 mm is a reasonable value for distribution mains. k can be slightly lower (0.06 to 0.08 mm) for long mains having only a few fittings per kilometre.

Three comments can be made at this stage about head losses in pressurized water mains:

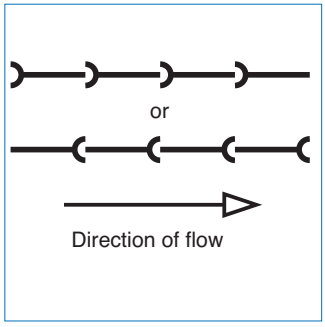
The head losses correspond to the energy that must be supplied for the water to flow in the pipeline. It is the **sum of three factors:**

a - internal water friction (linked to the viscosity),

b - water friction along the pipe wall (linked to the roughness),

c - local changes to flow (bends, joints, etc.)

In practice, the **bulk of the head losses** attributable to the **internal water friction** (factor a). Water friction on the pipe wall (factor b), which is the **only factor that depends on the type of pipe,** is much less: at the most 7 % of factor for a cement-lined pipe (k = 0.03 mm).



Local changes to the flow (factor c) also play a small role in comparison to factor a: this explains why pipe sockets can be laid in either direction.

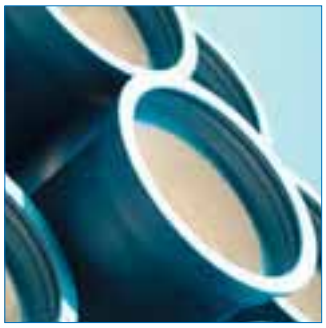
The actual internal diameter of the pipe plays an important role:

– at a given flow rate (general case), each % less in the diameter is 5 % more head loss,

– at a given head loss (gravity pipelines), each % less in the diameter is 2.5 % less in the resultant flow rate.

Head losses

Changes with time



A series of investigations carried out on old and recent installations of iron pipes, lined with cement mortar, has given C values (HAZEN-WILLIAM formula) for a large range of diameters and lengths of service.

The results are given on the table below, showing C values converted to equivalent k values (in the COLEBROOK-WHITE formula).

Comment

In some cases when transporting raw water with a high solid fraction content at a low flow velocity, experience has shown that an increase in k over time must be factored in, irrespective of the type of pipe used.

The results cover different types of mortar linings and waters from widely spread geographical locations.

It can be concluded that:

- cement mortar lined pipes provide a large flow capacity which remains constant with time,
- an overall value of k = 0.1 mm is a reasonably certain assumption for calculating long term head losses in cement mortar lined pipes.

DN	Year of installation	Age during the measure	Value of coefficient C (Hazen-William)	Value of k (Colebrook-White)
		years		
150	1941	0	145	0.025
		12	146	0.019
		16	143	0.060
250	1925	16	134	0.148
		32	135	0.135
		39	138	0.098
300	1928	13	134	0.160
		29	137	0.119
		36	146	0.030
300	1928	13	143	0.054
		29	140	0.075
		36	140	0.075
700	1939	19	148	0.027
		25	146	0.046
700	1944	13	148	0.027
		20	146	0.046

(Journal AWWA - June 1974).

Head losses (tables)

See also: *page*
- Cement (mortar lining) 229
- DUCTAN 235
- Head losses 39

The head losses have been calculated for ductile iron pipelines internally lined with cement mortar.

Hypothesis for the calculation:

- *pipeline is full of water,*
- *DN 40 to 2 000,*
- *roughness coefficient: k = 0.03 mm and k = 0.1 mm*
- *kinematic viscosity of water: $\upsilon = 1.301 \cdot 10^{-6} m^2/s$.*
- *water temperature: T = 10 °C.*

For BLUTOP pipelines internally coated with DUCTAN, calculation hypotheses used are as follows:

- *pipeline full of water*
- *DN/OD 90, 110, 125*
- *roughness coefficient:*
  - *k = 0,01 mm*
  - *k = 0,05 mm (singular head losses)*

Head losses (tables)

Q	DN 40			DN 50			NATURAL C40 DN 60		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
0.60	8.514	9.339	0.48						
0.70	11.209	12.399	0.56						
0.80	14.238	15.870	0.64						
0.90	17.596	19.751	0.72						
1.00	21.280	24.039	0.80	7.211	7.901	0.51			
1.10	25.286	28.735	0.88	8.552	9.418	0.56			
1.20	29.610	33.836	0.95	9.998	11.063	0.61			
1.30	34.252	39.343	1.03	11.546	12.834	0.66			
1.40	39.209	45.254	1.11	13.197	14.731	0.71			
1.50	44.479	51.569	1.19	14.949	16.754	0.76	6.173	6.754	0.53
1.60	50.061	58.288	1.27	16.801	18.903	0.81	6.931	7.609	0.57
1.70	55.953	65.411	1.35	18.753	21.178	0.87	7.729	8.513	0.60
1.80	62.155	72.937	1.43	20.805	23.578	0.92	8.567	9.465	0.64
1.90	68.665	80.865	1.51	22.956	26.103	0.97	9.445	10.466	0.67
2.00	75.482	89.197	1.59	25.206	28.752	1.02	10.362	11.515	0.71
2.10	82.605	97.931	1.67	27.554	31.527	1.07	11.318	12.612	0.74
2.20	90.034	107.067	1.75	29.999	34.427	1.12	12.312	13.758	0.78
2.30	97.769	116.606	1.83	32.543	37.451	1.17	13.346	14.951	0.81
2.40	105.808	126.546	1.91	35.183	40.600	1.22	14.418	16.193	0.85
2.50	114.150	136.889	1.99	37.920	43.874	1.27	15.529	17.483	0.88
2.60	122.796	147.634	2.07	40.754	47.272	1.32	16.678	18.821	0.92
2.70	131.745	158.781	2.15	43.684	50.795	1.38	17.865	20.207	0.95
2.80	140.997	170.330	2.23	46.711	54.442	1.43	19.091	21.640	0.99
2.90	150.550	182.280	2.31	49.833	58.213	1.48	20.354	23.122	1.03
3.00	160.406	194.632	2.39	53.051	62.109	1.53	21.655	24.651	1.06
3.10	170.563	207.386	2.47	56.365	66.128	1.58	22.994	26.229	1.10
3.20	181.021	220.542	2.55	59.774	70.272	1.63	24.370	27.854	1.13
3.30	191.779	234.099	2.63	63.279	74.541	1.68	25.785	29.527	1.17
3.40	202.838	248.058	2.71	66.879	78.933	1.73	27.236	31.247	1.20
3.50	214.198	262.418	2.79	70.574	83.450	1.78	28.725	33.016	1.24
3.60	225.858	277.180	2.86	74.363	88.091	1.83	30.252	34.832	1.27
3.70	237.817	292.343	2.94	78.248	92.855	1.88	31.815	36.696	1.31
3.80				82.227	97.744	1.94	33.416	38.607	1.34
3.90				86.300	102.757	1.99	35.054	40.566	1.38
4.00				90.468	107.894	2.04	36.730	42.573	1.41
4.20				99.088	118.540	2.14	40.191	46.730	1.49
4.40				108.084	129.682	2.24	43.801	51.077	1.56
4.60				117.456	141.321	2.34	47.557	55.614	1.63
4.80				127.203	153.454	2.44	51.461	60.342	1.70
5.00				137.326	166.084	2.55	55.512	65.260	1.77
5.20				147.823	179.209	2.65	59.709	70.369	1.84
5.40				158.694	192.830	2.75	64.052	75.667	1.91
5.60				169.939	206.947	2.85	68.541	81.156	1.98
5.80				181.557	221.559	2.95	73.176	86.835	2.05
6.00							77.957	92.704	2.12
6.20							82.883	98.763	2.19
6.40							87.954	105.011	2.26
6.60							93.170	111.450	2.33
6.80							98.531	118.079	2.41
7.00							104.037	124.898	2.48
7.20							109.687	131.907	2.55
7.40							115.482	139.105	2.62
7.60							121.421	146.494	2.69
7.80							127.505	154.072	2.76
8.00							133.732	161.840	2.83
8.20							140.104	169.798	2.90
8.40							146.619	177.946	2.97

Figures directly applicable for water at 10 °C

* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

Head losses (tables)

Q	DN 65			NATURAL C40 DN 80			NATURAL C40 DN 100		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
1.60	4.706	5.117	0.48						
1.80	5.813	6.358	0.54						
2.00	7.026	7.727	0.60						
2.20	8.343	9.223	0.66						
2.40	9.765	10.847	0.72						
2.60	11.289	12.597	0.78	4.121	4.480	0.52			
2.80	12.915	14.473	0.84	4.709	5.138	0.56			
3.00	14.642	16.476	0.90	5.333	5.838	0.60			
3.20	16.470	18.605	0.96	5.992	6.582	0.64			
3.40	18.399	20.860	1.02	6.686	7.369	0.68			
3.60	20.427	23.240	1.08	7.415	8.198	0.72			
3.80	22.554	25.746	1.15	8.180	9.069	0.76			
4.00	24.781	28.377	1.21	8.978	9.984	0.80	3.039	3.289	0.51
4.20	27.106	31.134	1.27	9.812	10.940	0.84	3.318	3.600	0.53
4.40	29.529	34.016	1.33	10.679	11.940	0.88	3.609	3.923	0.56
4.60	32.050	37.023	1.39	11.581	12.981	0.92	3.911	4.261	0.59
4.80	34.669	40.155	1.45	12.517	14.065	0.95	4.223	4.611	0.61
5.00	37.385	43.413	1.51	13.487	15.191	0.99	4.547	4.975	0.64
5.20	40.198	46.795	1.57	14.491	16.359	1.03	4.882	5.352	0.66
5.40	43.109	50.303	1.63	15.528	17.570	1.07	5.228	5.743	0.69
5.60	46.116	53.935	1.69	16.599	18.823	1.11	5.585	6.146	0.71
5.80	49.220	57.692	1.75	17.704	20.118	1.15	5.952	6.563	0.74
6.00	52.421	61.575	1.81	18.842	21.455	1.19	6.331	6.993	0.76
6.20	55.718	65.582	1.87	20.013	22.834	1.23	6.720	7.436	0.79
6.40	59.111	69.714	1.93	21.218	24.256	1.27	7.120	7.893	0.81
6.60	62.600	73.971	1.99	22.456	25.719	1.31	7.531	8.362	0.84
6.80	66.185	78.352	2.05	23.727	27.225	1.35	7.953	8.845	0.87
7.00	69.866	82.859	2.11	25.032	28.772	1.39	8.385	9.341	0.89
7.20	73.642	87.490	2.17	26.369	30.362	1.43	8.828	9.850	0.92
7.40	77.515	92.246	2.23	27.739	31.994	1.47	9.282	10.372	0.94
7.60	81.483	97.126	2.29	29.143	33.668	1.51	9.746	10.907	0.97
7.80	85.546	102.131	2.35	30.579	35.383	1.55	10.221	11.456	0.99
8.00	89.704	107.261	2.41	32.048	37.141	1.59	10.706	12.017	1.02
8.20	93.958	112.516	2.47	33.550	38.941	1.63	11.202	12.592	1.04
8.40	98.308	117.896	2.53	35.084	40.782	1.67	11.708	13.180	1.07
8.60	102.752	123.400	2.59	36.652	42.666	1.71	12.225	13.781	1.09
8.80	107.291	129.028	2.65	38.252	44.592	1.75	12.753	14.394	1.12
9.00	111.925	134.782	2.71	39.885	46.559	1.79	13.291	15.021	1.15
9.20	116.655	140.660	2.77	41.550	48.569	1.83	13.839	15.661	1.17
9.40	121.479	146.662	2.83	43.248	50.620	1.87	14.398	16.315	1.20
9.60	126.398	152.790	2.89	44.979	52.714	1.91	14.968	16.981	1.22
9.80	131.412	159.041	2.95	46.742	54.849	1.95	15.547	17.660	1.25
10.00				48.537	57.027	1.99	16.137	18.352	1.27
10.50				53.168	62.654	2.09	17.658	20.140	1.34
11.00				58.002	68.542	2.19	19.244	22.010	1.40
11.50				63.037	74.693	2.29	20.894	23.961	1.46
12.00				68.275	81.105	2.39	22.608	25.993	1.53
12.50				73.714	87.780	2.49	24.387	28.107	1.59
13.00				79.354	94.716	2.59	26.230	30.302	1.66
13.50				85.196	101.914	2.69	28.136	32.579	1.72
14.00				91.239	109.374	2.79	30.107	34.937	1.78
14.50				97.482	117.095	2.88	32.141	37.376	1.85
16.50							40.914	47.947	2.10
18.50							50.699	59.817	2.36
20.50							61.493	72.987	2.61
22.50							73.291	87.456	2.86

Figures directly applicable for water at 10 °C
* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

Head losses (tables)

Q	NATURAL C40 DN 125			NATURAL C40 DN 150			NATURAL C40 DN 200		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
7.00	2.832	3.070	0.57						
7.50	3.209	3.490	0.61						
8.00	3.607	3.936	0.65						
8.50	4.027	4.408	0.69						
9.00	4.469	4.906	0.73	1.844	1.984	0.51			
9.50	4.931	5.429	0.77	2.034	2.193	0.54			
10.00	5.415	5.977	0.81	2.232	2.412	0.57			
10.50	5.920	6.552	0.86	2.438	2.641	0.59			
11.00	6.445	7.151	0.90	2.653	2.880	0.62			
11.50	6.992	7.777	0.94	2.876	3.129	0.65			
12.00	7.559	8.428	0.98	3.107	3.388	0.68			
12.50	8.147	9.104	1.02	3.347	3.656	0.71			
13.00	8.756	9.806	1.06	3.595	3.935	0.74			
13.50	9.385	10.533	1.10	3.852	4.224	0.76			
14.00	10.035	11.285	1.14	4.116	4.522	0.79			
14.50	10.705	12.063	1.18	4.389	4.830	0.82			
15.00	11.396	12.867	1.22	4.669	5.149	0.85			
15.50	12.107	13.695	1.26	4.958	5.477	0.88			
16.00	12.838	14.549	1.30	5.255	5.814	0.91	1.297	1.389	0.51
16.50	13.590	15.429	1.34	5.560	6.162	0.93	1.371	1.471	0.53
17.00	14.362	16.333	1.39	5.873	6.519	0.96	1.448	1.555	0.54
17.50	15.154	17.263	1.43	6.194	6.887	0.99	1.526	1.641	0.56
18.00	15.966	18.219	1.47	6.523	7.264	1.02	1.606	1.729	0.57
18.50	16.799	19.199	1.51	6.861	7.651	1.05	1.688	1.820	0.59
19.00	17.651	20.205	1.55	7.206	8.047	1.08	1.772	1.913	0.60
19.50	18.524	21.237	1.59	7.559	8.454	1.10	1.858	2.008	0.62
20.00	19.416	22.293	1.63	7.920	8.870	1.13	1.945	2.105	0.64
20.50	20.329	23.375	1.67	8.289	9.296	1.16	2.035	2.204	0.65
21.00	21.262	24.482	1.71	8.665	9.732	1.19	2.126	2.306	0.67
21.50	22.214	25.614	1.75	9.050	10.177	1.22	2.219	2.410	0.68
22.00	23.187	26.772	1.79	9.443	10.633	1.24	2.314	2.516	0.70
22.50	24.180	27.955	1.83	9.843	11.098	1.27	2.411	2.624	0.72
23.00	25.192	29.163	1.87	10.252	11.573	1.30	2.510	2.734	0.73
23.50	26.224	30.397	1.91	10.668	12.057	1.33	2.611	2.847	0.75
24.00	27.277	31.655	1.96	11.092	12.552	1.36	2.713	2.962	0.76
26.00	31.684	36.942	2.12	12.867	14.627	1.47	3.141	3.443	0.83
28.00	36.408	42.633	2.28	14.766	16.857	1.58	3.599	3.959	0.89
30.00	41.448	48.728	2.44	16.790	19.244	1.70	4.085	4.510	0.95
32.00	46.802	55.226	2.61	18.937	21.787	1.81	4.600	5.096	1.02
34.00	52.471	62.128	2.77	21.208	24.485	1.92	5.144	5.717	1.08
36.00	58.454	69.432	2.93	23.602	27.339	2.04	5.717	6.372	1.15
38.00				26.119	30.348	2.15	6.317	7.063	1.21
40.00				28.758	33.513	2.26	6.946	7.788	1.27
42.00				31.520	36.833	2.38	7.604	8.548	1.34
44.00				34.404	40.309	2.49	8.289	9.342	1.40
46.00				37.409	43.940	2.60	9.003	10.172	1.46
48.00				40.537	47.726	2.72	9.744	11.035	1.53
50.00				43.786	51.668	2.83	10.514	11.934	1.59
55.00							12.559	14.332	1.75
60.00							14.777	16.946	1.91
65.00							17.168	19.777	2.07
70.00							19.731	22.823	2.23
75.00							22.465	26.085	2.39
80.00							25.370	29.564	2.55
85.00							28.446	33.258	2.71
90.00							31.692	37.167	2.86

Figures directly applicable for water at 10 °C

* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

WATER CYCLE

Head losses (tables)

Q	NATURAL C40 DN 250			NATURAL C40 DN 300			NATURAL C30 DN 350		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
30.00	1.377	1.483	0.61						
32.00	1.549	1.673	0.65						
34.00	1.730	1.874	0.69						
36.00	1.921	2.086	0.73	0.792	0.844	0.51			
38.00	2.121	2.309	0.77	0.874	0.934	0.54			
40.00	2.330	2.543	0.81	0.960	1.027	0.57			
42.00	2.549	2.788	0.86	1.049	1.125	0.59			
44.00	2.776	3.044	0.90	1.142	1.227	0.62			
46.00	3.013	3.310	0.94	1.238	1.334	0.65			
48.00	3.258	3.588	0.98	1.339	1.445	0.68			
50.00	3.513	3.876	1.02	1.442	1.559	0.71	0.682	0.726	0.52
52.00	3.776	4.176	1.06	1.550	1.679	0.74	0.732	0.781	0.54
54.00	4.049	4.486	1.10	1.661	1.802	0.76	0.785	0.838	0.56
56.00	4.331	4.807	1.14	1.776	1.930	0.79	0.838	0.897	0.58
58.00	4.621	5.139	1.18	1.894	2.062	0.82	0.894	0.958	0.60
60.00	4.920	5.482	1.22	2.016	2.198	0.85	0.951	1.021	0.62
62.00	5.229	5.836	1.26	2.141	2.338	0.88	1.010	1.085	0.64
64.00	5.546	6.200	1.30	2.270	2.483	0.91	1.070	1.152	0.67
66.00	5.872	6.575	1.34	2.402	2.631	0.93	1.132	1.220	0.69
68.00	6.207	6.961	1.39	2.538	2.784	0.96	1.196	1.290	0.71
70.00	6.550	7.358	1.43	2.677	2.942	0.99	1.261	1.363	0.73
72.00	6.902	7.766	1.47	2.820	3.103	1.02	1.328	1.437	0.75
74.00	7.264	8.185	1.51	2.967	3.269	1.05	1.397	1.513	0.77
76.00	7.634	8.614	1.55	3.116	3.438	1.08	1.467	1.591	0.79
78.00	8.012	9.054	1.59	3.270	3.612	1.10	1.539	1.670	0.81
80.00	8.400	9.505	1.63	3.427	3.790	1.13	1.612	1.752	0.83
85.00	9.406	10.680	1.73	3.834	4.254	1.20	1.802	1.965	0.88
90.00	10.467	11.922	1.83	4.262	4.744	1.27	2.002	2.189	0.94
95.00	11.583	13.232	1.94	4.713	5.260	1.34	2.213	2.425	0.99
100.00	12.752	14.609	2.04	5.184	5.802	1.41	2.433	2.673	1.04
105.00	13.976	16.053	2.14	5.677	6.371	1.49	2.662	2.932	1.09
110.00	15.253	17.565	2.24	6.192	6.965	1.56	2.902	3.204	1.14
115.00	16.584	19.144	2.34	6.727	7.586	1.63	3.151	3.487	1.20
120.00	17.969	20.790	2.44	7.284	8.232	1.70	3.410	3.782	1.25
125.00	19.407	22.504	2.55	7.862	8.905	1.77	3.679	4.088	1.30
130.00	20.899	24.285	2.65	8.460	9.604	1.84	3.957	4.406	1.35
135.00	22.444	26.134	2.75	9.080	10.329	1.91	4.245	4.736	1.40
140.00	24.043	28.049	2.85	9.721	11.080	1.98	4.542	5.078	1.46
145.00	25.695	30.032	2.95	10.383	11.856	2.05	4.849	5.431	1.51
150.00				11.066	12.659	2.12	5.166	5.796	1.56
155.00				11.770	13.488	2.19	5.492	6.173	1.61
160.00				12.495	14.343	2.26	5.828	6.561	1.66
165.00				13.240	15.224	2.33	6.173	6.961	1.71
170.00				14.007	16.131	2.41	6.528	7.373	1.77
175.00				14.794	17.064	2.48	6.892	7.796	1.82
180.00				15.602	18.023	2.55	7.266	8.231	1.87
185.00				16.431	19.008	2.62	7.649	8.678	1.92
190.00				17.281	20.019	2.69	8.041	9.136	1.97
195.00				18.151	21.056	2.76	8.443	9.606	2.03
200.00				19.042	22.119	2.83	8.855	10.088	2.08
210.00				20.886	24.323	2.97	9.706	11.086	2.18
220.00							10.594	12.131	2.29
230.00							11.520	13.223	2.39
240.00							12.484	14.361	2.49
250.00							13.485	15.546	2.60
260.00							14.523	16.777	2.70
270.00							15.599	18.055	2.81
280.00							16.712	19.379	2.91

Figures directly applicable for water at 10 °C
* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

Head losses (tables)

Q	NATURAL C30 DN 400			NATURAL C30 DN 450			NATURAL C30 DN 500		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
65.00	0.575	0.612	0.52						
70.00	0.659	0.702	0.56						
75.00	0.747	0.799	0.60						
80.00	0.841	0.902	0.64	0.474	0.503	0.50			
85.00	0.940	1.010	0.68	0.530	0.564	0.53			
90.00	1.044	1.125	0.72	0.588	0.627	0.57			
95.00	1.153	1.245	0.76	0.650	0.694	0.60			
100.00	1.267	1.371	0.80	0.713	0.764	0.63	0.428	0.453	0.51
105.00	1.385	1.504	0.84	0.780	0.837	0.66	0.467	0.496	0.53
110.00	1.509	1.642	0.88	0.850	0.913	0.69	0.509	0.542	0.56
115.00	1.638	1.786	0.92	0.922	0.993	0.72	0.552	0.588	0.59
120.00	1.772	1.935	0.95	0.997	1.075	0.75	0.597	0.637	0.61
125.00	1.911	2.091	0.99	1.075	1.161	0.79	0.643	0.688	0.64
130.00	2.055	2.253	1.03	1.155	1.251	0.82	0.691	0.740	0.66
135.00	2.204	2.420	1.07	1.239	1.343	0.85	0.741	0.795	0.69
140.00	2.357	2.594	1.11	1.324	1.438	0.88	0.792	0.851	0.71
145.00	2.516	2.773	1.15	1.413	1.537	0.91	0.845	0.909	0.74
150.00	2.679	2.958	1.19	1.504	1.639	0.94	0.899	0.969	0.76
155.00	2.847	3.149	1.23	1.598	1.744	0.97	0.955	1.031	0.79
160.00	3.020	3.345	1.27	1.695	1.852	1.01	1.013	1.094	0.81
165.00	3.198	3.548	1.31	1.794	1.964	1.04	1.072	1.160	0.84
170.00	3.380	3.756	1.35	1.896	2.079	1.07	1.132	1.227	0.87
175.00	3.568	3.971	1.39	2.001	2.196	1.10	1.195	1.296	0.89
180.00	3.760	4.191	1.43	2.108	2.317	1.13	1.259	1.368	0.92
185.00	3.957	4.417	1.47	2.218	2.442	1.16	1.324	1.440	0.94
190.00	4.159	4.648	1.51	2.331	2.569	1.19	1.391	1.515	0.97
195.00	4.366	4.886	1.55	2.446	2.699	1.23	1.459	1.592	0.99
200.00	4.577	5.129	1.59	2.564	2.833	1.26	1.529	1.670	1.02
210.00	5.014	5.634	1.67	2.807	3.110	1.32	1.674	1.832	1.07
220.00	5.471	6.161	1.75	3.061	3.399	1.38	1.825	2.002	1.12
230.00	5.946	6.712	1.83	3.326	3.701	1.45	1.982	2.179	1.17
240.00	6.440	7.286	1.91	3.601	4.016	1.51	2.145	2.363	1.22
250.00	6.953	7.883	1.99	3.886	4.344	1.57	2.314	2.555	1.27
260.00	7.485	8.504	2.07	4.182	4.684	1.63	2.489	2.753	1.32
270.00	8.035	9.148	2.15	4.488	5.036	1.70	2.671	2.960	1.38
280.00	8.605	9.815	2.23	4.804	5.401	1.76	2.858	3.173	1.43
290.00	9.193	10.506	2.31	5.131	5.779	1.82	3.051	3.394	1.48
300.00	9.800	11.219	2.39	5.468	6.170	1.89	3.251	3.622	1.53
310.00	10.426	11.956	2.47	5.815	6.573	1.95	3.456	3.857	1.58
320.00	11.071	12.716	2.55	6.173	6.988	2.01	3.668	4.100	1.63
330.00	11.734	13.499	2.63	6.541	7.417	2.07	3.885	4.350	1.68
340.00	12.416	14.306	2.71	6.919	7.857	2.14	4.109	4.607	1.73
350.00	13.117	15.136	2.79	7.307	8.311	2.20	4.338	4.872	1.78
360.00	13.836	15.989	2.86	7.705	8.777	2.26	4.574	5.144	1.83
370.00	14.574	16.865	2.94	8.114	9.255	2.33	4.815	5.423	1.88
380.00				8.533	9.747	2.39	5.062	5.709	1.94
390.00				8.962	10.250	2.45	5.316	6.003	1.99
400.00				9.401	10.767	2.52	5.575	6.304	2.04
420.00				10.310	11.837	2.64	6.111	6.928	2.14
440.00				11.259	12.958	2.77	6.671	7.581	2.24
460.00				12.249	14.129	2.89	7.255	8.263	2.34
480.00							7.862	8.974	2.44
500.00							8.493	9.714	2.55
520.00							9.147	10.483	2.65
540.00							9.825	11.282	2.75
560.00							10.526	12.109	2.85
580.00							11.251	12.965	2.95

Figures directly applicable for water at 10 °C

* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

Head losses (tables)

Q	NATURAL C30 DN 600			DN 700			DN 800		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
160.00	0.417	0.443	0.57						
170.00	0.466	0.496	0.60						
180.00	0.517	0.552	0.64						
190.00	0.571	0.611	0.67						
200.00	0.628	0.673	0.71	0.296	0.313	0.52			
210.00	0.687	0.737	0.74	0.324	0.343	0.55			
220.00	0.748	0.805	0.78	0.353	0.375	0.57			
230.00	0.812	0.875	0.81	0.383	0.407	0.60			
240.00	0.878	0.949	0.85	0.414	0.441	0.62			
250.00	0.947	1.025	0.88	0.446	0.476	0.65			
260.00	1.018	1.104	0.92	0.480	0.512	0.68	0.251	0.265	0.52
270.00	1.092	1.186	0.95	0.514	0.550	0.70	0.269	0.284	0.54
280.00	1.168	1.271	0.99	0.550	0.589	0.73	0.287	0.304	0.56
290.00	1.247	1.358	1.03	0.587	0.629	0.75	0.306	0.325	0.58
300.00	1.327	1.449	1.06	0.625	0.671	0.78	0.326	0.346	0.60
310.00	1.411	1.542	1.10	0.664	0.714	0.81	0.346	0.368	0.62
320.00	1.496	1.638	1.13	0.704	0.758	0.83	0.367	0.390	0.64
330.00	1.584	1.737	1.17	0.745	0.804	0.86	0.388	0.414	0.66
340.00	1.675	1.839	1.20	0.787	0.850	0.88	0.410	0.438	0.68
350.00	1.768	1.943	1.24	0.830	0.898	0.91	0.433	0.462	0.70
360.00	1.863	2.051	1.27	0.875	0.947	0.94	0.456	0.487	0.72
370.00	1.960	2.161	1.31	0.921	0.998	0.96	0.479	0.513	0.74
380.00	2.060	2.274	1.34	0.967	1.050	0.99	0.504	0.540	0.76
390.00	2.163	2.390	1.38	1.015	1.103	1.01	0.528	0.567	0.78
400.00	2.267	2.509	1.41	1.064	1.157	1.04	0.554	0.594	0.80
420.00	2.483	2.755	1.49	1.165	1.270	1.09	0.606	0.652	0.84
440.00	2.709	3.013	1.56	1.270	1.388	1.14	0.660	0.712	0.88
460.00	2.944	3.281	1.63	1.379	1.510	1.20	0.717	0.774	0.92
480.00	3.189	3.561	1.70	1.493	1.638	1.25	0.776	0.839	0.95
500.00	3.442	3.853	1.77	1.611	1.771	1.30	0.837	0.907	0.99
520.00	3.705	4.155	1.84	1.733	1.909	1.35	0.900	0.977	1.03
540.00	3.977	4.469	1.91	1.860	2.053	1.40	0.965	1.050	1.07
560.00	4.259	4.794	1.98	1.990	2.201	1.46	1.033	1.125	1.11
580.00	4.550	5.131	2.05	2.125	2.354	1.51	1.102	1.203	1.15
600.00	4.850	5.478	2.12	2.265	2.513	1.56	1.174	1.284	1.19
620.00	5.159	5.837	2.19	2.408	2.676	1.61	1.248	1.367	1.23
640.00	5.477	6.208	2.26	2.556	2.845	1.66	1.324	1.452	1.27
660.00	5.805	6.589	2.33	2.707	3.018	1.71	1.403	1.540	1.31
680.00	6.142	6.982	2.41	2.863	3.197	1.77	1.483	1.631	1.35
700.00	6.488	7.386	2.48	3.024	3.381	1.82	1.566	1.724	1.39
720.00	6.843	7.801	2.55	3.188	3.569	1.87	1.650	1.820	1.43
740.00	7.207	8.228	2.62	3.357	3.763	1.92	1.737	1.918	1.47
760.00	7.581	8.666	2.69	3.529	3.962	1.97	1.826	2.019	1.51
780.00	7.963	9.115	2.76	3.706	4.166	2.03	1.917	2.122	1.55
800.00	8.355	9.575	2.83	3.887	4.375	2.08	2.010	2.228	1.59
850.00				4.358	4.920	2.21	2.252	2.503	1.69
900.00				4.855	5.497	2.34	2.507	2.795	1.79
950.00				5.377	6.105	2.47	2.775	3.102	1.89
1 000.00				5.925	6.744	2.60	3.056	3.425	1.99
1 050.00				6.500	7.415	2.73	3.351	3.764	2.09
1 100.00				7.099	8.118	2.86	3.658	4.119	2.19
1 150.00				7.725	8.853	2.99	3.978	4.490	2.29
1 200.00							4.312	4.876	2.39
1 250.00							4.658	5.278	2.49
1 300.00							5.017	5.696	2.59
1 350.00							5.389	6.130	2.69
1 400.00							5.774	6.579	2.79
1 450.00							6.172	7.045	2.88

Figures directly applicable for water at 10 °C

* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

Head losses (tables)

Q	DN 900			DN 1 000			DN 1 100		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
340.00	0.231	0.244	0.53						
360.00	0.257	0.272	0.57						
380.00	0.284	0.301	0.60						
400.00	0.312	0.331	0.63	0.187	0.197	0.51			
420.00	0.341	0.363	0.66	0.204	0.215	0.53			
440.00	0.372	0.396	0.69	0.222	0.235	0.56			
460.00	0.403	0.431	0.72	0.241	0.255	0.59			
480.00	0.436	0.467	0.75	0.261	0.277	0.61	0.164	0.173	0.51
500.00	0.470	0.504	0.79	0.281	0.299	0.64	0.177	0.186	0.53
520.00	0.506	0.543	0.82	0.303	0.322	0.66	0.190	0.201	0.55
540.00	0.542	0.583	0.85	0.324	0.345	0.69	0.204	0.215	0.57
560.00	0.580	0.625	0.88	0.347	0.370	0.71	0.218	0.231	0.59
580.00	0.619	0.668	0.91	0.370	0.395	0.74	0.233	0.246	0.61
600.00	0.659	0.712	0.94	0.394	0.421	0.76	0.248	0.262	0.63
620.00	0.701	0.758	0.97	0.419	0.448	0.79	0.263	0.279	0.65
640.00	0.743	0.805	1.01	0.444	0.476	0.81	0.279	0.296	0.67
660.00	0.787	0.853	1.04	0.470	0.504	0.84	0.295	0.314	0.69
680.00	0.832	0.903	1.07	0.497	0.534	0.87	0.312	0.332	0.72
700.00	0.878	0.955	1.10	0.524	0.564	0.89	0.329	0.351	0.74
720.00	0.925	1.007	1.13	0.552	0.595	0.92	0.347	0.370	0.76
740.00	0.974	1.061	1.16	0.581	0.627	0.94	0.365	0.390	0.78
760.00	1.023	1.117	1.19	0.610	0.659	0.97	0.383	0.410	0.80
780.00	1.074	1.174	1.23	0.641	0.693	0.99	0.402	0.431	0.82
800.00	1.126	1.232	1.26	0.671	0.727	1.02	0.421	0.452	0.84
850.00	1.261	1.383	1.34	0.752	0.816	1.08	0.471	0.507	0.89
900.00	1.403	1.544	1.41	0.836	0.910	1.15	0.524	0.565	0.95
950.00	1.552	1.712	1.49	0.925	1.008	1.21	0.579	0.626	1.00
1 000.00	1.709	1.890	1.57	1.017	1.112	1.27	0.637	0.690	1.05
1 050.00	1.872	2.076	1.65	1.114	1.221	1.34	0.698	0.757	1.10
1 100.00	2.043	2.270	1.73	1.216	1.335	1.40	0.761	0.828	1.16
1 150.00	2.221	2.473	1.81	1.321	1.454	1.46	0.827	0.901	1.21
1 200.00	2.406	2.685	1.89	1.431	1.578	1.53	0.895	0.977	1.26
1 250.00	2.599	2.905	1.96	1.545	1.707	1.59	0.966	1.057	1.32
1 300.00	2.798	3.134	2.04	1.663	1.840	1.66	1.040	1.139	1.37
1 350.00	3.004	3.372	2.12	1.785	1.979	1.72	1.116	1.225	1.42
1 400.00	3.218	3.618	2.20	1.911	2.123	1.78	1.194	1.313	1.47
1 450.00	3.438	3.872	2.28	2.041	2.272	1.85	1.276	1.405	1.53
1 500.00	3.666	4.135	2.36	2.176	2.425	1.91	1.359	1.499	1.58
1 550.00	3.901	4.407	2.44	2.314	2.584	1.97	1.446	1.597	1.63
1 600.00	4.142	4.687	2.52	2.457	2.748	2.04	1.534	1.698	1.68
1 650.00	4.391	4.976	2.59	2.604	2.916	2.10	1.626	1.801	1.74
1 700.00	4.647	5.274	2.67	2.755	3.090	2.16	1.720	1.908	1.79
1 750.00	4.909	5.580	2.75	2.910	3.268	2.23	1.816	2.018	1.84
1 800.00	5.179	5.894	2.83	3.069	3.452	2.29	1.915	2.131	1.89
1 850.00	5.456	6.217	2.91	3.232	3.640	2.36	2.016	2.247	1.95
1 900.00	5.739	6.549	2.99	3.400	3.834	2.42	2.120	2.365	2.00
1 950.00				3.571	4.032	2.48	2.227	2.487	2.05
2 000.00				3.747	4.235	2.55	2.336	2.612	2.10
2 100.00				4.110	4.657	2.67	2.561	2.871	2.21
2 200.00				4.489	5.098	2.80	2.797	3.142	2.31
2 300.00				4.885	5.559	2.93	3.042	3.425	2.42
2 400.00							3.298	3.720	2.53
2 500.00							3.563	4.028	2.63
2 600.00							3.838	4.347	2.74
2 700.00							4.124	4.679	2.84
2 800.00							4.419	5.022	2.95

Figures directly applicable for water at 10 °C

* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

WATER CYCLE

Head losses (tables)

Q	DN 1 200			DN 1 400			DN 1 500		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
600.00	0.162	0.171	0.53						
650.00	0.188	0.198	0.57						
700.00	0.215	0.228	0.62						
750.00	0.244	0.259	0.66						
800.00	0.275	0.293	0.71	0.130	0.137	0.52			
850.00	0.308	0.329	0.75	0.145	0.153	0.55			
900.00	0.342	0.366	0.80	0.161	0.170	0.58	0.115	0.121	0.51
950.00	0.379	0.406	0.84	0.178	0.189	0.62	0.128	0.134	0.54
1 000.00	0.416	0.447	0.88	0.196	0.208	0.65	0.140	0.148	0.57
1 050.00	0.456	0.490	0.93	0.215	0.228	0.68	0.153	0.162	0.59
1 100.00	0.497	0.536	0.97	0.234	0.249	0.71	0.167	0.177	0.62
1 150.00	0.540	0.583	1.02	0.254	0.270	0.75	0.181	0.192	0.65
1 200.00	0.584	0.632	1.06	0.275	0.293	0.78	0.196	0.208	0.68
1 250.00	0.630	0.683	1.11	0.296	0.317	0.81	0.212	0.225	0.71
1 300.00	0.678	0.736	1.15	0.319	0.341	0.84	0.228	0.242	0.74
1 350.00	0.728	0.791	1.19	0.342	0.366	0.88	0.244	0.260	0.76
1 400.00	0.779	0.848	1.24	0.366	0.392	0.91	0.261	0.278	0.79
1 450.00	0.831	0.907	1.28	0.390	0.420	0.94	0.279	0.297	0.82
1 500.00	0.886	0.968	1.33	0.416	0.447	0.97	0.297	0.317	0.85
1 550.00	0.942	1.031	1.37	0.442	0.476	1.01	0.315	0.338	0.88
1 600.00	0.999	1.096	1.41	0.469	0.506	1.04	0.334	0.359	0.91
1 650.00	1.059	1.162	1.46	0.496	0.536	1.07	0.354	0.380	0.93
1 700.00	1.120	1.231	1.50	0.525	0.568	1.10	0.374	0.402	0.96
1 750.00	1.182	1.301	1.55	0.554	0.600	1.14	0.395	0.425	0.99
1 800.00	1.246	1.374	1.59	0.584	0.633	1.17	0.416	0.449	1.02
1 850.00	1.312	1.448	1.64	0.615	0.667	1.20	0.438	0.473	1.05
1 900.00	1.380	1.524	1.68	0.646	0.702	1.23	0.460	0.497	1.08
1 950.00	1.449	1.603	1.72	0.678	0.738	1.27	0.483	0.522	1.10
2 000.00	1.519	1.683	1.77	0.711	0.775	1.30	0.507	0.548	1.13
2 100.00	1.665	1.849	1.86	0.779	0.851	1.36	0.555	0.602	1.19
2 200.00	1.818	2.023	1.95	0.850	0.930	1.43	0.605	0.658	1.24
2 300.00	1.977	2.204	2.03	0.924	1.013	1.49	0.658	0.716	1.30
2 400.00	2.142	2.394	2.12	1.001	1.099	1.56	0.712	0.777	1.36
2 500.00	2.314	2.591	2.21	1.080	1.189	1.62	0.769	0.841	1.41
2 600.00	2.492	2.795	2.30	1.163	1.283	1.69	0.828	0.906	1.47
2 700.00	2.677	3.008	2.39	1.248	1.379	1.75	0.888	0.974	1.53
2 800.00	2.867	3.228	2.48	1.337	1.480	1.82	0.951	1.045	1.58
2 900.00	3.065	3.456	2.56	1.428	1.583	1.88	1.016	1.118	1.64
3 000.00	3.268	3.691	2.65	1.522	1.691	1.95	1.083	1.194	1.70
3 100.00	3.478	3.934	2.74	1.620	1.801	2.01	1.152	1.271	1.75
3 200.00	3.694	4.185	2.83	1.720	1.915	2.08	1.223	1.352	1.81
3 300.00	3.917	4.444	2.92	1.823	2.033	2.14	1.296	1.435	1.87
3 400.00				1.928	2.154	2.21	1.371	1.520	1.92
3 500.00				2.037	2.279	2.27	1.448	1.607	1.98
3 650.00				2.206	2.472	2.37	1.567	1.743	2.07
3 800.00				2.380	2.673	2.47	1.691	1.885	2.15
3 950.00				2.562	2.882	2.57	1.819	2.032	2.24
4 100.00				2.750	3.099	2.66	1.952	2.184	2.32
4 250.00				2.944	3.323	2.76	2.090	2.342	2.41
4 400.00				3.144	3.555	2.86	2.232	2.505	2.49
4 550.00				3.351	3.795	2.96	2.379	2.674	2.57
4 700.00							2.530	2.848	2.66
4 850.00							2.685	3.027	2.74
5 000.00							2.845	3.212	2.83
5 150.00							3.010	3.403	2.91
5 300.00							3.179	3.599	3.00

Figures directly applicable for water at 10 °C
* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

Head losses (tables)

Q	DN 1 600			DN 1 800			DN 2 000		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)	k = 0.03 mm	k = 0.10 mm	V (m/s)
1 100.00	0.122	0.128	0.55						
1 200.00	0.143	0.151	0.60						
1 300.00	0.166	0.176	0.65	0.094	0.098	0.51			
1 400.00	0.190	0.202	0.70	0.107	0.113	0.55			
1 500.00	0.216	0.230	0.75	0.122	0.128	0.59			
1 600.00	0.244	0.260	0.80	0.137	0.145	0.63	0.082	0.086	0.51
1 700.00	0.273	0.292	0.85	0.154	0.162	0.67	0.092	0.096	0.54
1 800.00	0.304	0.325	0.90	0.171	0.181	0.71	0.102	0.107	0.57
1 900.00	0.336	0.360	0.94	0.189	0.200	0.75	0.113	0.119	0.60
2 000.00	0.369	0.397	0.99	0.208	0.221	0.79	0.124	0.131	0.64
2 100.00	0.404	0.436	1.04	0.227	0.242	0.83	0.136	0.144	0.67
2 200.00	0.441	0.476	1.09	0.248	0.265	0.86	0.148	0.157	.0.70
2 300.00	0.479	0.518	1.14	0.269	0.288	0.90	0.161	0.170	0.73
2 400.00	0.519	0.562	1.19	0.291	0.312	0.94	0.174	0.185	0.76
2 500.00	0.560	0.608	1.24	0.314	0.337	0.98	0.188	0.200	0.80
2 600.00	0.603	0.655	1.29	0.338	0.364	1.02	0.202	0.215	0.83
2 700.00	0.647	0.705	1.34	0.363	0.391	1.06	0.216	0.231	0.86
2 800.00	0.692	0.755	1.39	0.388	0.419	1.10	0.232	0.247	0.89
2 900.00	0.739	0.808	1.44	0.414	0.448	1.14	0.247	0.265	0.92
3 000.00	0.788	0.863	1.49	0.441	0.478	1.18	0.263	0.282	0.95
3 100.00	0.838	0.919	1.54	0.469	0.509	1.22	0.280	0.300	0.99
3 200.00	0.889	0.977	1.59	0.498	0.540	1.26	0.297	0.319	1.02
3 300.00	0.942	1.036	1.64	0.528	0.573	1.30	0.315	0.338	1.05
3 400.00	0.997	1.097	1.69	0.558	0.607	1.34	0.333	0.358	1.08
3 500.00	1.053	1.161	1.74	0.589	0.642	1.38	0.351	0.379	1.11
3 650.00	1.139	1.258	1.82	0.637	0.696	1.43	0.380	0.410	1.16
3 800.00	1.229	1.360	1.89	0.687	0.752	1.49	0.409	0.443	1.21
3 950.00	1.322	1.466	1.96	0.739	0.810	1.55	0.440	0.477	1.26
4 100.00	1.418	1.576	2.04	0.793	0.870	1.61	0.472	0.512	1.31
4 250.00	1.518	1.689	2.11	0.848	0.932	1.67	0.505	0.549	1.35
4 400.00	1.621	1.806	2.19	0.906	0.997	1.73	0.539	0.587	1.40
4 550.00	1.727	1.928	2.26	0.965	1.063	1.79	0.574	0.626	1.45
4 700.00	1.836	2.053	2.34	1.025	1.132	1.85	0.610	0.666	1.50
4 850.00	1.949	2.182	2.41	1.088	1.203	1.91	0.647	0.707	1.54
5 000.00	2.065	2.315	2.49	1.152	1.276	1.96	0.685	0.750	1.59
5 200.00	2.224	2.498	2.59	1.241	1.376	2.04	0.737	0.809	1.66
5 400.00	2.390	2.689	2.69	1.333	1.481	2.12	0.792	0.870	1.72
5 600.00	2.561	2.886	2.79	1.428	1.589	2.20	0.848	0.933	1.78
5 800.00	2.737	3.090	2.88	1.526	1.701	2.28	0.906	0.999	1.85
6 000.00	2.920	3.301	2.98	1.627	1.816	2.36	0.966	1.066	1.91
6 200.00				1.731	1.936	2.44	1.027	1.136	1.97
6 400.00				1.839	2.059	2.52	1.091	1.208	2.04
6 600.00				1.949	2.186	2.59	1.156	1.282	2.10
6 800.00				2.063	2.317	2.67	1.223	1.359	2.16
7 000.00				2.180	2.451	2.75	1.292	1.437	2.23
7 200.00				2.300	2.589	2.83	1.363	1.518	2.29
7 400.00				2.423	2.731	2.91	1.436	1.601	2.36
7 600.00				2.549	2.877	2.99	1.510	1.686	2.42
7 800.00							1.587	1.773	2.48
8 000.00							1.665	1.863	2.55
8 200.00							1.745	1.954	2.61
8 400.00							1.826	2.048	2.67
8 600.00							1.910	2.144	2.74
8 800.00							1.995	2.242	2.80
9 000.00							2.083	2.343	2.86
9 200.00							2.171	2.445	2.93
9 400.00							2.262	2.550	2.99

Figures directly applicable for water at 10 °C

* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

WATER CYCLE

Head losses (tables)

Q	BLUTOP DN/OD 90			BLUTOP DN/OD 110			BLUTOP DN/OD 125		
	j (m/km)*			j (m/km)*			j (m/km)*		
(l/s)	k = 0.01 mm	k = 0.05 mm	V (m/s)	k = 0.01 mm	k = 0.05 mm	V (m/s)	k = 0.01 mm	k = 0.05 mm	V (m/s)
2.8	3.84	4.05	0.52						
3	4.34	4.59	0.55						
3.2	4.87	5.16	0.59						
3.4	5.43	5.77	0.63						
3.6	6.01	6.40	0.67						
3.8	6.62	7.07	0.70						
4	7.26	7.76	0.74						
4.2	7.92	8.49	0.78	2.81	2.95	0.50			
4.4	8.61	9.25	0.81	3.05	3.21	0.53			
4.6	9.32	10.04	0.85	3.30	3.48	0.55			
4.8	10.06	10.85	0.89	3.56	3.76	0.58			
5	10.83	11.70	0.92	3.83	4.05	0.60			
5.2	11.62	12.58	0.96	4.11	4.35	0.62			
5.4	12.44	13.49	1.00	4.40	4.67	0.65			
5.6	13.28	14.43	1.04	4.69	4.99	0.67	2.44	2.57	0.51
5.8	14.14	15.41	1.07	5.00	5.32	0.70	2.60	2.74	0.53
6	15.04	16.41	1.11	5.31	5.66	0.72	2.76	2.91	0.55
6.2	15.95	17.44	1.15	5.63	6.01	0.74	2.93	3.09	0.57
6.4	16.89	18.50	1.18	5.96	6.37	0.77	3.10	3.27	0.59
6.6	17.86	19.59	1.22	6.30	6.74	0.79	3.28	3.46	0.60
6.8	18.85	20.71	1.26	6.65	7.12	0.82	3.46	3.66	0.62
7	19.86	21.86	1.29	7.01	7.52	0.84	3.64	3.86	0.64
7.2	20.90	23.04	1.33	7.37	7.92	0.86	3.83	4.06	0.66
7.4	21.97	24.25	1.37	7.74	8.33	0.89	4.02	4.27	0.68
7.6	23.05	25.49	1.40	8.12	8.75	0.91	4.22	4.48	0.69
7.8	24.17	26.76	1.44	8.51	9.18	0.94	4.42	4.70	0.71
8	25.30	28.06	1.48	8.91	9.62	0.96	4.63	4.93	0.73
8.2	26.46	29.39	1.52	9.32	10.07	0.98	4.84	5.15	0.75
8.4	27.65	30.75	1.55	9.73	10.53	1.01	5.05	5.39	0.77
8.6	28.85	32.14	1.59	10.15	11.00	1.03	5.27	5.63	0.79
8.8	30.08	33.56	1.63	10.58	11.48	1.06	5.49	5.87	0.80
9	31.34	35.01	1.66	11.02	11.97	1.08	5.72	6.12	0.82
9.2	32.62	36.49	1.70	11.47	12.47	1.10	5.95	6.37	0.84
9.4	33.92	38.00	1.74	11.92	12.97	1.13	6.18	6.63	0.86
9.6	35.25	39.54	1.77	12.38	13.49	1.15	6.42	6.89	0.88
9.8	36.59	41.10	1.81	12.85	14.02	1.18	6.67	7.16	0.90
10	37.97	42.70	1.85	13.33	14.56	1.20	6.91	7.43	0.91
10.5	41.50	46.82	1.94	14.57	15.95	1.26	7.55	8.14	0.96
11	45.18	51.13	2.03	15.85	17.39	1.32	8.21	8.87	1.01
11.5	49.00	55.62	2.13	17.18	18.90	1.38	8.90	9.63	1.05
12	52.97	60.30	2.22	18.56	20.47	1.44	9.61	10.42	1.10
12.5	57.08	65.16	2.31	19.99	22.10	1.50	10.35	11.25	1.14
13	61.34	70.21	2.40	21.47	23.79	1.56	11.11	12.10	1.19
13.5	65.74	75.44	2.50	22.99	25.54	1.62	11.90	12.98	1.23
14	70.27	80.85	2.59	24.57	27.35	1.68	12.71	13.90	1.28
15	79.78	92.23	2.77	27.86	31.15	1.80	14.41	15.81	1.37
16	89.84	104.34	2.96	31.35	35.19	1.92	16.20	17.84	1.46
17				35.02	39.47	2.04	18.09	20.00	1.55
18				38.89	43.98	2.16	20.08	22.27	1.65
19				42.94	48.74	2.28	22.16	24.66	1.74
20				47.18	53.74	2.40	24.34	27.16	1.83
21				51.60	58.97	2.52	26.61	29.79	1.92
22				56.21	64.44	2.64	28.97	32.53	2.01
23				61.01	70.15	2.76	31.43	35.39	2.10
24				65.98	76.10	2.88	33.98	38.36	2.19
25							36.62	41.46	2.29
26							39.36	44.67	2.38
27							42.19	48.00	2.47
28							45.11	51.45	2.56
29							48.12	55.01	2.65
30							51.22	58.69	2.74
31							54.41	62.49	2.83
32							57.69	66.40	2.93

Figures directly applicable for water at 10 °C
* Head (in meters) of the fluid as it flows through a standard kilometer of the relevant pipe.

1993 - Dominican Republic - DN 1800



Pressures (terminology)

See also: *page*
- Allowable operating pressures 57
- Works testing 251
- Site tests 369
- Water hammer 74

With the term "pressure", a distinction needs to be drawn between terminology used by:
- *the network designer (dependent on the hydraulic capacity),*
- *the manufacturer (dependent on the product performance), and*
- *the network user (dependent on the service).*





DN 200 NATURAL pipe
Bursting pressure 156 bar

Terminology

The terminology listed below is drawn from the draft European standard EN 805 – Water supply. Specification for external networks and components – applicable to all materials.

	Terminology			
	Abbreviation	French	English	German
Designer	**DP**	**Pression de calcul en régime permanent**	Design pressure	Systembetriebsdruck
	MDP	**Pression maximale de calcul**	Maximum design pressure	höchster Systembetriebsdruck
	STP	**Pression d'épreuve du réseau**	System test pressure	Systemprüfdruck
Manufacturer	**PFA**	**Pression de fonction-nement admissible**	Allowable operating pressure	zulässiger Bauteilbetriebsdruck
	PMA	**Pression maximale admissible**	Allowable maximum operating pressure	höchster zulässiger Bauteilbetriebsdruck
	PEA	**Pression d'épreuve admissible**	Allowable test pressure	zulässiger Bauteilprüfdruck
User	**OP**	**Pression de fonctionnement**	Operating pressure	Betriebsdruck
	SP	**Pression de service**	Service pressure	Versorgungsdruck

The product Standards EN 545 and ISO 2531 – Ductile iron pipes and fittings – also use this terminology applicable to the manufacturer.

Pressures (terminology)

Designer's terminology

- **DP-Design pressure**

Maximum service pressure in the pressure zone set by the designer but not including water hammer.

- **MDP - Maximum design pressure**

Maximum service pressure in the pressure zone set by the designer and including water hammer and taking into account future developments.
MDP is written **MDPa** when water hammer is included as a set figure.
MDP is written **MDPc** when water hammer has been calculated.

- **STP - System test pressure**

Hydrostatic pressure applied to a newly laid pipe to ensure its integrity and leak tightness.

Manufacturer's terminology (applicable to present catalogue)



NATURAL pipe
Class 40

- **PFA - Allowable operating pressure**

Internal pressure, **excluding water hammer**, that a component can safely and continuously withstand under permanent hydraulic service.

- **PMA - Allowable maximum operating pressure**

Maximum internal pressure, **including water hammer**, that a component can safely withstand during service.

- **PEA - Allowable test pressure**

Maximum hydrostatic pressure that can be applied on site to a newly laid pipe component.

User's terminology

- **OP - Operating pressure**

Internal pressure at a given time and point in the water distribution system.

Pressures (terminology)

● SP - Service pressure

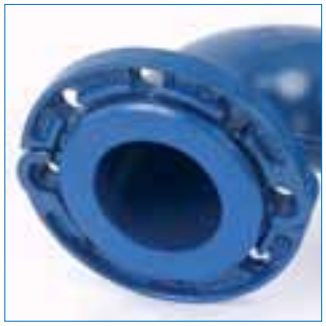
Internal pressure supplied to the consumer.

Other manufacturer's definitions

● PN - Nominal pressure (in compliance with Standard EN 545)

Numerical designation expressed by a number used for reference purposes. All flanged components with the same DN and designated by the same PN are compatible for interconnection.

Standard EN 545 – Annex A 4, table A.2 – sets out for flanged pipes and fittings, the following PN equivalents in PFA, PMA and PEA:



NATURAL fitting with flange

DN	PN 10			PN 16			PN 25			PN 40		
	PFA	PMA	PEA	PFA	PMA	PEA	PFA	PMA	PEA	PFA	PMA	PEA
40 to 50	See PN 40			See PN 40			See PN 40			40	48	53
60 to 80	See PN 16			16	20	25	See PN 40			40	48	53
100 to 150	See PN 16			16	20	25	25	30	35	40	48	53
200 to 300	10	12	17	16	20	25	25	30	35	40	48	53
350 to 1 200	10	12	17	16	20	25	25	30	35	–	–	–
1 400 to 2 000	10	12	17	16	20	25	–	–	–	–	–	–
For DN 80 flanged parts manufactured by PAM, use the following equivalents:												
80	See PN 40			See PN 40			See PN 40			40	48	53

● Leaktightness test pressure (in the sense of Standard EN 545)

Pressure applied to a component during its manufacture to ensure its leaktightness. (See WORKS TESTING.)

Allowable operating pressures

See also: *page*
- Pressure (terminology) 54
- Safety factors 73
- Flanges (dimensions/drilling) 150
- Works testing 251
- Site test 369
- Water hammer 74

PAM *pipelines are designed to withstand high pressures, generally much greater than the values usually encountered in the networks. This is justified by the need to withstand the numerous stresses on the pipelines during installation, but also and above all, over the years.*

Pipeline design calculation

DP ≤ PFA
(allowable operating pressure)
MDP ≤ PMA
(allowable maximum operating pressure)
STP ≤ PEA
(allowable test pressure)

When choosing a pipeline component, it is essential to ensure that the three inequalities opposite are respected.
Where:
DP = Design pressure in steady state,
MDP= Maximum design pressure,
STP = System test pressure.

Safety factor

The pressures indicated in the following tables were produced using high safety factors which take into account not only the forces due to the internal pressure but also numerous other sometimes accidental stresses on the pipelines during installation and when they are in service.

For example:
For a pipe, the allowable operating pressure (PFA) is calculated with a safety factor of:
– 3 with respect to the minimum tensile strength,
– approximately 2 with respect to the minimum yield strength*.
Please contact our technical teams whenever you want to use a component at pressures greater than those indicated in the tables.

Note:
* according to the generally observed relationship between tensile strength and yield strength

Allowable operating pressures

Using the pressure table

The pressure resistance of a component depends on:
– the strength of the body of this component,
and
– the performance of the joint(s) fitted.
For each type of component (pipes, fittings, etc.) and each type of joint, the following tables give the applicable PFA, PMA and PEA values.

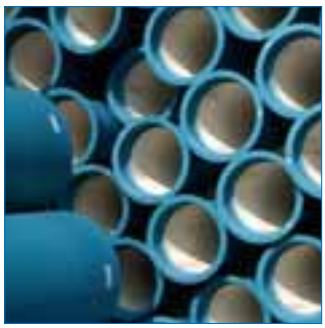
If a pipe is equipped with two types of assembly, one at each end, choose the lowest PFA, PMA and PEA values.

If a pipe is equipped with two types of assembly (e.g. Tee with two sockets and flanged branch) choose the lowest PFA, PMA and PEA values.

For example: Tee DN 300 with 2 EXPRESS sockets, flanged branch DN 150 PN 40:
PFA = 40
PMA = 48
PEA = 53

Pressures of pipes and fittings

● NATURAL range



NATURAL pipes

DN	Class Pipe	Not anchored						Anchored		
		STANDARD			EXPRESS**			STANDARD Vi EXPRESS Vi***		
		PFA	PMA	PEA	PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*
60	C40	64	76	81	64	76	81	25	30	35
80	C40	64	76	81	64	76	81	23	27	32
100	C40	64	76	81	64	76	81	23	27	32
125	C40	64	76	81	64	76	81	22	26	31
150	C40	62	74	79	57	68	73	18	21	26
200	C40	50	60	65	50	60	65	16	19	24
250	C40	43	51	56	46	55	60	16	19	24
300	C40	40	48	53	43	51	56	16	19	24
350	C30	35	42	47	25	30	35	16	19	24
400	C30	32	38	43	25	30	35	16	19	24
450	C30	30	36	41	25	30	35	13	15	20
500	C30	30	36	41	25	30	35	11	13	18
600	C30	30	36	41	25	30	35	10	12	17

Pipes and fittings* - NATURAL - Classes C40 and C30
** The fittings are class K12.*
*** NATURAL EXPRESS pipes are available in DN 100, 150, 200, 250 and 300, NATURAL EXPRESS fittings from DN 60 to 600.*
**** EXPRESS Vi anchoring is available from DN 60 to 300.*

Allowable operating pressures



NATURAL UNIVERSAL pipes

Pipes and fittings* - NATURAL UNIVERSAL, UNIVERSAL - Class K9

DN	Class Pipe	Not anchored UNIVERSAL			Anchored UNIVERSAL Vi Std V+i***			Anchored UNIVERSAL Ve**		
		PFA	PMA	PEA	PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*
80	K9	85	102	107	60	72	77	-	-	-
100	K9	85	102	107	56	67	72	64	76	81
125	K9	85	102	107	52	62	67	60	72	77
150	K9	79	94	99	48	57	62	55	66	71
200	K9	62	74	79	43	51	56	50	60	65
250	K9	54	64	69	39	46	51	45	54	59
300	K9	49	58	63	34	40	45	40	48	53
350	K9	45	54	59	25	30	35	38	45	50
400	K9	42	50	55	20	24	29	35	42	47
450	K9	40	48	53	16	19	24	32	38	43
500	K9	38	45	50	16	19	24	30	36	41
600	K9	36	43	48	16	19	24	27	32	37

** The fittings are class K12. ** UNIVERSAL pipes are not available in DN 80.*
**** STANDARD V+i anchoring available in DN 350 to 600, only on pipe K9 or higher K.*

● CLASSIC range



CLASSIQUE pipes

Pipes - STANDARD - Class K9

DN	Class Pipe	Not anchored STANDARD			Anchored STANDARD Ve		
		PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*
700	K9	34	40	45	25	30	35
800	K9	32	38	43	16* 25**	19* 30**	24* 35**
900	K9	31	37	42	16* 25**	19* 30**	24* 35**
1 000	K9	30	36	41	16* 25**	19* 30**	24* 35**
1 100	K9	29	34	39	16* 25**	19* 30**	24* 35**
1 200	K9	28	33	38	16* 25**	19* 30**	24* 35**
1 400	K9	28	33	38	-	-	-
1 500	K9	27	32	37	-	-	-
1 600	K9	27	32	37	-	-	-
1 800	K9	26	31	36	-	-	-
2 000	K9	26	31	36	-	-	-

** Values obtained with cast iron bolts. ** Values obtained with special bolts and bearing flanges*



Fitting

Fittings - STANDARD - Class K12

DN	Class Pipe	Not anchored STANDARD			Not anchored EXPRESS**			Anchored STANDARD Ve		
		PFA	PMA	PEA	PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*
700	K12	34	40	45	25	30	35	25	30	35
800	K12	32	38	43	25	30	35	16* 25**	19* 30**	24* 35**
900	K12	31	37	42	25	30	35	16* 25**	19* 30**	24* 35**
1 000	K12	30	36	41	25	30	35	16* 25*	19* 30**	24* 35**
1 100	K12	29	34	39	25	30	35	16* 25**	19* 30**	24* 35**
1 200	K12	28	33	38	25	30	35	16* 25**	19* 30**	24* 35**
1 400	K12	25 22***	30 26***	35 31***	-	-	-	-	-	-
1 500	K12	25 22***	30 26***	35 31***	-	-	-	-	-	-
1 600	K12	25 21***	30 25***	35 30***	-	-	-	-	-	-
1 800	K12	25 16***	30 19***	35 24***	-	-	-	-	-	-
2 000	K12	25 16***	30 19***	35 24***	-	-	-	-	-	-

** Values obtained with cast iron bolts. ** Values obtained with special bolts and bearing flanges.*
**** Values for Tee with 2 sockets and branch DN > 600*

PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Allowable operating pressures



PAMLOCK pipe

Pipes and fittings* - UNIVERSAL and PAMLOCK - Class K9

DN	Class Pipe	Not anchored UNIVERSAL PAMLOCK			Anchored UNIVERSAL PAMLOCK		
		PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*
700	K9	34	40	45	27	32	37
800	K9	32	38	43	25	30	35
900	K9	31	37	42	25	30	35
1 000	K9	30	36	41	25	30	35
1 100	K9	-	-	-	-	-	-
1 200	K9	28	33	38	20**	24	29
1 400	K9	28	33	38	25 22***	30 26***	35 31***
1 500	K9	27	32	37	25 22***	30 26***	35 31***
1 600	K9	27	32	37	25 21***	30 25***	35 30***
1 800	K9	26	31	36	16	19	24
2 000	K9	-	-	-	-	-	-

** The fittings are class K12. ** 25 bar in K10.*
**** Values for Tee with 2 sockets and branch DN > 600*
For more information, please consult us

● ALPINAL range



ALPINAL pipe

Pipes and fittings - ALPINAL

DN	Class Pipe	Not anchored UNIVERSAL			Anchored UNIVERSAL Vi			UNIVERSAL Ve		
		PFA	PMA	PEA	PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*	*bar*
80	K10	100	120	125	100	120	125	-	-	-
100	K12	100	120	125	100	120	125	-	-	-
125	K12	100	120	125	100	120	125	-	-	-
150	K12	100	120	125	63	76	81	100	120	125
200	K12	100	120	125	-	-	-	100	120	125
250	K12	78	93	98	-	-	-	63	76	81
300	K12	70	84	89	-	-	-	63	76	81
400	K12	63	76	81	-	-	-	63	76	81
500	K12	50	60	65	-	-	-	45	54	59

● BLUTOP range



BLUTOP pipe

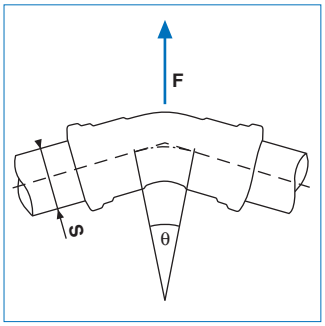
Pipes and fittings - BLUTOP

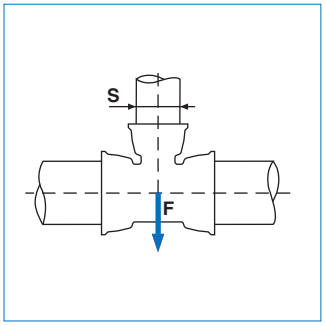
DN	Class Pipe	Not anchored BLUTOP			Anchored BLUTOP Vi		
		PFA	PMA	PEA	PFA	PMA	PEA
		bar	*bar*	*bar*	*bar*	*bar*	*bar*
90	C25	25	30	35	16	19	20
110	C25	25	30	35	16	19	20
125	C25	25	30	35	16	19	20

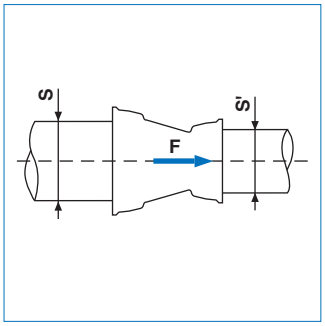
Hydraulic thrust

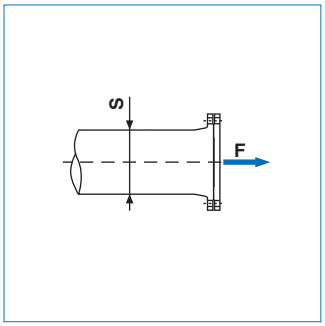
See also: *page*
- Joint anchoring 63
- Calculation of anchoring lengths 67
- Anchor blocks 69

Hydraulic thrust forces occur at changes in direction, reductions in diameter (bends, tees, tapers) and at the ends of pipelines carrying water under pressure. They can be high and must be counterbalanced by appropriate anchored joint systems, or by anchor blocks.









Thrust forces occur in a pressurized main:
- at any change in direction (bends, tees),
- at any change in diameter (tapers),
- at each end (blank flanges).

These localized thrusts must be counteracted to prevent joint separation:
- either by using anchored joints,
- or construction of concrete anchor blocks.

The forces can be calculated by the general formula:

$F = K.P.S$

F : Thrust force (N)

P: Maximum internal pressure (site test pressure) (Pa)

S: Cross section (internal for flanged joints, external for all other types) (m^2)

K: A coefficient which is a function of the shape and dimensions of the pipeline component concerned

Blank flanges, tees: K = 1

Reducing tapers: K = 1 – S' / S (S' being the smaller)

$$\text{Bends of angle } \theta : K = 2 \sin \frac{\theta}{2}$$

K = 1.414 for 90° bends

K = 0.765 for 45° bends

K = 0.390 for 22 1/2° bends

K = 0.196 for 11 1/4° bends

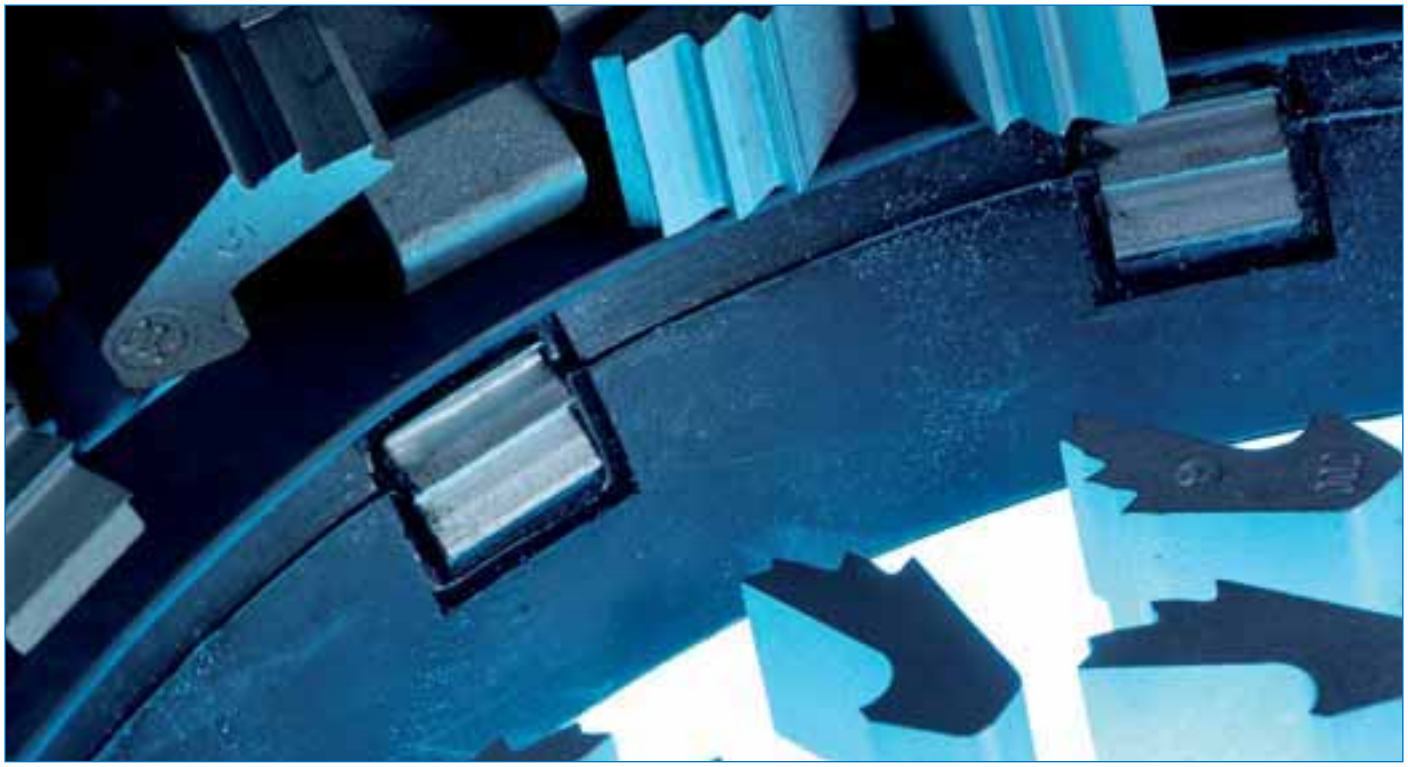
PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Hydraulic thrust

The table below gives the thrust forces for 1 bar pressure. (For other pressures, multiply the pressure in bar by the site test pressure).

DN	Thrust F in daN for 1 bar				
	Tees and blank flanges	90° Bends	45° Bends	22 1/2° Bends	11 1/4° Bends
60	47	66	36	18	9
80	75	107	58	29	15
100	109	155	84	43	21
125	163	230	125	63	32
150	227	321	174	89	44
200	387	547	296	151	76
250	590	834	451	230	116
300	835	1 180	639	326	164
350	1 122	1 587	859	438	220
400	1 445	2 044	1 106	564	283
450	1 809	2 559	1 385	706	355
500	2 223	3 144	1 701	867	436
600	3 167	4 479	2 424	1 236	621
700	4 278		3 274	1 669	839
800	5 568		4 262	2 173	1 092
900	7 014		5 368	2 737	1 375
1 000	8 626		6 602	3 366	1 691
1 100	10 405		7 964	4 060	2 040
1 200	12 370		9 468	4 827	2 425
1 400	16 787		12 848	6 550	3 291
1 500	19 236		14 723	7 506	3 771
1 600	21 851		16 724	8 526	4 284
1 800	27 612		21 133	10 773	5 413
2 000	34 045		26 057	13 284	6 674

STANDARD Vi gasket



Anchoring

Anchoring water pipes -Why?

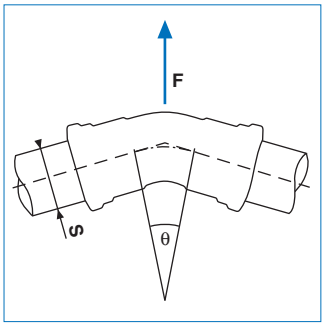
Hydraulic thrust forces occur at the location of changes in direction, reductions in diameter (bends, tees, tapered sections) and at the end of pipelines carrying pressurized fluid. These forces may lead to joint separation on the pipeline unless they are counteracted by using concrete anchor blocks or anchoring devices.

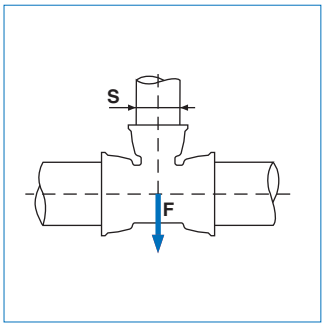
Hydraulic thrust forces can be very severe and must be counteracted by suitable anchoring devices or concrete anchor blocks.
Hydraulic thrust forces can be calculated using the following general formula:

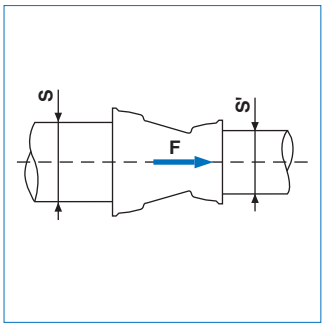
$$F = K.P.S$$

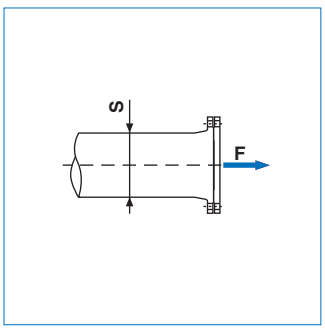
F : thrust force (in N)
P : maximum internal pressure (on-site test pressure) (in Pa)
S : cross sectional area (inside for flanged joints, outside for all other types) (in m^2)
K : coefficient according to the geometry of the piping component concerned

Hydraulic thrust forces ocurring in a pipeline:









Value of coefficient K depending on the type of fitting	
Fitting	K
Blank flange	1.000
1/4 bend	1.414
1/8 bend	0.765
1/16 bend	0.390
1/32 bend	0.196
Taper	1 – S'/S (S' smallest section)
Tee	1.000



STANDARD Vi anchoring system

PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Anchoring

Thrust in daN for pressure of 1 bar					
DN	**Tee and blank flange**	**1/4 Bend**	**1/8 Bend**	**1/16 Bend**	**1/32 Bend**
60	47	66	36	18	9
80	75	107	58	29	15
100	109	155	84	43	21
125	163	230	125	63	32
150	227	321	174	89	44
200	387	547	296	151	76
250	590	834	451	230	116
300	835	1 180	639	326	164
350	1 122	1 587	859	438	220
400	1 445	2 044	1 106	564	283
450	1 809	2 559	1 385	706	355
500	2 223	3 144	1 701	867	436
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800	5 568		4 262	2 173	1 092
900	7 014		5 368	2 737	1 375
1000	8 626		6 602	3 366	1 691
1100	10 405		7 964	4 060	2 040
1200	12 370		9 468	4 827	2 425
1400	16 787		12 848	6 550	3 291
1500	19 236		14 723	7 506	3 771
1600	21 851		16 724	8 526	4 284
1800	27 612		21 133	10 773	5 413
2000	34 045		26 057	13 284	6 674



Locking a STANDARD Vi anchoring system with the bucket of a digger

Anchoring

Greater freedom in designing networks

Phasing out concrete anchor blocks

Anchoring technologies are increasingly taking the place of concrete anchor blocks which have many drawbacks including their weight and size.

• Space on work sites

The larger the diameter of the pipeline, the bigger the anchor blocks required. This can lead to real problems as the limited space available under ground has to be shared by a great many networks (such as gas, sewage, telecommunications and cable networks).

• Trench opening time

Good concreting practices require a maturing time of 28 days before applying a load. Even if this time can be shortened, it constitutes a major constraint that is no longer acceptable in urban areas.

• Long-term risks of destabilization

These risks may be due to natural causes, such as non-homogeneous soils or irregular ground, nearby digging for work on other networks, especially in urban areas. These factors affect the stability and, therefore, the durability of concrete structures and raise the fear of possible junction separations.

• A heritage that is hard to manage

Major dismantling works have to be carried out when modifications or servicing are required on a pipeline or, later on, when a pipe has to be removed at the end of its life.

Anchoring: A modern approach to water supply networks

The utilization of anchoring solutions is growing fast in most countries all over world. These solutions offer significant advantages:

• Limiting space requirement underground

Pipelines fitted with anchoring systems take up no more space than pipelines without anchoring. This leaves space for other networks and, what is more, helps reduce the volumes of material to be excavated.

• Reducing logistic constraints

For reasons such as accessibility and cost, it is not always easy to bring in several cubic metres of concrete to make anchor blocks. Pipeline laying rates are often limited by the rotation of trucks delivering concrete. Anchoring devices are light and easy to transport to the installation site, whether it be in the city, in the country, or in remote mountainous or desert regions.

• Quick installation and setting into service

Anchoring systems are extremely quick to install, especially the STANDARD Vi and EXPRESS Vi systems. What is more, they can be submitted to hydraulic tests immediately after being installed.

• Proven stability and durability

The operation of anchoring systems relies on a combination of their intrinsic resistance to joint separation and friction with the soil. PAM's recommendations on anchoring lengths take into account the type of soil and the risks of works conducted in the vicinity of the pipes. The anchoring systems receive the same level of corrosion protection as the pipes and fittings.

Anchoring

• Possibility of dismantling

Pipelines can always be dismantled with tools supplied by PAM, without entailing long and extensive civil engineering work.

Greater flexibility for network acceptance procedures

Pipe laying and site acceptance procedures have been speeded up and have reached an unprecedented level of reliability thanks to anchoring devices.

• No longer any need to wait for concrete to set

Pipes are ready for pressure testing as soon as the anchoring devices have been fitted.

• Doing away with test anchor blocks

There is no longer any need to make test anchor blocks for the individual testing of pipeline segments thanks to the use of EXPRESS Vi flanged socket fittings.

• Shorter segments can be tested

It is now possible to test shorter lengths of pipeline so it is easier to locate and solve any problems that may arise and trenches can be refilled more quickly.

PAM anchoring devices can be tested up to their allowable test pressure (PEA) during acceptance tests.

Anchoring solutions to meet increasingly strict pipe-laying requirements

The various anchoring solutions can be adapted to respond to even the most difficult pipe-laying situations:

- Casing pipe-laying, road crossing, tunnels, bridges,
- Directional drilling or pipe bursting replacement (UNIVERSAL Ve, see directional drilling brochure),
- Laying in mountainous areas, notably using UNIVERSAL anchoring solutions adopted in the ALPINAL range (see the ALPINAL brochure), and also for micro hydroelectric power plants, etc.
- Pipe-laying in poor soil or submerged ground, etc

STANDARD Vi inserts

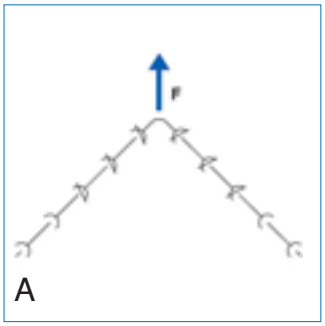




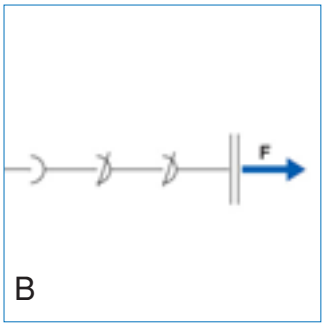
Anchoring and sustainable development

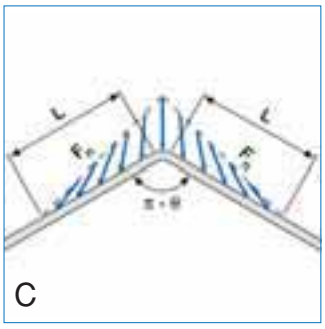
- Save on materials: joints weighing just a few kilos can replace several tons of concrete.
- Save space: thanks to the compactness of these systems.
- Save on transport (for earth fills and concrete).
- Save time.
- Save wood, as formwork for concrete anchor blocks is no longer needed.

Calculation of anchoring lengths

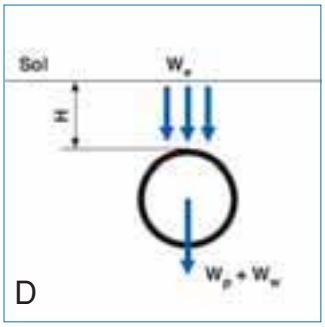


Situations of anchoring pipeline





Parameters used to calculate anchoring length



What length of pipeline should be anchored?

The technique is based on the principle of anchoring joints over a sufficient length on both sides of a region of hydraulic thrust, such as a bend, in order to harness soil/pipe friction forces to counteract the thrust force.
The calculation of the length to be anchored does not depend on the anchoring system used. It depends on the test pressure, the pipe diameter and the parameters shown in the two figures, C & D.
The following formula is used to calculate the anchoring length

$$L = \frac{PS}{Fn} x \left(\frac{\Pi}{2} - \frac{\theta}{2}\right) x \left(tg \frac{\theta}{2}\right) x c$$

- L: anchoring length (in m)
- P: on-site test pressure (in Pa)
- S: cross section (in m^2)
- n: bend angle (in radians)
- c: safety coefficient (generally 1.2)
- Fn: frictional force per metre of pipe (in N/m)

$$Fn = K.f.(2.We + Wp + Ww)$$

- Wp: weight per metre of empty pipe (in N/m)
- Ww: weight per metre of water (in N/m)
- K: coefficient of earth fill pressure distribution around pipes (depending on compacting, K = 1.1 to 1.5)
- f: coefficient of soil/pipe friction
- We: weight per metre of earth fill (in N/m)

$$We = \gamma.HD\alpha_1$$

- α_1 = 1, for test with joints with earth fill
- α_1 = 2/3, for test with uncovered joints
- D : pipe outside diameter (in m)
- H : covering height (in m)

$$f = \alpha_2 .tg (o.8.\phi)x$$

- α_2 = 1 ; pipe with zinc or zinc-aluminium coating+ bituminous or epoxy paint
- α_2 = 2/3 ; TT pipe, with polyethylene or polyurethane coating
- α_2 = 2/3 ; pipe with polyethylene sleeve

  where Kf = min (K.2/3.tg (o.8ϕ); 0.3)
- ϕ : angle of internal friction for earth fill

PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Calculation of anchoring lengths

Anchoring lengths (in m) for average soil and 10 bar test pressure

DN	1/4 Bend			1/8 Bend			1/16 Bend			1/32 Bend			Blank flange, Tee		
Covering height	1 m	1.5 m	2 m	1 m	1.5 m	2 m	1 m	1.5 m	2 m	1 m	1.5 m	2 m	1 m	1.5 m	2 m
80	4.5	3.1	2.3	2.8	1.9	1.5	1.6	1.1	0.8	0.8	0.6	0.5	5.7	3.9	3.0
100	5.4	3.7	2.8	3.4	2.3	1.8	1.9	1.3	1.0	1.0	0.7	0.5	6.9	4.7	3.6
125	6.6	4.5	3.4	4.1	2.8	2.1	2.3	1.6	1.2	1.2	0.8	0.6	8.4	5.7	4.4
150	7.7	5.3	4.0	4.8	3.3	2.5	2.7	1.8	1.4	1.4	1.0	0.7	9.8	6.7	5.1
200	9.9	6.8	5.2	6.1	4.2	3.2	3.4	2.4	1.8	1.8	1.3	1.0	12.6	8.7	6.6
250	12.0	8.3	6.4	7.5	5.2	4.0	4.2	2.9	2.2	2.2	1.5	1.2	15.3	10.6	8.1
300	14.1	9.8	7.5	8.7	6.1	4.7	4.9	3.4	2.6	2.6	1.8	1.4	17.9	12.5	9.6
350	16.0	11.2	8.6	9.9	7.0	5.4	5.6	3.9	3.0	2.9	2.1	1.6	20.3	14.3	11.0
400	17.9	12.6	9.7	11.1	7.8	6.0	6.2	4.4	3.4	3.3	2.3	1.8	22.8	16.0	12.4
450	19.7	14.0	10.8	12.3	8.7	6.7	6.9	4.9	3.8	3.6	2.6	2.0	25.1	17.8	13.8
500	21.5	15.3	11.9	13.4	9.5	7.4	7.5	5.3	4.1	4.0	2.8	2.2	27.4	19.5	15.1
600	25.0	17.9	14.0	15.5	11.1	8.7	8.7	6.2	4.9	4.6	3.3	2.6	31.8	22.8	17.8
700	28.2	20.4	16.0	17.5	12.7	9.9	9.8	7.1	5.6	5.2	3.8	2.9	35.8	25.9	20.3
800	31.2	22.8	17.9	19.4	14.1	11.1	10.9	7.9	6.2	5.8	4.2	3.3	39.8	29.0	22.8
900	34.1	25.0	19.8	21.2	15.6	12.3	11.9	8.7	6.9	6.3	4.6	3.7	43.4	31.9	25.2
1 000	36.9	27.2	21.6	22.9	16.9	13.4	12.8	9.5	7.5	6.8	5.0	4.0	46.9	34.7	27.5
1 100	39.4	29.4	23.4	24.5	18.2	14.5	13.7	10.2	8.1	7.3	5.4	4.3	50.2	37.4	29.8
1 200	41.9	31.4	25.1	26.0	19.5	15.6	14.6	10.9	8.7	7.7	5.8	4.6	53.4	40.0	32.0
1 400	46.2	35.1	28.3	28.7	21.8	17.6	16.1	12.2	9.8	8.5	6.5	5.2	58.9	44.7	36.0
1 500	48.4	36.9	29.9	30.0	22.9	18.6	16.8	12.9	10.4	8.9	6.8	5.5	61.6	47.0	38.0
1 600	50.4	38.7	31.4	31.3	24.0	19.5	17.5	13.5	10.9	9.3	7.1	5.8	64.2	49.3	40.0
1 800	54.2	42.0	34.3	33.7	26.1	21.3	18.9	14.6	11.9	10.0	7.8	6.3	69.0	53.5	43.7

A safety coefficient may be applied to the length to be anchored, depending on:
- the laying conditions,
- the quality and compaction of the earth fill,
- uncertainty regarding the physical characteristics of the earth fill.

In case of ground with an average mechanical resistance, consisting of gravel or silty sand, with an internal friction angle of 30°, for a zinc or zinc-aluminium coated pipe with pore-sealer and a safety coefficient of 1.2 and a test pressure of 10 bar, the lengths to be anchored are indicated in the table above.

Where applicable, allowance should be made for any partial presence of groundwater by correcting the weight of the full pipe by applying the corresponding Archimedes'value.



NATURAL UNIVERSAL pipes.

Anchor blocks

See also: *page*
- Anchoring 63
- Hydraulic thrusts 61
- Pipe laying - steep incline 264
- Soils (mechanical properties) 80

Use of concrete anchor blocks is the most commonly applied technique for containing the hydraulic thrust of socket and spigot mains under pressure.
Its use is now in sharp decline.

Principle

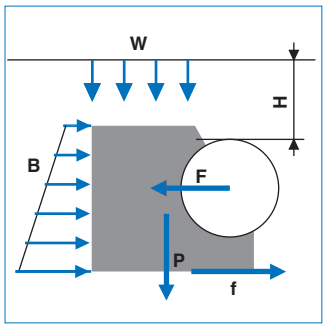
Various types of concrete anchor blocks can be designed, depending on the configuration of the main, the strength and type of soil, the presence, or absence, of significant amounts of ground water.
The block contains the hydraulic thrust forces:
- either by friction on the soil,
- or by bearing against the ground.

In practice, anchor blocks are designed by taking into account both the friction forces and the soil reaction against their bearing surfaces.
If the construction of concrete anchor blocks is prevented either by congestion problems or by low strength ground, the technique of joint anchoring or joint restraint can be used (see ANCHORING).

Dimensioning (usual cases)

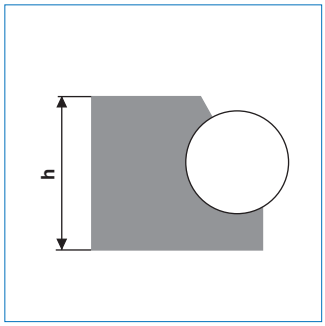
The volumes of concrete suggested in the following tables are calculated with both the soil friction and ground bearing support in mind, for the most common types of soil encountered. If trenches subsequently need to be excavated in the vicinity of the anchor blocks it is advisable to reduce the water pressure during the work.
The design assumptions are given below.
Please consult PAM for any other cases.

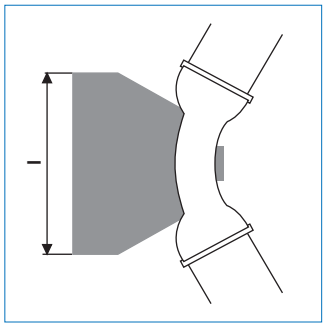
● Active forces (thrust block)

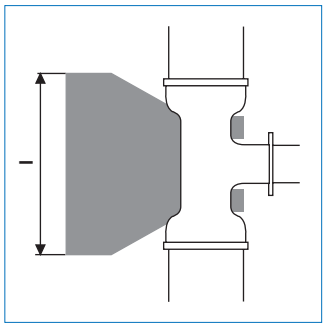


F: hydraulic thrust
P: block weight
W: soil weight
B: force bearing on trench wall
f: friction on soil
M: tilting moment.

Anchor blocks







Ground

Φ: soil internal friction angle
σ: acceptable ground resistance
H: depth of cover: 1.20 m
γ: density.
Mechanical properties:
– table 1 : Φ = 40° ; σ ≈ 1 daN/cm² ; γ = 2 t/m³
(high mechanical strength ground*).
– table 2 : Φ = 30° ; σ ≈ 0.6 daN/cm² ; γ = 2 t/m³
(moderate mechanical strength ground*).
No ground water.
* See SOILS (MECHANICAL PROPERTIES).

Concrete

Density: 2.3 t/m³

Pipes

DN 100 to DN 400
Test pressure: 10, 16 and 25 bar.

Example

22 1/2° bend, DN 250
Test pressure: 10 bar
Depth of cover: 1.2 m
Clay soil: Φ = 30° γ = 2 t/m³
Table 2 gives:
l x h = 0.70 m x 0.45 m
V = 0.25 m³

Advisory note

It is important to cast the concrete directly against the surrounding soil (check that there is no gap between block and soil) and to use a concrete mix having adequate strength.
Leave the pipe joints exposed for inspection during the hydraulic test.

PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Anchor blocks

TABLE 1

Internal friction: $\Phi = 40°$
Strength: $\sigma \approx 1$ daN/cm^2
Density: $\gamma = 2$ t/m^3
Depth of cover: H = 1.2 m
No ground water.

HIGH STRENGTH SOIL						
DN	Test pressure	11 1/4° Bend l x h/V	22 1/2° l x h/V	45° Bend l x h/V	90° Bend l x h/V	Blank flange and Tee l x h/V
	bar	*m x m/m³*	*m x m/m³*	*m x m/m³*	*m x m/m³*	*m x m/m³*
80	10	0.10 x 0.18/0.01	0.17 x 0.18/0.02	0.21 x 0.28/0.04	0.38 x 0.28/0.06	0.28 x 0.28/0.05
	16	0.13 x 0.18/0.01	0.18 x 0.28/0.03	0.33 x 0.28/0.05	0.59 x 0.28/0.11	0.43 x 0.28/0.07
	25	0.14 x 0.28/0.02	0.27 x 0.28/0.05	0.51 x 0.28/0.09	0.87 x 0.28/0.24	0.64 x 0.28/0.13
100	10	0.11 x 0.20/0.01	0.21 x 0.20/0.02	0.29 x 0.30/0.06	0.51 x 0.30/0.10	0.37 x 0.30/0.07
	16	0.17 x 0.20/0.02	0.24 x 0.30/0.04	0.45 x 0.30/0.08	0.77 x 0.30/0.20	0.57 x 0.30/0.11
	25	0.19 x 0.30/0.03	0.36 x 0.30/0.06	0.67 x 0.30/0.15	1.14 x 0.30/0.43	0.85 x 0.30/0.24
125	10	0.14 x 0.22/0.02	0.20 x 0.32/0.04	0.38 x 0.32/0.08	0.67 x 0.32/0.17	0.49 x 0.32/0.11
	16	0.23 x 0.22/0.03	0.32 x 0.32/0.07	0.59 x 0.32/0.14	1.01 x 0.32/0.37	0.75 x 0.32/0.20
	25	0.25 x 0.32/0.05	0.48 x 0.32/0.11	0.87 x 0.32/0.28	1.21 x 0.42/0.69	1.10 x 0.32/0.44
150	10	0.18 x 0.25/0.03	0.26 x 0.35/0.06	0.48 x 0.35/0.12	0.83 x 0.35/0.27	0.61 x 0.35/0.16
	16	0.28 x 0.25/0.04	0.40 x 0.35/0.09	0.73 x 0.35/0.21	1.04 x 0.45/0.54	0.93 x 0.35/0.34
	25	0.32 x 0.35/0.08	0.60 x 0.35/0.16	1.08 x 0.35/0.46	1.50 x 0.45/1.12	1.13 x 0.45/0.63
200	10	0.24 x 0.30/0.05	0.37 x 0.40/0. 12	0.68 x 0.40/0.24	0.98 x 0.50/0.54	0.86 x 0.40/0.33
	16	0.30 x 0.40/0.09	0.56 x 0.40/0.19	0.87 x 0.50/0.42	1.46 x 0.50/1.17	1.09 x 0.50/0.66
	25	0.45 x 0.40/0.14	0.84 x 0.40/0.32	1.27 x 0.50/0.89	1.84 x 0.60/2.24	1.58 x 0.50/1.37
250	10	0.31 x 0.35/0.08	0.48 x 0.45/0.20	0.75 x 0.55/0.35	1.28 x 0.55/0.99	0.95 x 0.55/0.55
	16	0.39 x 0.45/0.16	0.73 x 0.45/0.32	1.13 x 0.55/0.78	1.67 x 0.65/2.00	1.41 x 0.55/1.21
	25	0.59 x 0.45/0.24	0.93 x 0.55/0.53	1.63 x 0.55/1.61	2.36 x 0.65/3.98	1.81 x 0.65/2.34
300	10	0.37 x 0.40/0.12	0.59 x 0.50/0.28	0.93 x 0.60/0.58	1.41 x 0.70/1.53	1.17 x 0.60/0.91
	16	0.48 x 0.50/0.24	0.78 x 0.60/0.41	1.39 x 0.60/1.27	2.04 x 0.70/3.22	1.56 x 0.70/1.87
	25	0.63 x 0.60/0.27	1.15 x 0.60/0.87	1.79 x 0.70/2.48	2.64 x 0.80/6.14	2.04 x 0.80/3.65
350	10	0.43 x 0.45/0.18	0.61 x 0.65/0.27	1.11 x 0.65/0.88	1.67 x 0.75/2.30	1.26 x 0.75/1.31
	16	0.57 x 0.55/0.35	0.93 x 0.65/0.62	1.49 x 0.75/1.83	2.23 x 0.85/4.66	1.84 x 0.75/2.80
	25	0.75 x 0.65/0.41	1.23 x 0.75/1.26	1.96 x 0.85/3.61	2.76 x 1.05/8.83	2.26 x 0.95/5.34
400	10	0.49 x 0.50/0.25	0.71 x 0.70/0.39	1.17 x 0.80/1.20	1.79 x 0.90/3.18	1.46 x 0.80/1.87
	16	0.65 x 0.60/0.49	1.07 x 0.70/0.89	1.60 x 0.90/2.54	2.42 x 1.00/6.45	1.97 x 0.90/3.86
	25	0.87 x 0.70/0.59	1.43 x 0.80/1.80	2.13 x 1.00/5.02	2.94 x 1.30/12.33	2.48 x 1.10/7.44

Please consult PAM *for other cases.*

PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Anchor blocks

TABLE 2

Internal friction: $\Phi = 30°$
Strength: $\sigma \approx 0.6$ daN/cm^2
Density: $\gamma = 2$ t/m^3
Depth of cover: H = 1.2 m
No ground water.

MODERATE STRENGTH SOIL						
DN	Test pressure	11 1/4° Bend l x h/V	22 1/2° l x h/V	45° Bend l x h/V	90° Bend l x h/V	Blank flange and Tee l x h/V
	bar	*m x m/m³*	*m x m/m³*	*m x m/m³*	*m x m/m³*	*m x m/m³*
80	10	0.13 x 0.18/0.01	0.17 x 0.28/0.02	0.32 x 0.28/0.04	0.56 x 0.28/0.10	0.41 x 0.28/0.06
	16	0.14 x 0.28/0.02	0.26 x 0.28/0.04	0.49 x 0.28/0.08	0.85 x 0.28/0.23	0.63 x 0.28/0.13
	25	0.21 x 0.28/0.03	0.40 x 0.28/0.05	0.74 x 0.28/0.17	1.24 x 0.28/0.48	0.93 x 0.28/0.27
100	10	0.17 x 0.20/0.02	0.23 x 0.30/0.04	0.43 x 0.30/0.07	0.74 x 0.30/0.19	0.54 x 0.30/0.10
	16	0.18 x 0.30/0.03	0.35 x 0.30/0.05	0.65 x 0.30/0.15	1.11 x 0.30/0.41	0.83 x 0.30/0.23
	25	0.28 x 0.30/0.05	0.53 x 0.30/0.10	0.96 x 0.30/0.31	1.30 x 0.40/0.75	1.21 x 0.30/0.48
125	10	0.22 x 0.22/0.03	0.30 x 0.32/0.06	0.56 x 0.32/0.12	0.97 x 0.32/0.34	0.72 x 0.32/0.19
	16	0.25 x 0.32/0.04	0.47 x 0.32/0.08	0.85 x 0.32/0.27	1.18 x 0.42/0.65	1.07 x 0.32/0.42
	25	0.37 x 0.32/0.06	0.70 x 0.32/0.18	1.25 x 0.32/0.56	1.69 x 0.42/1.33	1.28 x 0.42/0.77
150	10	0.26 x 0.25 /0.04	0.38 x 0.35/0.08	0.70 x 0.35/0.19	0.99 x 0.45/0.49	0.89 x 0.35/0.31
	16	0.31 x 0.35/0.06	0.59 x 0.35/0.14	1.06 x 0.35/0.43	1.46 x 0.45/1.06	1.10 x 0.45/0.60
	25	0.47 x 0.35/0.10	0.87 x 0.35/0.30	1.27 x 0.45/0.81	2.28 x 0.45/2.12	1.58 x 0.45/1.24
200	10	0.29 x 0.40/0.07	0.54 x 0.40/0.14	0.83 x 0.50/0.38	1.39 x 0.50/1.07	1.05 x 0.50/0.61
	16	0.44 x 0.40/0.12	0.82 x 0.40/0.30	1.24 x 0.50/0.85	1.79 x 0.60/2.12	1.54 x 0.50/1.30
	25	0.66 x 0.40/0.20	1.02 x 0.50/0.58	1.77 x 0.50/1.73	2.51 x 0.60/4.15	1.93 x 0.60/2.47
250	10	0.37 x 0.45/0.12	0.70 x 0.45/0.25	1.08 x 0.55/0.71	1.60 x 0.65/1.83	1.35 x 0.55/1.11
	16	0.57 x 0.45/0.19	0.91 x 0.55/0.50	1.42 x 0.65/1.45	2.10 x 0.75/3.66	1.76 x 0.65/2.22
	25	0.74 x 0.55/0.33	1.32 x 0.55/1.06	2.02 x 0.65/2.92	2.72 x 0.85/6.91	2.27 x 0.75/4.24
300	10	0.46 x 0.50/0.19	0.75 x 0.60/0.37	1.32 x 0.60/1.16	1.95 x 0.70/2.94	1.49 x 0.70/1.71
	16	0.61 x 0.60/0.25	1.12 x 0.60/0.83	1.75 x 0.70/2.36	2.40 x 0.90/5.71	1.98 x 0.80/3.46
	25	0.91 x 0.60/0.55	1.46 x 0.70/1.64	2.27 x 0.80/4.53	3.12 x 1.00/10.73	2.58 x 0.90/6.61
350	10	0.54 x 0.55/0.27	0.89 x 0.65/0.57	1.42 x 0.75/1.67	2.13 x 0.85/4.25	1.76 x 0.75/2.56
	16	0.73 x 0.65/0.39	1.20 x 0.75/1.20	1.91 x 0.85/3.42	2.69 x 1.05/8.33	2.20 x 0.95/5.05
	25	1.08 x 0.65/0.84	1.73 x 0.75/2.46	2.51 x 0.95/6.58	3.25 x 1.35/15.73	2.88 x 1.05/9.61
400	10	0.62 x 0.60/0.38	0.94 x 0.80/0.78	1.53 x 0.90/2.32	2.31 x 1.00/5.89	1.89 x 0.90/3.53
	16	0.85 x 0.70/0.56	1.39 x 0.80/1.71	2.08 x 1.00/4.75	2.85 x 1.30/11.63	2.41 x 1.10/7.03
	25	1.14 x 0.80/1.15	1.85 x 0.90/3.39	2.63 x 1.20/9.12	3.63 x 1.50/21.79	2.96 x 1.40/13.49

Please consult PAM *for other cases.*

Safety factor

See also: *page*
- Allowable operating pressures 57
- Depth of cover 91
- Dimensions 147
- Quality management 247

The mechanical stresses (internal pressure, external loading) to which pipelines are subjected in service can be accurately evaluated. It is much more difficult however to predict with certainty the stresses the pipes will be subjected to, in course of time. For this reason, PAM *has chosen high safety factors to ensure the maximum possible life for its ductile iron pipes.*

Minimum specified safety factors

The pipes are designed to European Standard EN 545 and International Standard ISO 2531:

– **internal pressure:** the working stress in the pipe wall must not exceed one third of the tensile strength (420 MPa, which also corresponds approximately to one half the yield strength);

$$\sigma Work_{(tensile)} \leq \frac{Rp_{(tensile)}}{3}$$

$$\sigma Work_{(bending)} \leq \frac{Rm_{(bending)}}{2}$$

$$\frac{\Delta D}{D} \leq 4\ \%$$

The minimum safety factor for the calculation of internal pressure, is 3.

– **external loading:** the deformation must not result in:
- either a stress greater than half the yield bending strength (500 MPa),
- or maximum vertical ovality of 4 %.

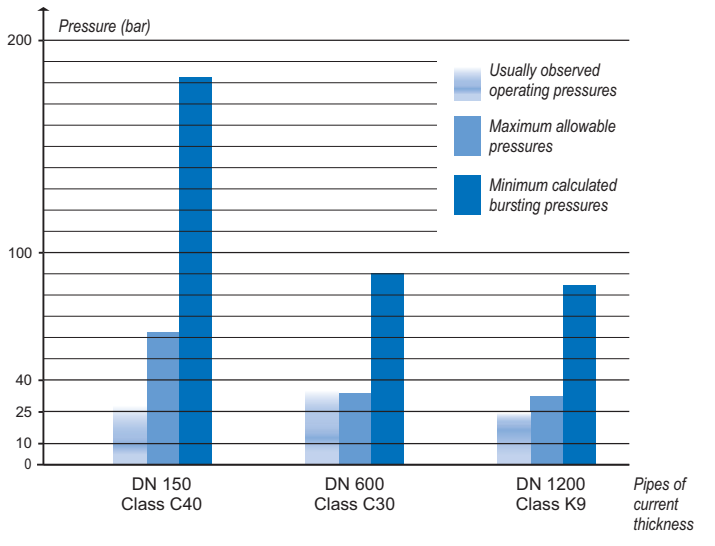
The maximum deformation of 4 % is recommended by European Standard EN 545 to guarantee the resistance of the cement mortar (mainly for DN > 800).

Experimental safety coefficients

The actual safety of PAM pipes is greater in practice than the nominal service levels (allowable operating pressure, depth of cover).

Indeed:
- the material's ductility gives ductile iron pipes a high capacity to absorb work or energy beyond its actual elastic limits;
- the methods used to calculate parts are conservative and include high safety coefficients.

This is clearly illustrated by the following two graphs on which it can be seen that the bursting pressures observed in experiments are more than twice the allowable operating pressure.



Example of practical safety factors

Water hammer

See also: *page*
- Safety factors 73
- Allowable operating pressures 57
- Diameter (selection) 31
- Pipeline profile 37

During the design of a pipeline, the possible risk of water hammer must be examined and quantified, in order to install the necessary protection devices, particularly in pumping mains.

If protection devices have not been provided, ductile iron pipes have a safety coefficient which is often useful when faced with accidental pressure surges.

Sources of water hammer

If the flow rate of a liquid in a main is abruptly altered, there is a violent change in pressure. This transient problem, known as water hammer, generally occurs when ancillary equipment is interrupted or operated (pumps, valves ...). Waves of pressure surges and pressure drops sweep through the main. Water hammer can occur equally well in gravity and pumping mains.
There are four main sources of water hammer:
- pump starting and stopping,
- closing of valves, fire and sluicing hydrants, etc.
- the presence of air,
- inadequate functioning of the protective equipment.

Consequences

The pressure surges involved can rupture certain pipes in critical cases, where the safety factors are inadequate. The pressure drops can create pockets of cavitation, prejudicial to pipes and valves, etc.

Simplified assessment

Wave propagation velocity: $a = \sqrt{\rho \left(\frac{1}{\varepsilon} + \frac{D}{Ee} \right)}$

Pressure surges and drops: $\Delta H = \pm a \frac{\Delta V}{g}$ *(ALLIEVI)* (1)

$$\Delta H = \pm \frac{2L\Delta V}{gt} \text{ (MICHAUD) (2)}$$

Water hammer

Where :

- a: wave propagation velocity (m/s)
- ρ: water density (1 000 kg/mm^3)
- ε: water modulus of elasticity (2.05.10^9 N/m^2)
- E: material modulus of elasticity (ductile iron: 1.7.10^{11} N/m^2)
- D: internal diameter (m)
- e: pipe thickness (m)
- ΔV: absolute value of velocity changes in constant flow before and after water hammer (m/s)
- ΔH: absolute value of the variation in maximum pressure around the normal static pressure (m of water gauge)
- L: length of the pipeline (m)
- t: effective closing time (sec)
- g: weight acceleration (9.81 m/s^2).

In practice the wave propagation velocity for water in ductile iron pipes is 1 200 m/s.

Formula (1) takes into account the rapid variation in flow velocity:

$$\left(t \leq \frac{2L}{a}\right).$$

Formula (2) takes into account the linear variation in the flow velocity as a function of time (function of a valve closure law, for example):

$$\left(t \geq \frac{2L}{a}\right).$$

The pressure varies from ± ΔH around the normal static pressure. This figure is at its maximum for the instantaneous closure of a valve, for example.

These simplified formulae provide a maximum assessment of water hammer and must be used with caution. They presuppose that the pipe does not have anti-water hammer protection and that the head losses are negligible. Further, they do not take into account the limiting factors, such as the pump turbine operation, or the pressure of saturating vapour in a pressure drop.

● Examples

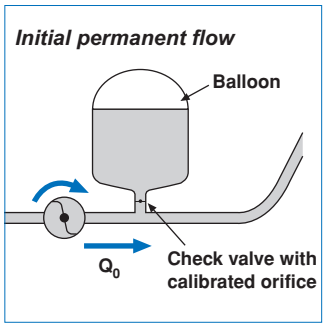
Pipe DN 200, C40, length 1000 m, discharge at 1.5 m/s:
a = 1 200 m/s

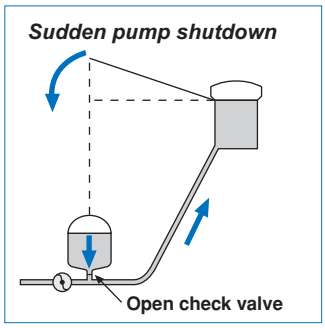
- Case No 1: sudden shutdown of a pump (negligible head loss, no anti-water hammer protection):
  $\Delta H = \pm \frac{1\ 200 \times 1.5}{9.81} = 183$ m (ie, about 18 bar)
- Case No 2: closure of a valve (effective time: 3 seconds):
  $\Delta H = \pm \frac{2 \times 1\ 000 \times 1.5}{9.81 \times 3} = 102$ m (ie, about 10 bar)

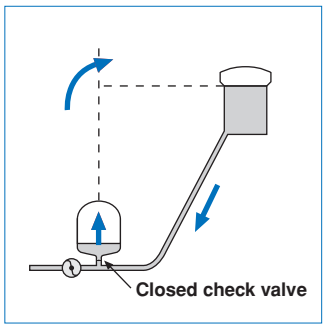
Complete assessment

The BERGERON graph method can be used to determine precisely the pressures and flow rates as a function of time at any point in a pipe subject to water hammer. There are now computer programs that solve these complex problems.

Water hammer







Prevention

The protective systems that can be installed to limit water hammer to an acceptable level are varied and must be adapted to suit each situation. They act by slowing the change in fluid velocity or by limiting the pressure surge in relation to the pressure drop.
The user must determine the pressure surge and pressure drop envelope created by water hammer and judge, according to the pipe profile, the type of protection to be installed:

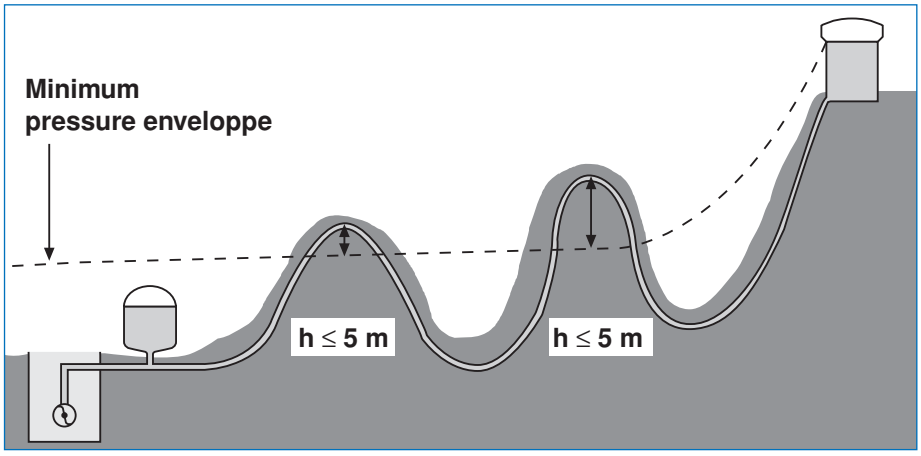
- pump inertia impellor,
- pressure relief valve,
- air or "automatic air control" balloon,
- auxiliary suction,
- balancing column.

The anti-water hammer balloon is frequently used. It has two functions:

- limit the pressure surge (head loss controlled by a check valve),
- prevent cavitation (balloon drainage).

In the event of a sudden pump shutdown, the pressure drop is offset by a flow rate provided by draining the balloon.
When the direction of water flow reverses, the energy in the water mass is transformed into a head loss by filling the balloon through a calibrated check valve.
The pipeline profile is the determinant factor in deciding the tank dimensions. In practice, the minimum pressure drop curve (after installing protection devices) must not fall more than five metres below the actual profile of the main.
The surge tank volume can be determined from the PUECH and MEUNIER graphs, or from computer programs.

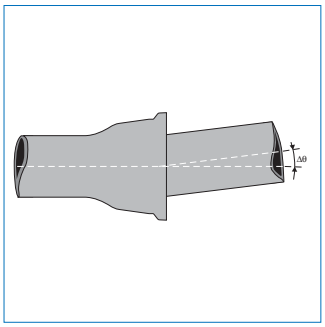
It should also be noted that ductile iron has a high safety margin:
– surges: PAM allows a 20 % excess over the maximum permissible pressure for transient pressure surges;
see MAXIMUM ALLOWABLE PRESSURES
– pressure drops: the joint guarantees a seal against external ingress, even in the case of partial vacuum in the main.

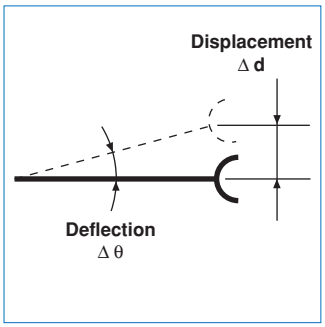


PRESSURE AND ANGULAR DEVIATION AT THE JOINT

Joint deflection

See also: *page*
• Unstable grounds 82





PAM *socket joints permit angular deflection. In addition to obvious advantages during laying and to accommodation of ground movements, the angular deflection allows negotiation of large radius bends without recourse to fittings, as well as a certain amount of route adjustment.*

Maximum allowable deflection

Junction	Unlocked			Locked				
DN	STANDARD °	EXPRESS °	UNIVERSAL °	STANDARD Vi °	EXPRESS Vi °	UNI Vi Ve Pk °	STD Ve °	STD V+i °
60	5	5	-	5	4	-	-	-
80	5	5	3	5	4	3	5	-
100	5	5	3	5	4	3	5	-
125	5	5	3	5	4	3	5	-
150	5	5	3	5	4	3	5	-
200	5	4	3	4	3	3	4	-
250	5	4	3	4	3	3	4	-
300	5	4	3	4	3	3	4	-
350	4	3	3	3	-	3	3	3
400	4	3	3	2	-	3	3	3
450	4	3	3	2	-	3	3	3
500	4	3	2	2	-	2	3	2
600	4	3	2	2	-	2	3	2
700	4	2	2	-	-	2	2	-
800	4	2	2	-	-	2	2	-
900	4	1.5	2	-	-	1.5	1.5	-
1000	4	1.5	1	-	-	1.2	1.5	-
1100	4	1.5	-	-	-	-	1.5	-
1200	4	1.5	1	-	-	1.1	1.5	-
1400	3	-	-	-	-	1	-	-
1500	3	-	-	-	-	1	-	-
1600	3	-	-	-	-	1	-	-
1800	2.5	-	-	-	-	0.8	-	-
2000	2	-	-	-	-	-	-	-

Deflections admitted during the laying have been recently increased for STANDARD joint.
For example:
– DN 1200 : 4°
– DN 200 : 5°

Joint deflection

Other joints:

– STANDARD and STANDARD Vi for ISOPAM pipeline

DN	Maximum allowable deflection Δθ	Pipe length	Radius bend R	Displacement Δd
	°	*m*	*m*	*cm*
100	4	6	86	42
125 and 150	3.5	6	98	37
200 and 250	3	6	115	32
300 and 350	2.5	6	138	26
400 to 600	2	6	172	21

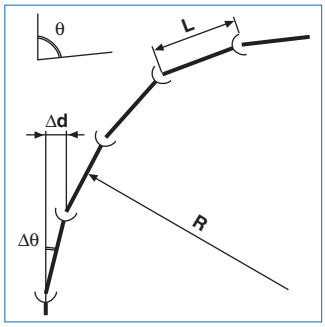
Note: the restriction is linked to the geometry of the thermal insulation.

– BLUTOP, BLUTOP Vi

DN / OD	Maximum allowable deflection (°)
90	6
110	6
125	6

Displacement and radius bend:

Some large radius bends can be negotiated easily by successive joint deflections. In this case, pipe jointing must be accomplished with perfectly aligned pipes, both horizontally and vertically. The joint must only be deflected when fully assembled.



- Negotiated bend radius: $R = \dfrac{L}{2sin\ \dfrac{\Delta\theta}{2}}$
- Number of pipes necessary for change in direction:

$$N = \frac{\theta}{\Delta\theta}$$

- Length of direction change: $C = N \times L$

where:

Δd: pipe end displacement (in m)
L: pipe length (in m)
θ: angle of direction change (in degrees)
Δθ: joint deflection (in degrees)
C: length of direction change (in m).

Angular deflection °	Pipe length					
	6 m		7 m		8 m	
	Radius bend	Displacement	Radius bend	Displacement	Radius bend	Displacement
	m	cm	m	cm	m	cm
1	-	-	401	12	458	14
2	172	21	201	24	229	28
3	115	31	134	37	153	42
4	86	42	100	49	115	56
5	69	52	-	-	-	-
6	57	63	-	-	-	-

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COMPREHENSIVE DUCTILE IRON PIPE SYSTEMS



Relying on its extensive knowledge in networks, SAINT-GOBAIN PAM develops coherent and modular systems adapted to all job site configurations.

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Soils (mechanical properties)

See also: *page*
- Depth of cover 91
- Pipe laying - steep incline 264
- Anchor blocks 69
- Anchoring 63
- Soil loads (pipe performance) 95

The data given below covers the generally accepted values for soil characterization. It does not dispense with actual site or laboratory measurements.

The values indicated in the table are those generally accepted for soil characterization. They allow the use of certain simplified design formulae given in this catalogue. They cannot replace actual site or laboratory measurements

Average characteristics of commonly encountered soils

Type of ground	Dry/Wet		Submerged	
	Φ	γ	Φ	γ
	degrees	*t/m³*	*degrees*	*t/m³*
Fragmented rock	40°	2	35°	1.1
Gravel, sands	35°	1.9	30°	1.1
Sand/gravel Silts/clays	30°	2	25°	1.1
Silts/clays	25°	1.9	15°	1
Humus organic clays/silts	15°	1.8	no mean characteristics	

Φ: Angle of internal friction (in degrees)
γ: Density (in t/m³)

Soils (mechanical properties)

Average values for backfill modulus of reaction E (a)

Type of soil used for backfill		Backfill module of reaction E		
Description	Classification (b)	Degree of compaction (Proctor)		
		Non compacted (80 à 85 %)	Controlled compaction (85 à 90 %)	Controlled and checked compaction > 90 %
		Mpa	*MPa*	*MPa*
Clean or slightly silty sand and gravel (elements < 50 mm)	B1 B2 B3 D1 D2	0.7	2.0	5.0
Silty or medium clay sand and gravel	B4 B5	0.6	1.2	3.0
Flint or millstone clay. Rubble, moraine, eroded rock, coarse alluvium with high percentage of fines	C1 C2 with Dmax<250 mm	0.5	1.0	2.5
Loam, fine sand, gravel, more or less plastic marl (Ip < 50)	A1 A2 A3 B6	< 0.3	0.6	0.6
Unstable rock: chalk, sandstone, schist. Composite soils (flint and millstone clay, moraine, eroded rock, coarse alluvium with elements that may exceed 50° mm	D3 C1 C2 avec Dmax>250 mm R13 R23 R34 R43	0.7	2.0	5.0

(a) As per Fascicule 70
(b) Classification as per NF P 11-300/GTR (Road works guide)
(c) Ip = Plasticity index

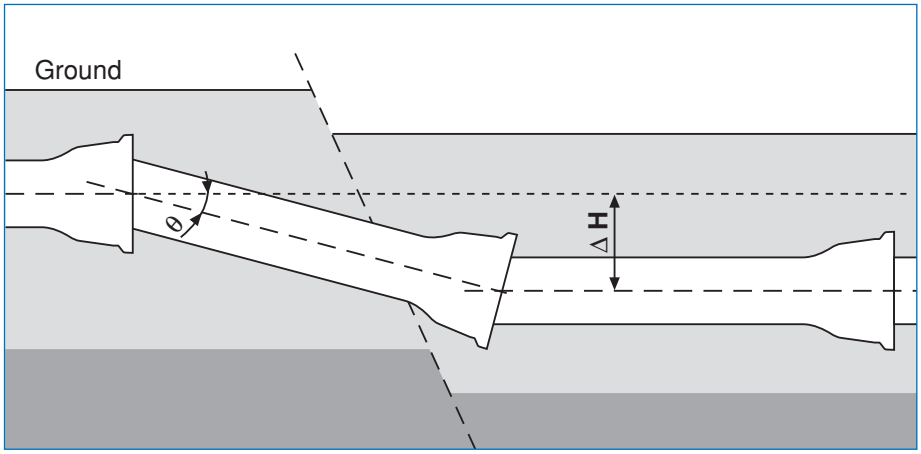
Unstable grounds

See also: *page*
- Joint deflection 77
- Anchoring 63

The elastomer joint gaskets provide ductile iron pipelines with a degree of flexibility which is one of the elements of safety when passing through inconsistent or unstable ground.

A pipeline's route may pass through inconsistent or unstable ground (marshy regions, subsidence due to pumping underground water, mining areas, consolidation of roadwork backfill, etc.).
In each of these cases, it is necessary to assess the potential subsidence and take all precautions to minimize the effect of soil movements on the pipeline. Site measurements are always recommended.
Experience has shown that when soil movements occur, pipes must be able to match the deformation imposed by the mass of moving earth rather than resisting the often considerable mechanical stress (axial and bending stresses). In this respect, PAM socket joints are nil tension and nil bending points, within the range of their joint deflection.
For extensive and uniform subsidence, the joint allows the pipe to function like a flexible chain. Of course, deformation extremes are determined by the maximum admissible deflection and slippage for each joint.

Admissible subsidence provided by joint deflection



Subsidence: $\Delta H = l\ tg\theta$

Axial slip: $\Delta l = (\Delta H^2 + l^2)^{1/2} - l$

l: pipe length (m)

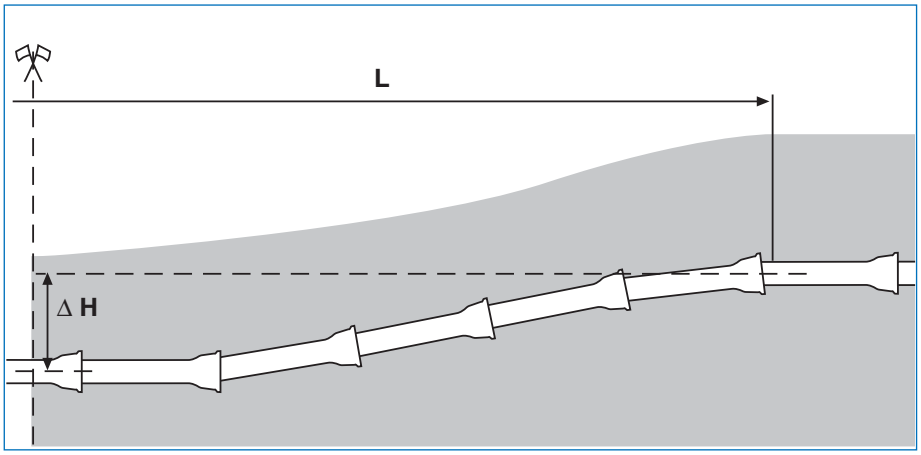
θ: admissible joint deflection.

Unstable grounds

● **Example**

For ΔH = 0.30 m in DN 200
θ = 3° (5° admissible)
Δl = 7 mm (20 mm admissible with the STANDARD joint)
There is no risk of the joint separating as the slip can be entirely absorbed by the joint.

Chain behaviour



Slip: $\Delta H = 2l\left(tg\theta + tg2\theta + tg3\theta + \ldots + tg\,\frac{n}{4}\,\theta\right)$

Axial extension: $\Delta L \approx \left(L^2 + \frac{16}{3}\,\Delta H^2\right)^{1/2} - L$ (where θ is very small)

l = pipe length
L = length of subsided section
n = number of pipes in the subsided section $\left(n = \frac{L}{l}\right)$

The pipe moves with the soil until the extreme limit before separation of the joint, according to the admissible play in the joints.

Comment: in the event of subsidence causing high ΔL extension, one solution may be to anchor the joints and make up for the extension with collars installed at the borders between the stable and unstable areas.

● **Example**

In DN 300 for ΔH = 0.5 m et L = 300 m :
$\theta_{av.}$ = 0.04° (5° admissible)
ΔL = 3 mm
A single joint can support the extension due to the curvature adopted by the 300 m section that has subsided 0.5 m below its original centre.

Earthworks*

See also: *page*

- Depth of cover 91
- Pipe laying equipment 277
- Unstable grounds 82
- Handling 286
- Soils (mechanical properties) 80

Trench excavation and backfilling depend on the following parameters:

- *environment,*
- *characteristics of the main (type of joint and diameter),*
- *nature of the soil (presence or absence of water),*
- *laying depth.*

The laying recommendations given below are those usually prescribed for ductile iron pipes.

Preparatory work

After making a thorough study of the type of environment, and obtaining agreement from the various Utilities (Telecom, Gas, Water ...), the contractor marks out on site the route and profile of the main to be laid, complying with the project as prescribed, and ensures that the proposals and the conditions under which they will be implemented are in accord.

Trench opening

Prepare for the breaking of road surfaces by pre-cutting the edges of the trench to avoid damaging the neighbouring areas. The width is slightly greater than the trench width. Excavation is usually carried out with a mechanical digger, suited to the pipe diameter, the type of ground and depth of laying.

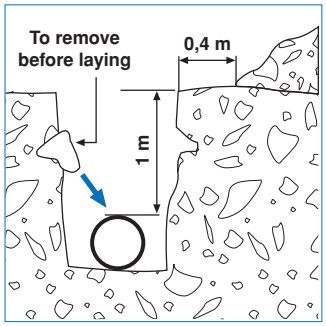
Trench width

The trench width depends on the DN, the type of soil, depth of laying and the methods of shoring and compaction. Care is taken during the work:

- to stabilize the walls, either by battering or shoring,
- to clear the edges of the excavation of lumps of rock or clods of earth, to prevent them from falling,
- to deposit the excavated material so as to leave a 0.4 metre space between the pipe and the trench.

(*) According to “les Cahiers Techniques de la Fondation de l’Eau.” “LA POSE DES CANALISATIONS”

Earthworks

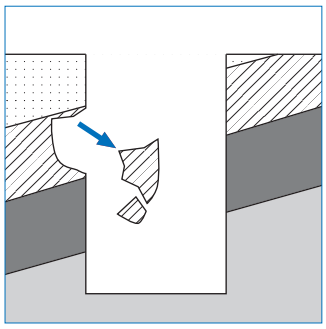


Trench depth

Fascicule 71, prescribes in article 47 that: “Trenches are prepared at every point to the depth indicated by the longitudinal profile. Unless otherwise specified, the normal trench depth is such that the depth of backfill above the crown of the pipe is not less than 1 meter”. This depth is justified by the need to protect against frost damage.

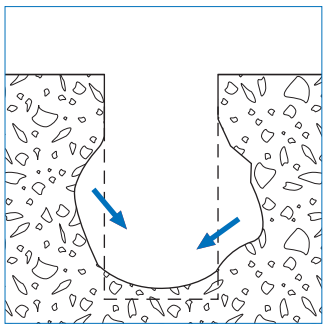
Types of soils

Soils can be divided into three main classes, based on their cohesion:



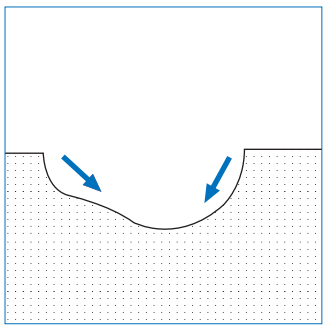
● Rock

Extremely cohesive, making excavation difficult but not precluding all possibility of collapse.
Cracks are sometimes present, which can result in complete chunks falling.



● Friable soils

By far the most common. These exhibit a certain amount of cohesion, which allows them to hold together for a while during excavation. This cohesion can change very rapidly under the influence of factors already mentioned (water ingress, nearby equipment movement, etc): collapse is possible.



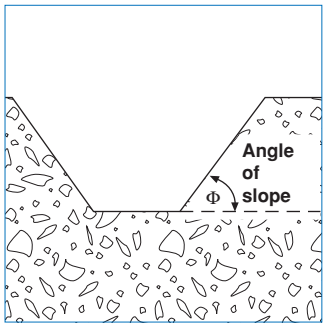
● Non-cohesive ground

This is ground lacking any cohesion, such as dry sand, muds or freshly restored backfill. These collapse almost instantaneously. Special procedures are needed for working in this type of ground.
Protection against the danger of collapse is therefore essential:

- either by sloping the trench sides backwards,
- or by shoring the trench sides.

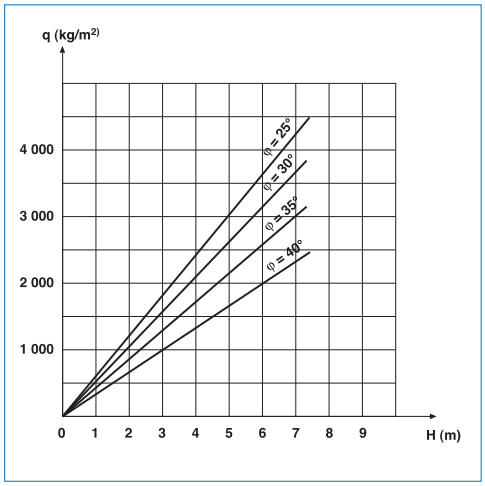
The precautions to be taken also depend on the situation (urban or rural), and the depth of laying.

Battering



Rarely used in urban situations because of the space needed, it consists of giving the walls an outward slope known as “the angle of slope”, which must be close to the internal friction angle of the soil. This angle varies with the type of soil. See SOILS (MECHANICAL PROPERTIES).

Earthworks



Trench shoring

There are numerous shoring techniques: it is important to study and adapt them before starting the work.
Shoring must be used in cases prescribed in existing regulations, or, in general, when demanded by the nature of the ground.

● **The most common shoring techniques:**

- prefabricated wooden panels (joined or single),
- wooden or metal sheeting,
- pile driven sheets.

Whichever technique is used, the earth pressure has to be taken into consideration. Panels must be capable of resisting a thrust over their whole height, given by the formula:

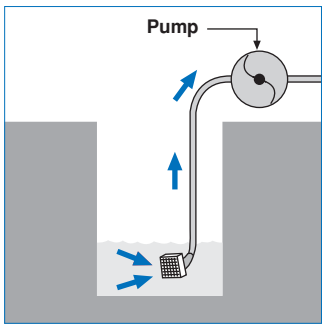
$$q = 0.75\ \gamma\ H\ tg^2\left(\frac{\pi}{4} - \frac{\varphi}{2}\right)$$

γ: soil density (in kg/m^3) (approximately equal to 2 000 kg/m^3)
φ: angle of internal soil friction.
q: thrust (kg/m^2).
H: depth (m).

Trench bottom

The trench bottom must be levelled to comply with the longitudinal profile of the main, and all stony protrusions or rubble must be eliminated. Ensure that the pipe rests on uniformly distributed soil.

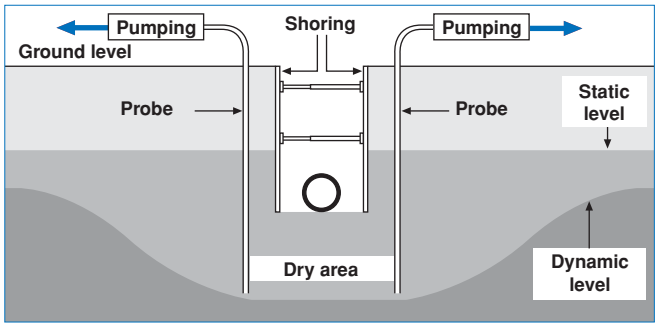
Joint holes need to be excavated for EXPRESS and anchored joints Ve, to facilitate assembly.



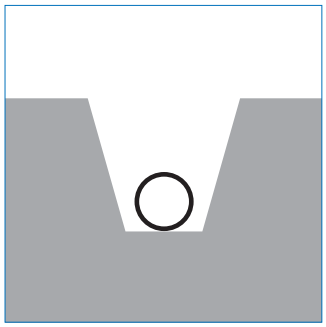
Presence of water: excavation must be from downstream to upstream, to allow the water to drain by itself from the trench bottom.

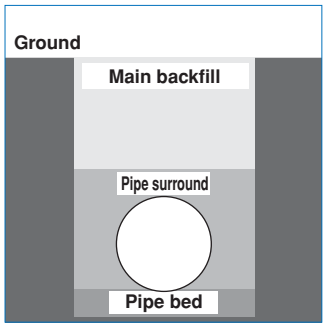
If the trench passes through ground flooded with water (water table) it may be necessary to remove the water from the trench by:

- pumping it out (directly from the trench or a sump at the side),
- dewatering with probes of filter wells.



Earthworks





Pipe bed, pipe surround and backfill

Pipe bed

The trench bottom provides the pipe foundation. In cases where the native soil is well broken up and relatively homogeneous, the pipes can be laid on the trench bottom, as previously described. It is essential to ensure that the pipes are properly bedded on the soil, particularly in the case of large diameters. If the trench bottom does not lend itself to direct laying, a bed of pea gravel or sand must be laid, over an approximate thickness of 10 cm.

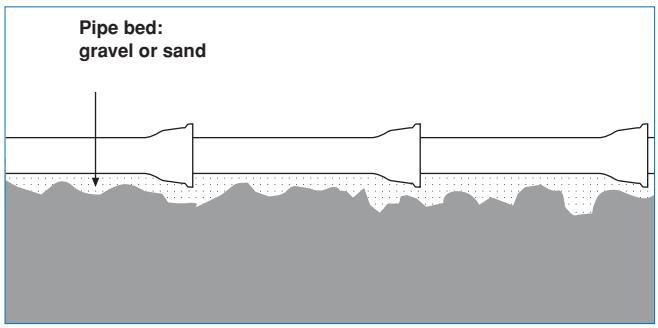
Refer to the section on soil DEPTH OF COVER for details of the different types of surrounds and backfills, in terms of:
- environment (earth loading, wheel loading, backfill quality),
- pipe diameter,
- types of soils encountered.

Pipe surround

Two types can be distinguished:
- a pipe supporting surround (to resist any ovality in the case of large diameter pipes), consisting of soil free from stones, etc., or brought-in material, compacted on the sides;
- a protective surround (in the case of very heterogeneous soils) consisting of stone-free soil or sand; this surround can act as both protection and support.

Main backfill

This is usually uncompacted infill with the original trench soil (away from roads), or by brought-in compacted material (beneath roads) when required.



Soil aggressivity

See also: *page*
• External coating (selection) 216

Buried pipes are subject to a variety of stresses, including soil and backfill corrosivity. The conventional zinc coating on the basic version of PAM pipes provides a high level of resistance to corrosion in most standard cases of application. However, the soil's corrosivity must be assessed to determine whether additional protection, such as a polyethylene sleeve or special coatings, is required. PAM's technical staff will carry out a soil survey at the customer's request.

Topographical study

General corrosion indicators

The general corrosion indicators are determined with the aid of a detailed map (Ordnance Survey type), which indicates:

- the ground contours: high spots are drier and better aerated, therefore less corrosive; low spots are wet and unaerated, therefore likely to be more corrosive,
- water courses to be crossed, wet areas,
- ponds, marshes, lakes, peat beds and other low areas, rich in humic acids and bacteria, and often polluted,
- estuaries, polders, salt marshes and saline soils bordering the sea.

Pollution and specific corrosion indicators

Using drawings (obtained from public departments), the following are determined:

- areas polluted by various effluents, such as liquid manure, distillery, dairy, papermaking waste (etc.) or by sewage, mainly from households,
- industrial wastes like slags, clinker, etc.,
- the proximity of other mains, like leaking effluent mains,
- industrial plants or equipment using direct current electricity (cathodically protected structures, electric traction systems, plants, etc.).

This survey indicates the various strata traversed and provides information on the nature of the terrain and its natural corrosivity.

Soil aggressivity

Geological survey

The following types of ground can be distinguished as a first analysis:

- low risk:
  - sands and gravels,
  - stony material,
  - limestones.
- high risk:
  - marls,
  - clays.
- very high risk:
  - gypsum,
  - pyrites (iron pyrites, copper pyrites),
  - salts used in chemical industry (sodium chloride, calcium sulphate),
  - combustible fossil substances (lignites, peats, coal, bitumen).

Indications of the presence of fossil substances are to be noted: pyrite ammonites in particular, which indicate that the soil contains pyrites (iron sulphides) and is therefore very corrosive, particularly since it is anaerobic.

Hydrogeology

Moisture is a contributing factor in soil corrosivity.
A hydrogeological study identifies impermeable soils likely to retain water, as well as the presence of water retaining strata. The boundaries of these soils are often marked by the presence of springs. These boundaries warrant particular attention: the corrosivity of the impermeable layer may be very high. The same applies for water retaining strata if they drain neighbouring soils containing soluble mineral salts (sodium chloride, calcium sulphate, etc.).

Site surveys

Through visual observations, measurements (resistivity) and analyses (soil samples), site surveys help to confirm and complement the topographical and geological findings.
The resistivity of a soil gives information on its ability to promote the phenomenon of electro chemical corrosion of a metal. It is a particularly significant parameter, because:

- it integrates virtually all the factors that influence corrosivity (presence of salts, water, etc.),
- it is very easy to measure on site (Wenner, or four pins, method).

The different measurement points are taken forward on the plotting of the pipeline. The measurements are made along the provisional pipeline route, at intervals dictated by the topography of the terrain and the results obtained. The lower the resistivity, the greater the soil corrosivity. For resistivity observed below 3,000 ohm x cm, we consider it necessary to confirm the action by taking a sample at depth exposure and a measure of its resistivity (gross and minimum) in laboratory.



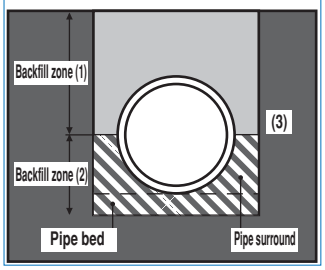
Depth of cover

See also: *page*
- Soil loads (pipe performance) 95
- Safety factors 73

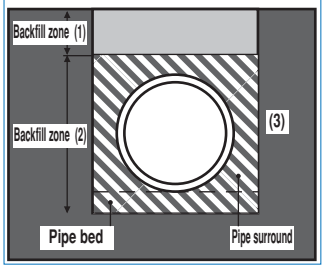
The minimum and maximum depth of cover depend on the pipe characteristics and the laying conditions.

Definitions

Rigid pipes



Flexible pipe



By convention, Fascicule 70 makes a distinction between:
- the **backfill area (1)**, and
- the **careful backfill area (2)** comprised of:
  - the trench bottom and pipe surround backfill up to at least 0.10 m above the assembly crown for flexible pipes;
  - the trench bottom and surround up to the horizontal diameter for rigid pipes
- the **extant soil (3).**

The **backfill zone (2)** conditions the pipe stability and/or protection.
Its execution must meet variable demands depending on:
- the pipe characteristics (rigid, semi-rigid, flexible);
- the external loadings (depth of cover, wheel loads);
- the more or less rocky or heterogeneous nature of the ground.

The **backfill zone (1)** varies according to the area involved (rural, semi-urban or urban), and has to take road stability into account.
Other constraints also affect the laying conditions:
- keeping the pipe frost-free (minimum depth of cover),
- passing through critical safety areas (railways, motorways, etc.), which require special arrangements,
- current regulations and local requirements applicable to roadways.

Depth of cover diagrams

The following diagrams show the maximum and minimum depths of cover for ductile iron pipes, with or without wheel loads.
Four laying cases, corresponding to common practice are presented. In all other cases, please consult PAM or Fascicule 70.
They have been established on the basis of the following:
- pipe resistance and deformation criteria compliant with Standard EN 545 (wall stress and vertical ovality),
- calculation model compliant with Fascicule 70 (French Regulations) without an aquifer.

Depth of cover

Definition of four laying cases

	Case n° 1	Case n° 2	Case n° 3	Case n° 4
	DN ≤ 600	DN 60 à 2000	DN ≤ 1 400 DN > 1 400	DN ≤ 600 DN > 600
Trench bottom	Flat bottom	Flat bottom	Bed in selected material	Bed in selected material
Backfill zone (2) **– Soil group *** **– Compacting** **– Es (bar)** **– 2 α (°)**	 4 Not compacted < 3 30	 3 Controlled compaction 7 30	 3 Controlled compaction 10 90	 1 Controlled compaction 20 90
Choice of materials	The backfill materials used (selected or not) directly in contact with the pipe must be exempt of stones or corrosive elements.			

* See table 1.

The cases defined above are understood without an aquifer, and not in reinforced trenches.

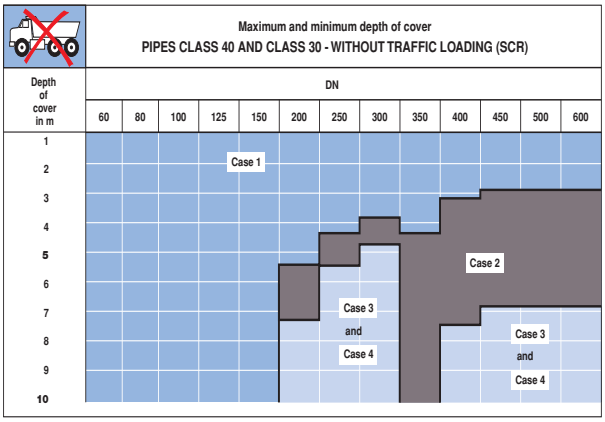
For other cases of pipe laying (under earthworks, reinforcements, etc.), please refer to Fascicule 70, or consult PAM.

SURROUNDING CONDITIONS OF THE PIPELINE

Depth of cover

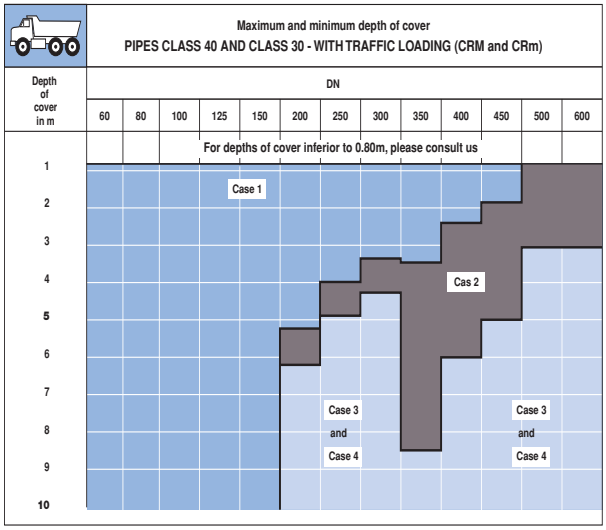
Maximum and Minimum depth of cover

● NATURAL pipes without traffic loading

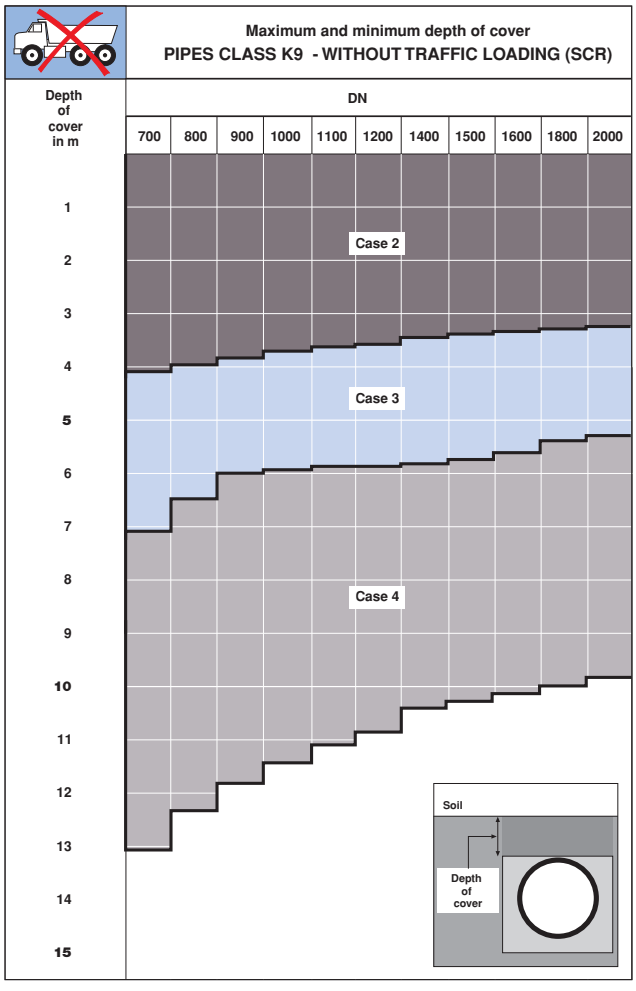


For UNIVERSAL class K9 (DN 80 to DN 600), please consult us.

● NATURAL pipes with traffic loading

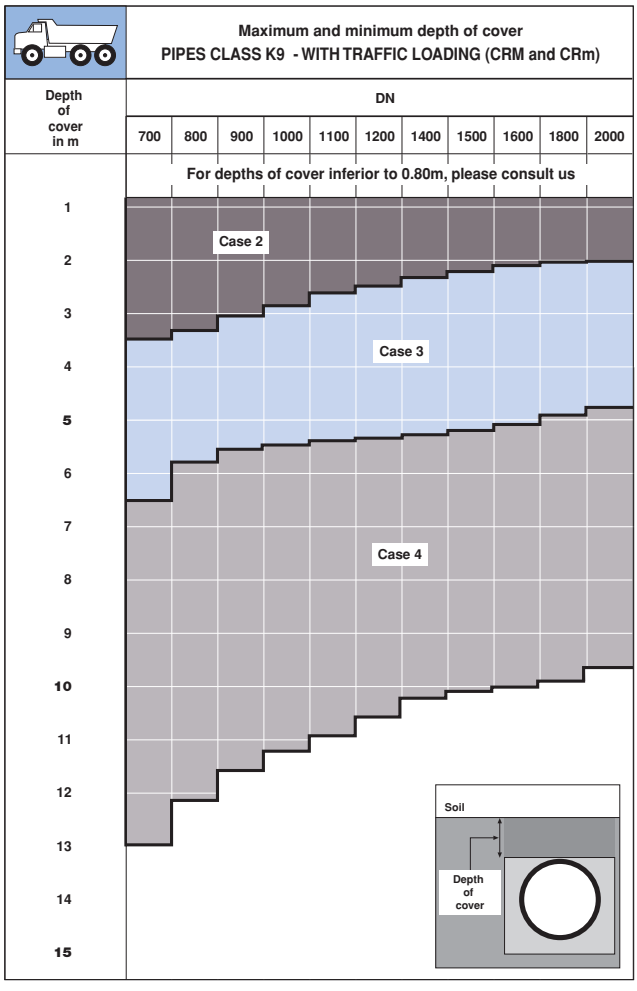


● Pipes class K9 without traffic loading



● Pipes class K9 with traffic loading

(Bc system: two 30-tonne triple axle trucks crossing.)



SCR : Maximum depth of cover without traffic loading
CRM : Maximum depth of cover with traffic loading
CRm : Minimum depth of cover without traffic loading

Depth of cover

Elements from Fascicule 70

The calculation method used takes into account:

– 6 soil groups, **see table 1**,

– 3 levels of compaction quality, **see table 2** and (if applicable) the influence of:

• the aquifer on soil parameters,

• reinforcement contraction as a function of trench width,

• wheel loads (Bc system: two 30-tonne triple axle trucks crossing).

Table 1

Soil group	Brief description
1	Clean or slightly silty sand and gravel (elements < 50 mm)
2	Silty or medium clay sand and gravel
3	Flint or millstone clay. Rubble, moraine, eroded rock, coarse alluvium with high percentage of fines
4	Loam, fine sand, gravel, clay, more or less plastic marl (Ip < 50)
5 a (*)	Very plastic clay and marl (Ip > 50). Soluble or polluting organic matter
5 b (**)	Unstable rock: chalk, sandstone, schist. Composite soils (flint and millstone clay, moraine, eroded rock, coarse alluvium with elements that may exceed 250 mm. Clean gravel, stable rock with elements > 50 mm.

(*) This material cannot be used either for the surround or the backfill zone (1).

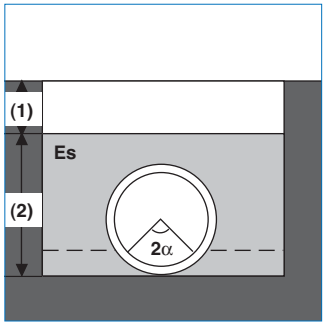
(**) This material cannot be used for the surround but may be used for the backfill zone (1).

Table 2

	Non-compacted		Controlled compaction		Controlled and checked compaction	
Soil group	Es	2α	Es	2α	Es	2α
	MPa	*degree*	*MPa*	*degree*	*MPa*	*degree*
1 (+)	0.7	60	2	90	5	120
2 (+)	0.6	60	1.2	90	3	120
3 (+)	0.5	60	1	90	2.5	120
4 (+)	< 0.3	60	0.6	60	0.6	60
5b (++)	0.7	–	2	–	5	–

(+) Surround or backfill zone (1).

(++) Only backfill zone (1).



2α: laying angle.

Es: backfill (2) modulus of reaction.

Other methods of calculation

Other calculation methods can be used:

– Annex F (informative) of European Standard EN 545 – Ductile iron pipes, fittings, accessories and their joints for water pipelines – Recommendations and test methods – Buried pipe calculation methods, depth of cover.

– the US Standard ANSI/AWWA C 150/A 21.50. Thickness design of ductile iron pipe.

Please consult PAM.

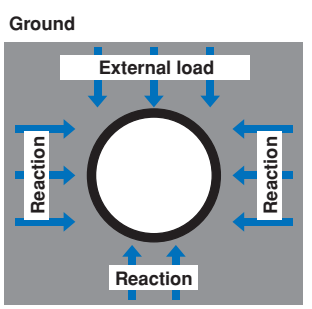
Soil loads (pipe performance)

See also: *page*
- Safety factors 73
- Depth of cover 91

The various types of pipes can be divided into three categories, depending on their performance:
- *rigid pipes,*
- *flexible pipes,*
- *semi-rigid pipes.*

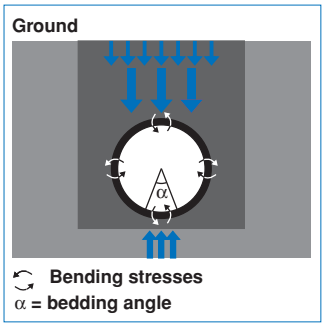
Ductile iron pipes are classed as semi-rigid. They provide a good compromise between resistance to top loading and vertical deflection, thus providing long term operational security.

Pipe/soil system



The mechanical performance of a buried pipe can only be understood by considering the pipe/soil system: the interaction of the pipes with the surrounding soils depends on their stiffness or flexibility, which induces stresses under different laying conditions.
Pipes can be divided into three categories, according to their resistance to external loading;
- Rigid pipes,
- Flexible pipes,
- Semi-rigid pipes.

Rigid pipes



● **Examples:**

Prestressed concrete.

● **Performance:**

Rigid pipes only accept a very small amount of ovality before they fail. The deformation is insufficient to bring the side support resistance of the backfill into play. All the soil top load is supported by the pipe, inducing high bending stresses in the walls.

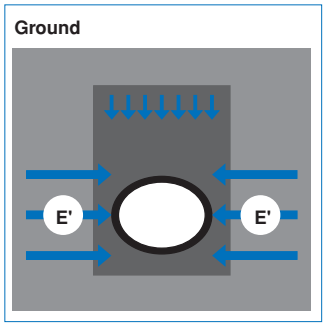
● **Design criteria:**

Usually maximum crushing load.

● **Consequences:**

Rigid pipes favour loads concentration at the pipe crown and invert. The performance of the rigid pipe/soil system is highly dependent on the bedding angle (α) and therefore on good bed preparation, particularly if there is any vehicle loading.

Soil loads (pipe performance)



Flexible pipes

- **Examples:**

Plastics, steel...

- **Performance:**

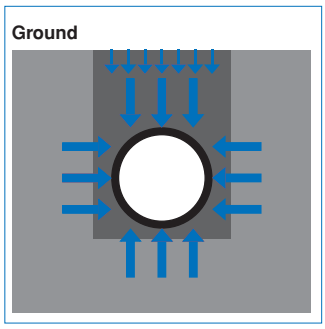
Flexible pipes withstand high vertical deflection without failure. The soil top load is therefore simply balanced by the pipe side support provided by the surrounding backfill.

- **Design criteria:**

Maximum permissible ovality, or maximum permissible bending stress; also resistance to buckling.

- **Consequences:**

The stability of the flexible pipe/soil system is directly dependent on the capacity of the backfill to develop passive side support resistance, therefore on its modulus of passive soil resistance E' and consequently on the quality of the backfill and its compaction.



Semi-rigid pipes

- **Examples:**

Ductile iron.

- **Performance:**



Semi-rigid pipes sustain sufficient ovality for part of the soil top load to mobilize backfill side support. The forces brought into play are therefore passive sidefill support and internal bending stresses in the pipe wall. The resistance to top loading is therefore distributed between the resistance of the pipe itself and that of the soil surround, the contributions of each being a function of the ratio of pipe and soil stiffness.

- **Design criteria:**

Maximum permissible bending stress (in small diameters) or maximum permissible ovality (for large diameters).

- **Consequences:**

By distributing the forces between the pipe and backfill, the semi-rigid pipe/soil system provides security against any changes in mechanical stressing with time, or of the support conditions themselves.



Product standards and related standards

See also: *page*
- Certification 252
- Quality 247

PAM ductile iron pipeline products comply with the European EN standards, as well as international ISO standards.

PAM pipeline systems comply with applicable standards:

– European standards (EN)
– International (ISO or EN ISO)

Compliance with European or international standards reflects the high degree of quality of the ductile iron pipeline systems.

Specifications	Standards	
	European EN standards	International ISO standards
Technical specifications of ductile iron	EN 545	ISO 2531
Socketed pipes	EN 545	ISO 2531
Socketed fittings	EN 545	ISO 2531
Flanged pipes	EN 545	ISO 2531
Flanged fittings	EN 545	ISO 2531
Junction type tests	EN 545	ISO 2531
Anchored junction type tests	EN 545	ISO 2531 ISO 10 804-1
Cement mortar internal lining	EN 545	ISO 4179
Zinc external coating of the pipes	EN 545	ISO 8179
HDPE external coating	EN 14 628	-
Polyurethane external coating	EN 15 189	-
Polyurethane internal lining	EN 15 655	-
Reinforced epoxy coating of the fittings	EN 14 901	-
Pre-insulated pipes	-	ISO 9394
Polyethylene sleeve	EN 545	ISO 8180
Design methods for pipelines*	EN 545	ISO 10 803
Site test	EN 805	ISO 10 802
Water supply Requirements for networks outside buildings	EN 805	-
Joint gaskets. Material specifications	EN 681.1	ISO 4633
Flange dimensions	EN 1092 - 2	ISO 7005 - 2
Fittings for PVC or HDPE pipelines	EN 12 842	-
Quality management systems - Requirements	EN ISO 9001	EN ISO 9001
Environmental management - Requirements	EN ISO 14001	EN ISO 14001

* *"Fascicule 70" in France*

NORMATIVE REFERENCES

Material in contact with drinking water

See also: *page*

- Drinking water 28
- Elastomers 161
- Cement (mortar lining) 229
- Zinc 220
- ZINALIUM 218
- Lubricating paste 275
- Linings (choice of) 228
- Certification 252

The material in contact with drinking water should not unacceptably affect the water's qualities.

Regulatory and standards context

The characteristics of water for human consumption are defined in a European Directive (see DRINKING WATER chapter).

There is no European Directive or Standard defining technical requirements applicable to material in contact with drinking water used in production, treatment and distribution facilities, aimed at verifying their compatibility with this type of water (for additional information on specific regulation for a given country, please consult us).

However, there is a French Order covering this topic: Order dated 29 May 1997, as modified by Order dated 24 June 1998.

Section 2 of this Order (Materials used for pipes and fittings, tanks and accessories), authorizes the use of material whose composition respects the recommendations set down in the annexes (type and maximum content of components), and makes provision, insofar as is necessary, for prior tests to assess the potential affect on the organoleptic, physical, chemical and biological quality of the water that comes into contact with the relevant material.

NORMATIVE REFERENCES

Material in contact with drinking water

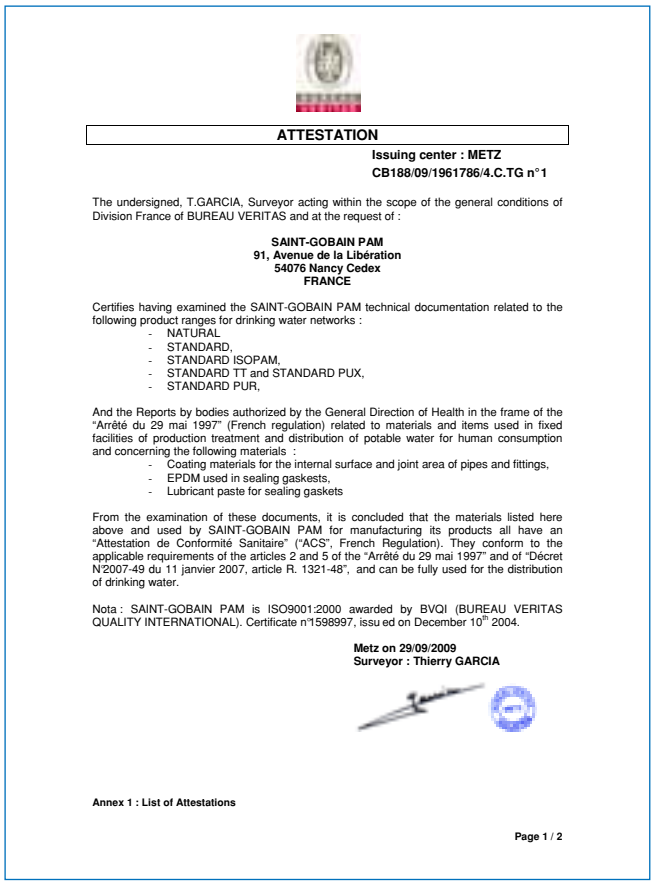
Material used by PAM in contact with drinking water

The material covered by the above regulations is listed in the following table:

Material	Use
Cement mortar	Pipe lining
Bituminous paint	Lining around pipe joints and some fittings
Blue epoxy	External coating and joint area lining of NATURAL pipe
Polyurethane epoxy varnish applied by cataphoresis	Lining for some fittings
Epoxy powder coating	Special lining for some fittings
Elastomers	Pipe and fitting joint gaskets
Lubricating paste	Joint assembly

Compliance

The above material used by PAM in its products is covered by reports by organizations approved by the French health authorities under the French Order dated 29 May 1997, certifying compliance with applicable regulations defined in this Order. All the materials listed are totally compatible with drinking water distribution applications.
These reports, as well as the technical documentation for the relevant products (pipes and fittings for drinking water distribution networks DN 60 to 2 000), have been reviewed by an independent organisation.



ATTESTATION

Issuing center : METZ
CB188/09/1961786/4.C.TG n°1

The undersigned, T.GARCIA, Surveyor acting within the scope of the general conditions of Division France of BUREAU VERITAS and at the request of :

SAINT-GOBAIN PAM
91, Avenue de la Libération
54076 Nancy Cedex
FRANCE

Certifies having examined the SAINT-GOBAIN PAM technical documentation related to the following product ranges for drinking water networks :

- NATURAL
- STANDARD,
- STANDARD ISOPAM,
- STANDARD TT and STANDARD PUX,
- STANDARD PUR,

And the Reports by bodies authorized by the General Direction of Health in the frame of the "Arrêté du 29 mai 1997" (French regulation) related to materials and items used in fixed facilities of production treatment and distribution of potable water for human consumption and concerning the following materials :

- Coating materials for the internal surface and joint area of pipes and fittings,
- EPDM used in sealing gaskets,
- Lubricant paste for sealing gaskets

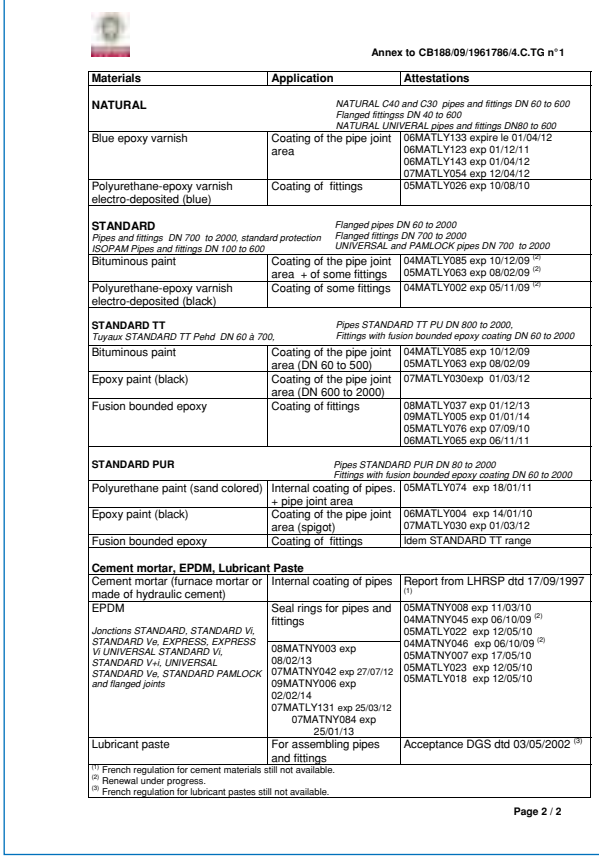
From the examination of these documents, it is concluded that the materials listed here above and used by SAINT-GOBAIN PAM for manufacturing its products all have an "Attestation de Conformité Sanitaire" ("ACS", French Regulation). They conform to the applicable requirements of the articles 2 and 5 of the "Arrêté du 29 mai 1997" and of "Décret N°2007-49 du 11 janvier 2007, article R. 1321-48", and can be fully used for the distribution of drinking water.

Nota : SAINT-GOBAIN PAM is ISO9001:2000 awarded by BVQI (BUREAU VERITAS QUALITY INTERNATIONAL). Certificate n°1598997, issued on December 10th 2004.

Metz on 29/09/2009
Surveyor : Thierry GARCIA

Annex 1 : List of Attestations

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Annex to CB188/09/1961786/4.C.TG n°1

Materials	Application	Attestations
NATURAL	*NATURAL C40 and C30 pipes and fittings DN 60 to 600* *Flanged fittingss DN 40 to 600* *NATURAL UNIVERAL pipes and fittings DN80 to 600*	
Blue epoxy varnish	Coating of the pipe joint area	06MATLY133 expire le 01/04/12 06MATLY123 exp 01/12/11 06MATLY143 exp 01/04/12 07MATLY054 exp 12/04/12
Polyurethane-epoxy varnish electro-deposited (blue)	Coating of fittings	05MATLY026 exp 10/08/10
STANDARD *Pipes and fittings DN 700 to 2000, standard protection ISOPAM Pipes and fittings DN 100 to 600*	*Flanged pipes DN 60 to 2000* *Flanged fittings DN 700 to 2000* *UNIVERSAL and PAMLOCK pipes DN 700 to 2000*	
Bituminous paint	Coating of the pipe joint area + of some fittings	04MATLY085 exp 10/12/09 (2) 05MATLY063 exp 08/02/09 (2)
Polyurethane-epoxy varnish electro-deposited (black)	Coating of some fittings	04MATLY002 exp 05/11/09 (2)
STANDARD TT *Tuyaux STANDARD TT Pehd DN 60 à 700,*	*Pipes STANDARD TT PU DN 800 to 2000,* *Fittings with fusion bounded epoxy coating DN 60 to 2000*	
Bituminous paint	Coating of the pipe joint area (DN 60 to 500)	04MATLY085 exp 10/12/09 05MATLY063 exp 08/02/09
Epoxy paint (black)	Coating of the pipe joint area (DN 600 to 2000)	07MATLY030exp 01/03/12
Fusion bounded epoxy	Coating of fittings	08MATLY037 exp 01/12/13 09MATLY005 exp 01/01/14 05MATLY076 exp 07/09/10 06MATLY065 exp 06/11/11
STANDARD PUR	*Pipes STANDARD PUR DN 80 to 2000* *Fittings with fusion bounded epoxy coating DN 60 to 2000*	
Polyurethane paint (sand colored)	Internal coating of pipes. + pipe joint area	05MATLY074 exp 18/01/11
Epoxy paint (black)	Coating of the pipe joint area (spigot)	06MATLY004 exp 14/01/10 07MATLY030 exp 01/03/12
Fusion bounded epoxy	Coating of fittings	Idem STANDARD TT range
Cement mortar, EPDM, Lubricant Paste		
Cement mortar (furnace mortar or made of hydraulic cement)	Internal coating of pipes	Report from LHRSP dtd 17/09/1997 (1)
EPDM *Jonctions STANDARD, STANDARD Vi, STANDARD Ve, EXPRESS, EXPRESS Vi UNIVERSAL STANDARD Vi, STANDARD V+i, UNIVERSAL STANDARD Ve, STANDARD PAMLOCK and flanged joints*	Seal rings for pipes and fittings 08MATNY003 exp 08/02/13 07MATNY042 exp 27/07/12 09MATNY006 exp 02/02/14 07MATLY131 exp 25/03/12 07MATNY084 exp 25/01/13	05MATNY008 exp 11/03/10 04MATNY045 exp 06/10/09 (2) 05MATLY022 exp 12/05/10 04MATNY046 exp 06/10/09 (2) 05MATNY007 exp 17/05/10 05MATLY023 exp 12/05/10 05MATLY018 exp 12/05/10
Lubricant paste	For assembling pipes and fittings	Acceptance DGS dtd 03/05/2002 (3)

(1) French regulation for cement materials still not available.
(2) Renewal under progress.
(3) French regulation for lubricant pastes still not available.

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Sustainable development, a commitment from PAM

PAM is the world leader in water cycle pipeline systems. Whilst this is a cause of great pride for all those that work with and for the company, it is also an immense responsibility.

Sustainable development lies at the heart of its corporate culture. PAM rapidly embraced the pioneering principles of sustainable development formulated by the Brundtland Commission. Since 1987, this international commission has encouraged today's generations to 'meet the needs of the present without compromising the ability of future generations to meet their own needs'.



PAM is committed to the following key fields:

- **The Environment**
- **Industry and the economy**
- **Social**

Its state-of-the-art technologies and focus on research and development have enabled it to consistently provide its customers with quality, sustainable, reliable and ergonomic solutions.

Like communication channels, water and sewerage pipelines are infrastructures created to last for several generations. Sustainable development depends on 'long lasting' rather than 'disposable' installations.

PAM has taken on board these principles and works to provide effective solutions for the environment.

More than 100 capitals and over 1000 large cities worldwide have been equipped with PAM products. Numerous hydraulic, water and sewerage projects are currently run with the support of PAM in order to boost the development of countries mainly in Latin America and Africa, but also in China and the Middle East.



The value of water



Laying of a water supply pipe

PAM overriding mission is to provide actions for the entire water cycle

The concept of sustainable development prompts an in-depth reflection on the consumption of water, its treatment and consequently its protection. The amount of fresh water used totals almost 4,430 km³ a year, 2,300 km³ of which are for consumption. An informed, responsible and environmentally friendly approach is essential in order to guarantee renewable and reusable water resources. Furthermore, through its research into pipelines, PAM works to improve the various uses of water and to narrow the gap between usage and consumption.

According to the World Health Organization, around 1.1 billion people in the world have no access to potable water and 2.4 billion have no sewerage systems. These major deficiencies in the water cycle have a dramatic impact on public health: 3.2 million people, most of them children, die from hygiene-related diseases each year.

The rivers and groundwater that constitute our traditional water resources require urgent conservation attention, yet it is also essential to work towards new and effective long term solutions. Indeed, the growth of urban areas and the population boom require new water treatment methods, and also naturally imply additional domestic, agricultural and industrial demands.

As a result of its long-standing industrial experience and total commitment to water cycle products, PAM is asked by customers and partners to take part in new water recycling projects, as well as desalination plants and recharging of underground aquifers as provision for potential future shortages, etc.



Its involvement in local government projects has made PAM aware of the need for more efficient and cost-effective management schemes, which respect the diversity of usage whilst guaranteeing the ecosystem (water supplies, treatment of used and rain water, the fight against fires, irrigation, etc.).

Highlights

- PAM is totally committed to the supply of water cycle products.
- Each year, its voluntary innovation policy takes the form of new watertight, sustainable and environmentally-friendly solutions.
- A member of local groups, PAM is committed to working for solutions for the supply and distribution of water, sewerage, irrigation and the fight against fires that provide greater protection for our ecosystems

Quality of life



The performance in terms of watertightness and the coatings of PAM's ductile iron pipeline systems guarantee the sanitary quality of water during transportation and distribution.

Constant attention is given to the quality of the water destined for human consumption produced by treatment plants. This applies both to the protection of the catchment areas and work on treatments including the regular lowering of potentially pathogenic micro-organisms and chemical products.

The challenge for PAM is to provide the transportation and distribution systems that guarantee this water reaches consumers in optimum condition. The careful choice of the materials used for pipelines in contact with water guarantees maximum quality and standards throughout the network. These materials are selected by the scientists at the PAM laboratories in close collaboration with the very best suppliers. Strict compliance with national regulations and current legislation is guaranteed thanks to an exhaustive quality assurance system based on ISO 9001 standards.

The company is equally committed to supplying pipeline systems that are not only leak-free today but will continue to be so in 100 years' time! Ductile iron pipeline joints are renowned for their water tightness. PAM has further enhanced this characteristic by using even more durable elastomer joints that are resistant to the oxidizing agents present in water and prevent the growth of micro-organisms on contact.



Ductile iron sewerage networks also require joints offering optimum performance in terms of watertightness in order to eliminate waste water leakages that could potentially contaminate the soil, groundwater and attack neighbouring pipelines.

PAM works with government authorities, water distributors and laying companies in order to implement ongoing improvements to its products.

Highlights

- Guaranteed potability of the water distributed through naturally watertight ductile iron pipes, preventing any leakage from this resource.
- Meticulous selection of materials (coatings, joints, repair products, lubricants), certified by France's ACS, Germany's DVGW, UK's WRAS and DWI, meeting the sanitary standards for the production of water supply and distribution products.
- Promotion of top quality reliable products allowing for the promotion of tap water consumption.
- Mineral interior pipe coatings based on cement mortar produced using potable water for optimum sanitary conditions.
- INTEGRAL and TAG 32 ranges for watertight sewerage networks to prevent pollution of soil and to allow for the treatment of all waste water.

Durability, reliability

PAM's pipeline systems are designed to last for more than 100 years.

As proved by many studies, sustainable development depends on 'long lasting' rather than 'disposable' installations. PAM has taken on board these principles and works to provide effective solutions for the environment.

The average annual rate of potable water pipeline renewal stands at around 0.6 to 0.7%. This means that based on current investment levels, the pipelines currently being laid will be required to last around 150 years!



Mont St-Michel site testing area for PAM.

The durability of ductile iron works has been known for decades. Indeed, there are many hydraulic networks with cast iron pipelines that were laid over 100 or even 150 years ago, and which continue to provide a satisfactory service. Replacement of these pipelines is not yet required.

Apart from the intrinsic qualities of ductile iron, this durability is also attributable to the quality of the exterior coatings, which provide protection against soil aggression, as well as the interior ones, which resist water or effluent reactivity.

For decades, the research staff at PAM's laboratories has worked painstakingly to provide state of the art protective coatings. This work covers both theoretical and practical aspects, including laboratory experiments and, above all, exhaustive on-site testing.

To this end, PAM owns testing grounds in the Bay of Mont-Saint-Michel, which it uses for trials on new coatings under the most aggressive soil conditions.
Interior linings play an equally important role in ensuring durability. PAM has developed centrifuged cement mortar-based mineral linings with blast furnace cement for potable water and aluminous cement for sewerage which have become worldwide leaders. The company also offers an additional range of linings, such as epoxy for fittings, spigots and the interior of TAG 32 pipes, or the brand new Ductan for Blutop pipes used for smaller diameter water distribution

Highlights

- In certain cities around the world, such as a Paris, cast iron pipelines that were laid 150 years ago are still in service.
- PAM ductile iron pipelines have been laid in more than 100 capital cities worldwide.
- Emerging nations such as China, India and Russia, etc., are opting to use ductile iron pipelines for their supply networks.
- Towns and cities choose ductile iron pipeline systems in order to reduce leakage rates.
- The ZINALIUM coating, made from zinc and aluminium and used in the Natural and Blutop ranges, at least doubles the lifetime of ductile iron pipes.

The future is water for all



Ductile iron fittings in Mauritania.



Site meeting in Panama.

Supplying potable tap water, collecting and treating waste water are global challenges that require the very finest technologies.

There is an urgent worldwide need for potable water supplies, as well as the collection and treatment of waste water in accordance with specific local and environmental conditions. This need is particularly evident in emerging nations. As water is an essential resource, the solutions must be based on an environmentally friendly approach. Care for the environment, active on site collaboration between local teams and PAM engineers and technicians, and a dialogue that takes into account the future management of the projects carried out, are all values and principles that we apply on a daily basis.

Right from the drawing board stage of any project, PAM provides the various groups involved with optimum solutions aimed at improving the performance of the networks to be laid and facilitating their installation in areas where access is often difficult. The vast range of PAM products provides solutions capable of overcoming difficulties in terms of hydraulic performance and pipeline protective coatings in even the harshest land conditions such as the Persian Gulf (characterised by corrosive soils, high temperatures and solar radiation, etc.).

An example of this is the Doha North Sewage Treatment Works project in Qatar, which complies fully with PAM's sustainable development principles and values. Indeed, Qatar is the first member state of the Golf Cooperation Council to undertake to reduce its greenhouse gas emissions between now and 2012. Its environmental policy aims to preserve its natural resources whilst guaranteeing industrial development. Set to become operational in 2010, the Middle East's largest waste water treatment and reuse plant will allow for the irrigation of green spaces on a small island that is home to an important nature reserve for oryx, gazelles and migrating birds.

The Doha North treatment plant will be eco-friendly and will generate high quality reusable water. It will also be equipped with an odour control system.

Highlights

- upply of pipeline systems to Algeria, Libya, Mauritania, Senegal, Nigeria, Palestine, Qatar, Pakistan, China, Peru, Brazil, Mexico, etc., to provide quality water supplies and long-lasting sewerage systems.
- Delivery of pipelines for the Doha North treatment plant in Qatar that will transport 439,000 m^3 of water a day, tripling the existing capacity. The plant will recycle water for a population of 900,000.
- Supply of around 200 km of pipelines for the Aftout Essahli project in Mauritania, within the framework of the national strategy for the fight against poverty.
- The Urbital range promotes the use of recycled water.

Energies for renewal



Forced main for hydropower station in Norway.

The teams of engineers and technicians at PAM work to reduce the energy consumption of the equipment it supplies to hydroelectric power stations.

Hydroelectric energy is a renewable energy that has been in use for decades. It currently makes up 16.6% of the world's electricity production, and 89% of the electricity generated using renewable resources, with an annual growth rate of 2%.

In addition to large dams, it is also possible to produce decentralized electricity that does not spill any waste into the water or generate contaminating gases. Indeed, compared with a traditional combustion power station, each year, a 1MW hydroelectric power station will prevent the emission of around 2,500 tons of CO2 into the atmosphere. 1MW is enough to meet the electricity needs of around 630 homes. Today's mini power stations are designed to respect natural water flows and the facilities are built to blend into the landscape. The pressure pipes that supply the water to the turbines are generally made from ductile iron and run underground. Various European countries have adopted hydroelectric technology in order to reach the 20% target set by the European Union for 2020.
In addition to the fundamental need for the development of renewable energies, energy and material economies boast a vast potential for action in terms of sustainable development.



PAM renews and implements ongoing improvements to its production processes in order to optimize energy consumption. Special attention is given to its buildings where the ambitious long-term objective is to cut energy consumption by 4.

The optimization of product weight is also of considerable interest, as it allows for reduction in energy consumption not only during production, but also during the transportation and installation stages.

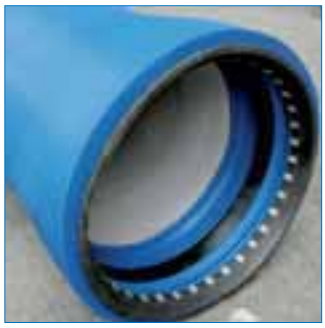
Highlights

- PAM participates actively in the development of micro hydroelectric power stations, especially in Norway and Austria.
- The use of charcoal from the PAM plantations to produce coke for use in Brazilian blast furnaces.
- In just 10 years, PAM has cut its energy requirements by 30%.
- The objective is to cut energy consumption in buildings by 4 between now and 2040.
- Energy consumption during transportation is dependent on the reduction of unnecessary product weight.

At the core of natural resources



Cast iron pipe laid in the late 17th century during the construction of Versailles Palace and which is destined for recycling.





Scrap used to produce ductile iron pipes and fittings.

100% of ductile iron materials can be permanently recycled without losing any of their performance properties.

Ductile iron is essentially an alloy made from iron, carbon and silicon – elements which are found in large amounts in the earth's crust, which is made up of around 5% iron and 26% silicon. Known worldwide reserves of pure iron stand at around 230 billion tons, which at current consumption rates guarantee supplies for many years to come.

Yet iron, as scrap iron and a waste metal, also boasts the world's highest material recycling rate, which stands at around 67%. The iron recycling sector is well-organized on a local scale, ensuring efficient, professional and economically feasible collection methods. This sector is enjoying steady growth and the amount of scrap iron used worldwide exceeds 400 million tons a year.

Ductile iron pipeline systems made from recycled products offer identical levels of performance to those made from iron ore. Also worthy of mention is the fact that recycled iron can be used for the production of both sewerage and potable water distribution systems.

PAM works hard to develop high performance products, limiting the amount of materials used to that which is strictly necessary, in accordance with current regulations. The new Natural, TAG 32 and Blutop ranges represent major breakthroughs in the reduction of raw materials, whilst at the same time guaranteeing optimum performance levels.

In addition, PAM has implemented a policy aimed at reducing water consumption in its factories through developments such as the Archimedes process for lining the pipe interiors with cement.

Highlights

- 100% of ductile iron materials can be permanently recycled.
- Following recycling, ductile iron can be used to produce pipelines for both potable water and sewerage.
- Integrated on site energy management allows for consumption to be reduced.
- The new Archimedes process, which consists of coating the pipe interiors, requires less water and generates less silt.

SUSTAINABLE DEVELOPMENT

In contact with the earth, naturally



Pipeline project to supply water to the cities of Algier and Tizi-Ouzou.

The sturdiness of ductile iron pipelines allows for the reuse of natural soil for backfilling trenches.

Laying pipelines may require the excavation of large amounts of earth, which may be as much as 5 to 10 times the volume of the pipeline laid. All too often, this earth is dumped and replaced with imported backfill.

Taking account of all phases of the operations, ranging from production to installation to the entire life cycle of the installation, is essential in order to ensure the correct approach to sustainable development. The environmental impact of the laying phase is of particular importance. Disposing of the excavated earth and importing backfill is restrictive, costly and impacts the environment. Certain studies have shown that the environmental impact during laying is far higher than during the manufacturing phase. This has led to an analysis of the life cycle that is currently in progress.



A series of simple actions have already been implemented in order to reduce native soil materials as far as possible, thereby considerably reducing the need to excavate the natural environment, dumping and unnecessary lorry traffic. The sturdy and solid nature of ductile iron pipelines, together with their resistance to cracking and the active properties of the coatings, allow for the use of native soil in most cases (following the clearing of larger stones) as a covering for the laying bed.

PAM has also developed product lines adapted to trench-free laying processes, particularly Horizontal Directional Drilling. This is possible thanks to the development of the new anchoring systems featured in our Universal Ve range. As a result, several tens of kilometres of ductile iron pipes are laid in Europe each year without the need for trenches. This technique is experiencing rapid expansion.

Highlights

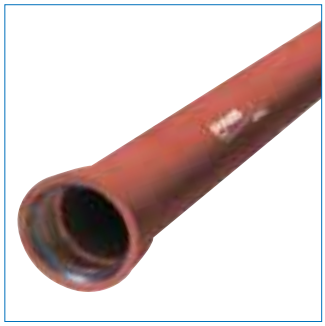


- Promotion of the reuse of natural backfill instead of filler materials, thank to the resistance and sturdiness of ductile iron pipelines.
- Limited inconvenience associated with laying extensions during the products lifetime.
- Design of systems that are faster to lay.
- Active promotion of trenchless laying technologies whenever appropriate.

Ongoing innovation



PAM KAMELEO
variable angle fitting



TAG 32



BLUTOP

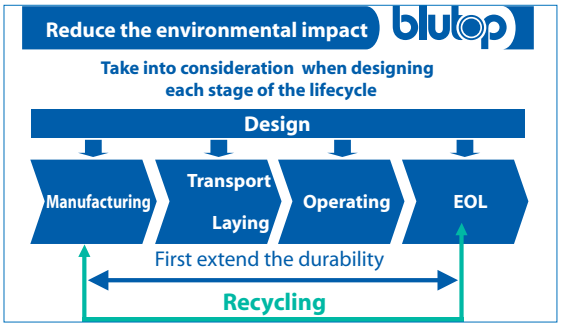
Innovation based on life cycle analyses and the eco-conception, allows for the reduction of the impact on the environment.

The eco-conception is based on in-depth analyses of the life cycles of the major product lines. This falls within the framework of the ISO 14 001 Standard, and is made up of four stages: defining objectives; analyzing the life cycle; assessing the impact on the environment; and research into improvements.

PAM has worked with leading independent life cycle analysis (LCA) experts on its major product lines, covering their installation and maintenance throughout their useful lives (more than 100 years). These analyses will be the object of PCR (Product Category Rules) and environmental statements which provide reliable details of the environmental impact of our products.

PAM works to reduce atmospheric and waste emissions, assessing products in order to guarantee sustainable performance that meets customer needs. By staying one step ahead of future environmental regulations, PAM aims to think about the future today.

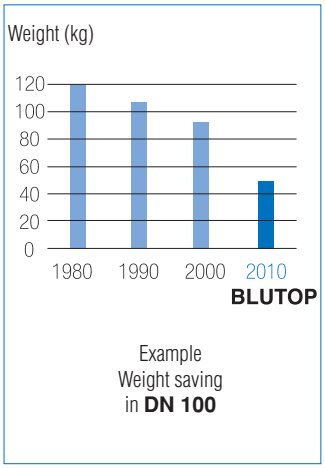
Within the space of just fifteen years, the company has achieved a 20% reduction in the weight from the ductile iron pipes that made up the old generation of products to the new Natural range. This revolutionary innovation has been achieved without reducing the excellent safety coefficient of our products, which offer a 3x factor of resistance to bursting (i.e. a minimum resistance of 120 bar for Class 40 Natural pipes). In addition, energy and raw material consumption per metre of pipeline and year of exploitation has been cut by four since 1990.

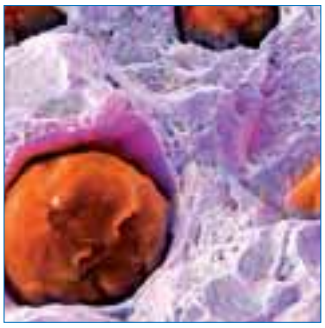


Highlights

- CO_2 emissions from the Natural range are around 20% lower than the classic range.
- The new Blutop and TAG 32 ranges allow for a reduction of between 30% and 50% in the amount of materials used.
- Anchoring system technologies have allowed for the elimination of heavy and voluminous concrete blocks, thereby reducing the amount of space required underground.
- Laying ergonomics is taken into consideration right from the design stage.

Responsible production





Graphite nodule electronic beam microscopy

The challenge for PAM is to guarantee constant progress in its industrial processes in order to reduce energy consumption and cut CO2 emissions.

Its exhaustive know-how of water cycle products enabled PAM to rapidly identify and control the environmental issues involved in its industrial processes. In France, 19% of investments in materials go to projects relating to health and the environment. Eighty percent of PAM's waste products are currently valorised (i.e. value recovered in some way), and the aim is for that figure to rise to 100%. In Europe, production is balanced between those subsidiaries using iron ore and those that opt for recycled scrap iron. Internal recycling of metal waste from the production process stands at 100%.

In order to take this commitment even further, all the group's production sites are currently working to obtain ISO 14001 Standard certification, and the aim is for this process to be completed by 2010. Numerous sites have already been certified, and a large number of projects have already taken shape for 2008 and 2009. The targets set are ambitious in terms of the results expected. This certification is unquestionable proof of the existence and efficiency of PAM's environment management system. These international regulations allow for the assessment of factory activity in terms of the environment, as well as providing proof of the company's commitment to implementing environmental protection strategies.

Obtaining the ISO 14001 Standard Certificate is based on the involvement and maximum commitment of all those that work with and for PAM on the various sites. The certificate covers both the product design and production phases.

The ISO 14001 Standard Certificate is in line with the company's long-standing concern for quality in terms of the design, manufacturing and commercialization of its products, as shown by its ISO 9001 certificate. Thus, PAM's policy is to apply ongoing improvements to its range of products in order to guarantee maximum customer satisfaction. The teams at PAM analyze their product and service needs, and then define the specifications necessary to meet those demands whilst at the same time ensuring maximum protection for the environment. They industrialize the production methods suitable for manufacturing the products, purchase the materials and manufacture in accordance with the defined and controlled specifications, and finally guarantee the delivery and provision of the products and services within the agreed deadlines.

In order to secure ongoing improvements to performance in all areas, the teams assess the results of their actions, quantifying and analyzing any discrepancies with the objectives set, defining and applying corrective actions and checking their efficiency. PAM aims to become the world leader in its field and its quality assurance policy reflects this objective.

Responsible production

Highlights

- All plants will be ISO 14001 certified by 2010.
- In Europe, production is balanced between the production of iron using iron ore and recycled scrap iron.
- 80% of all waste materials are valorised. The objective is for 0% non-valorised waste.
- 19% of PAM's investments in France are spent on health and the environment.



A transport synergy



Iron ore train.



Pipe loading Anvers.

PAM uses modes of transport that emit low levels of CO2 in order to supply its factories with raw materials and deliver its products to its customers.

PAM has acquired outstanding skills and know-how in the transportation of pipelines, and is capable of meeting both its national and international requirements over considerable distances.

It has systematically optimized its transport systems by combining several means (waterways, sea, rail and road). Excellent project planning enables the products to be delivered in optimum conditions and at the best rates, reducing transport difficulties to a minimum.

Localised production sites on several continents (Europe, Latin America, Asia and Africa) allow for optimum solutions, and reduce the distances to be covered.

Both PAM's production and distribution sites are generally interconnected by rail and waterways. In France, for instance, the site in the Lorraine region at Pont-à-Mousson receives most of its raw materials via rail or waterway. The products manufactured there are then loaded onto trains or barges, and then, if necessary switched to a vessel at a port.

Highlights



- 65% of the manufactured products are transported by rail, waterways or sea:
  1 train = 60 lorries
  1 barge = between 120 and 150 lorries
- The Blutop range can be manually transported and assembled, thereby reducing the need for vehicles on site.
- The reuse of natural backfill drastically reduces lorry rotation and the need for filler materials.
- The production plants are carefully selected in accordance with the delivery sites.

Commitment from PAM





PAM's stockyard.

PAM is committed to the challenges of sustainable development at each stage of the design, production and commercialization processes.

The principles and values defended by PAM are based on the responsible use of resources and materials, as well as a strong professional commitment to respect for the environment and health and safety in the workplace. Internally, a constant flow of communication with all its workers and collaborators allows for the smooth implementation of positive corporate changes whilst encouraging personal career development. The flow of information and two-way communication favours professional achievements within the general interests of the company.

In addition, the integration of the disabled into the workforce is one of the values applied at PAM. In addition to the natural respect for the individual, this principle enhances the motivation of all its employees, building up a sense of cohesion. The concern for sustainable development is present in each of the decisions made and is reflected in the working conditions and remuneration: a secure environment, the identification and prevention of risks, and the assessment of possible hazards.

PAM contributes actively to the needs and demands of sustainable development by involving all its collaborators and employees, transmitting values of responsibility, transparency, creativity and innovation. The application of the EHS Charter (environment, hygiene in industry and health and safety) is a direct response to its respect for the law and health and safety in the workplace.

Highlights

- Social policy based on 3 principles:
  - Respect for people,
  - Respect for health and safety at work,
  - Respect for employee rights.
- Recruitment of more than 550 new collaborators in France between 2007 and 2008.
- 3.5% of the payroll is dedicated to training (50,000 hours).
- Integrated Work Assistance Centre for the insertion of the disabled.
- Saint-Gobain has signed up to the UN Global Compact.





PAM. WITH YOU, WITHOUT LIMIT

PAm

COMPREHENSIVE DUCTILE IRON PIPE SYSTEMS



Relying on its extensive knowledge in networks, SAINT-GOBAIN PAM develops coherent and modular systems adapted to all job site configurations.

The PAM marking on its products bears witness to experience and the search for innovative solutions. It signifies the attention given to manufacturing of quality products that are reliable, ergonomic and easy-to-install.

Committed to continually explore ways to better account for water cycle requirements, the SAINT-GOBAIN PAM team is devoted to offering its customers more than just products.



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SAINT-GOBAIN
PAM

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PAM

RANGES

Water supply and distribution

Irrigation

Dedicated applications

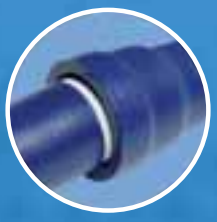
NATURAL



CLASSIC



BLUTOP



KAMELEO



PMI
Couplings



IRRIGAL



ALPINAL



URBITAL



SAINT-GOBAIN
PAM

CONTENT

Ranges Content

Water supply and distribution

NATURAL p. 119
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TT PE and TT PUX p. 123
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Irrigation

IRRIGAL p. 135

Dedicated applications

ALPINAL p. 139
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NATURAL

See also: *page*
- External coatings (choice) 216
- ZINALIUM 218
- Epoxy- cataphoresis 231



The NATURAL range of pipes and fittings from DN 60 to 600 features new high-performance external coatings suitable for a wide range of applications:

- *ZINALIUM and blue epoxy coating for pipes,*
- *blue epoxy resin deposited by cataphoresis for the fittings.*

Advantages

The NATURAL range is compatible with more than 95 % of the most frequently encountered ground types. NATURAL is a range:

- which removes the need for systematic soil surveys (resistivity measurements, sampling, etc.)
- which can cross corrosive ground without risk, with no need for additional protection using a polyethylene sleeve
- which simplifies the management of small and medium diameter pipeline inventories.



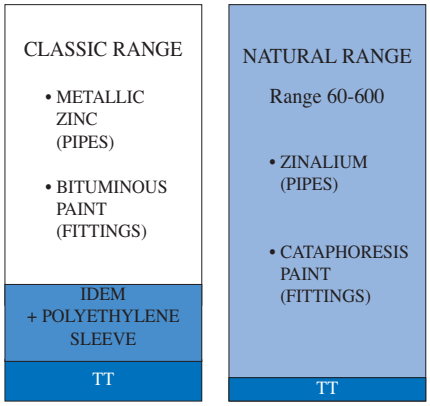
Field of use

The few cases where the NATURAL range is unsuitable are easy to identify by simple examination of the pipeline layout. The TT range is recommended for the following exceptions:

- acidic peaty soils
- soils containing waste, ash, cinders or soils polluted by discharges or industrial effluents
- soils under the saline water table

and, possibly, soils with uncontrolled stray currents.

With the NATURAL range and thanks to its very wide field of use, there is no need for additional protection with polyethylene sleeve. For the above-mentioned exceptions, the TT range should be used (special coatings).



NATURAL

See also: *page*
- STANDARD joint 164
- Cement (mortar) 229
- ZINALIUM 218

Description DN 60 to DN 600

● NATURAL pipes

NATURAL pipes are Class 40 (DN 60 to 300) or Class 30 (DN 350 to 600), coated internally with centrifuged blast furnace cement mortar. The external coating consists of a thick layer of ZINALIUM (400 g/m²) and a layer of blue epoxy resin. The NATURAL range is also available in two variants: NATURAL UNIVERSAL and PUR.

● NATURAL fittings

NATURAL fittings with EXPRESS joints are coated by cataphoresis with a layer of blue epoxy resin. The average thickness of the coating is very regular and at least 70 microns.

See: EXPRESS JOINT
CATAPHORESIS EPOXY



EXPRESS fitting

Locking / Anchoring

NATURAL pipes and fittings can be locked by STANDARD Vi and EXPRESS Vi joints respectively to form an anchored pipeline.

See: STANDARD Vi JOINT
EXPRESS Vi JOINT
LOCKING

Installation

NATURAL pipelines retain the ease of installation inherent to ductile iron pipelines. They require no additional protection on site after jointing.



NATURAL pipe laying

Standards

EN 545. Ductile iron pipes, fittings and accessories and their joints for water pipelines.
ISO 2531

CLASSIC

See also: *page*
- STANDARD joint 164
- Cement (mortar) 229
- Zinc 220

The CLASSIC range of pipes and fittings from DN 700 to 2000 features high-performance external coatings suitable for a very wide range of applications:

- *Zinc 200 g/m² and bituminous paint for pipes*
- *Bituminous paint or epoxy resin applied by cataphoresis for fittings.*



CLASSIC pipes

Advantages

The ductile iron pipeline systems in the CLASSIC range form coherent, modular assemblies capable of withstanding all types of situation. The mechanical properties of ductile iron, combined with flexible junctions fitted with elastomer joint gaskets, have led to the development of pipeline systems that are both strong and flexible, capable of absorbing highly unfavourable operating conditions or ground situations without damage. Ductile iron pipelines currently represent the best mechanical offer on the market of large and medium diameters.

Socketed pipelines are easily laid one after the other, with no on-site operations (welding or cathodic protection), no specialized personnel, using simple tools available on site. A wide range of junctions with push-in or mechanical joints, anchored or not, is available to adapt to the various site configurations or different laying situations.

Their strength simplifies the backfilling and compacting operations, with no impact on lifetime.

Field of use

Developed by PAM research, the basic external coating - metallic zinc (200 g/m²) + bituminous paint finishing layer, protects the pipelines by galvanic effect. Experience has shown that it is perfectly suited to most ground types. If necessary, an additional polyethylene protective sleeve can be applied.

If soil surveys indicate high aggressivity, PAM proposes an offering of TT, PE or PUX coatings dedicated to aggressive soils and special applications.

The clean and smooth internal protection of CLASSIC pipes consists of a cement mortar applied by centrifugal process. The internal surface of the cement mortar has low roughness, which favours flow, reduces head losses and protects the fluid from contact with the metal.

When the presence of soft water is known or suspected, PAM recommends a PUR internal polyurethane coating, more suitable in this case than cement mortar. To complete the offer, fittings with special coatings are also available. Chemical analysis of the water will confirm the recommendation. All materials coming into contact with drinking water are alimentary quality, in compliance with DGS (Directorate General for Health) requirements.

CLASSIC RANGE
• METALLIC ZINC (PIPES) • BITUMINOUS PAINT (FITTINGS)
IDEM + POLYETHYLENE SLEEVE
TT

CLASSIC

Description DN 700 to DN 2000



Panama DN 1600

● CLASSIC pipes

CLASSIC pipes are Class K9 (EN 545 and ISO 2531), with STANDARD joints, coated internally with centrifuged blast furnace cement mortar. The external coating consists of a thick layer of zinc (200 g/m²) and a layer of black bituminous paint.

● CLASSIC fittings

CLASSIC fittings with EXPRESS or STANDARD joints are coated by cataphoresis with a layer of black epoxy resin. The average thickness of the coating is very regular and at least 35 microns.

See: EXPRESS JOINT
CATAPHORESIS EPOXY

Locking / Anchoring



Panama DN 1600

CLASSIC pipes and fittings can be locked by STANDARD Ve joints or by the UNIVERSAL Ve and PAMLOCK systems without bolts.

See: STANDARD Ve JOINT
UNIVERSAL Ve JOINT
PAMLOCK JOINT

Installation

CLASSIC pipelines retain the ease of installation inherent to ductile iron pipelines. They require no additional protection on site after jointing.

Standards

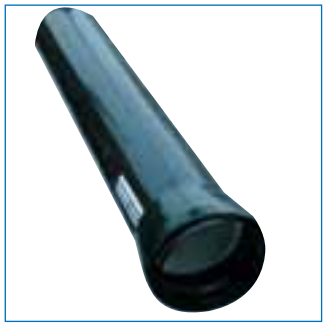
EN 545. Ductile iron pipes, fittings and accessories and their joints for water pipelines.
ISO 2531

Remark

Please contact us for products in the CLASSIC range from DN 60 to 600.

TT PE and TT PUX

See also: *page*
- External coatings (choice) 216
- Soil aggressivity 88
- TT (installation) 347



TT PE pipe

The TT protection system (pipes, fittings and joint accessories) is suitable for highly corrosive soils (saline and peaty soils, etc.).

Carried out in factory, it consists of:

- *on pipes: a thick polyethylene (DN ≤ 700) or polyurethane (800 ≤ DN ≤ 2000) coating.*
- *on fittings: a fusion bonded epoxy coating.*

Standards: EN 545, EN 14628, EN 15189.

Field of use

The ductile iron pipes, fittings and accessories given this type of protection are designed for use in very highly aggressive areas:
- sea arm or marsh crossings,
- installation in saline water table,
- etc.

See SOIL AGGRESSIVITY.

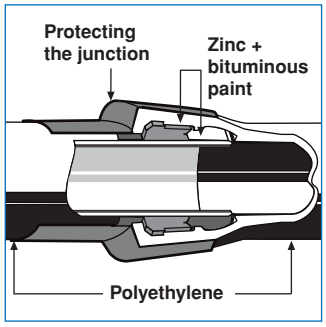


TT PUX pipe

Protective mechanisms

The TT protective system consists of thick organic coatings. They act as a protective screen between the cast iron and the external environment.
These protective coatings are suitable when the operating temperatures of the fluid carried does not exceed:
- 30 °C for the polyethylene coating (DN ≤ 700),
- 50 °C for the polyurethane coating (700 < DN ≤ 2000).

For higher temperatures, please contact us.



TT PE polyethylene coating (DN 60 to 700)

The protective system consists of:
Pipe barrel: a polyethylene coating, approximately 2 mm thick, applied on the external surface of the cast iron pipe and bonded with a layer of thermofusible adhesive according to a coextrusion technique.
Junction:
- DN 60 to 300 - elastomer sleeve,
- DN 350 to 700 - heat-shrink sleeve.

If a STANDARD Vi or UNIVERSAL anchored pipeline is used in saline exterior environment, the elastomer sleeve must be replaced by a heat-shrink sleeve. Please contact us.

Fittings: a fusion bonded epoxy coating applied on the internal and external surfaces of the fittings, tapping collars, etc.

TT PE and TT PUX



Accessories: rotatable flanges receive the same coating as the fittings on which they are mounted. The steel bolts of the flanged joints are galvanized.

Pipe thickness

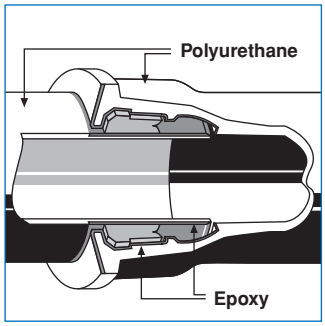
- DN 60 to 300: class C40
- DN 350 to 600: class C30
- DN 700: class K9

Implementation

The TT pipelines retain the ease of installation inherent to ductile iron pipelines. A few specific operations or precautions are required, however. See TT (installation).

TT PUX polyurethane coating (DN 800 to 2000)

The protective system consists of:
Pipe barrel:
- a polyurethane coating, thickness 900 microns (min. 700 microns), applied by spraying on the external surface of the pipe,
- an epoxy coating applied by spraying on the ends (spigot and inside the socket) of the pipe.



Fittings: a fusion bonded epoxy coating applied on the internal and external surfaces of the fittings.
Accessories: rotatable flanges receive the same coating as the fittings on which they are mounted. The steel bolts of the flanged joints are galvanized.

Please contact us for TT PUX pipes in the range from DN 80 to 700.

Installation



Pipelines with special polyurethane coating retain the ease of installation inherent to ductile iron pipelines.
They require no additional protection on site after jointing. In case of anchoring fittings, a special coating must be applied on the joint.
Please contact us.
See TT (installation).

Standards

EN 545: Ductile iron pipes, fittings and accessories and their joints for water pipelines.
Recommendations and test methods.
EN 14628: External polyethylene coating for pipes.
EN 15189: External polyurethane coating for pipes.
ISO 2531

PUR

See also: *page*
- Aggressive or corrosive water 29
- Internal lining (choice) 228
- Fusion bonded epoxy (coating for fittings) 232
- Drinking water 28

The special internal protection of PUR pipes consists of an internal polyurethane lining.

These pipes, in conjunction with STANDARD fusion bonded epoxy coated fittings, are designed to carry very soft and aggressive water associated with long dwell times (more than 3 days).

They are also designed to carry mineral water, whose analysis must not vary between the pipeline inlet and outlet, and raw water.

Standards: EN 545, EN 16 655

Field of use

PUR ductile iron pipes, with internal polyurethane lining and the associated fittings can only be used to transport the following types of water:

- **Very soft** (less than 5 °F), associated with long dwell times (more than 3 days) when the traditional cement mortar lining is unsuitable (risk of increasing the water alkalinity).
  See AGGRESSIVE OR CORROSIVE WATER
- **Mineral**, i.e. whose chemical analysis must not vary between the pipeline inlet and outlet.

For **industrial applications**: please contact us
The **maximum operating temperature** is 35 °C.



Internal linings of pipes and fittings

● **The pipe linings consist of:**

- **Internal:** 1 mm thick sand-coloured polyurethane, min. 700 µm.
- **Socket:** 300 µm polyurethane on the inside in contact with the water carried.
- **Spigot:** total min. thickness of the epoxy-zinc + black solvent epoxy = 150 µm.

The **fittings** associated with the PUR pipes have internal and external fusion bonded epoxy coatings. See FUSION BONDED EPOXY.

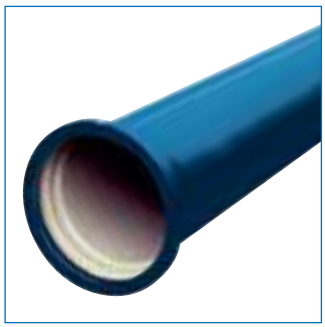
Performance

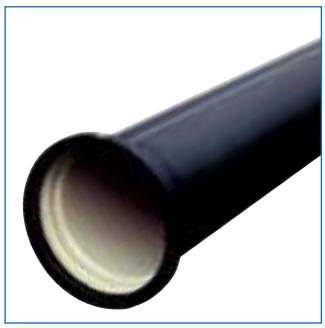
The efficiency and performance of the polyurethane coating (passive protection) depend on its continuity, adherence and stability over time.

PUR

The main characteristics of the polyurethane coating are:

- **Continuity and leaktightness of the polyurethane film** (checked using a Holiday detector test)
- **Its adherence:** greater than 8 MPa at 23 °C
- **Its stability:** The polyurethane coating selected by PAM is chemically stable and resistant to ageing: the amount of water absorbed by the coating after 100 days in distilled water, indicated by absorption test, is less than 4 %.
- **The elongation at break** is greater than 10 %. The polyurethane coating tolerates without damage the constraints (ovalisation, bending, etc.) on the ductile iron pipe within the limiting values specified in standard EN 545.





Range

PUR pipes and STANDARD fittings,
- DN 80 to 600 in NATURAL PUR
- DN 700 to 2000 in STANDARD PUR

Other characteristics of pipes and fittings

They are the same as those of the NATURAL pipes or the CLASSIC pipes: mechanical properties, pressures, external coatings, STANDARD joint, etc.

Sanitary conformity

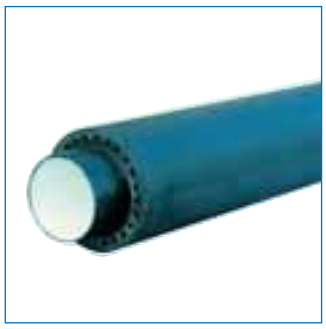
The coatings (polyurethane, epoxy) and the materials involved in the composition of the joint (elastomers) used in the PUR range have received a Sanitary Conformity Certificate (ACS) in compliance with the provisions of the Decree dated 29 May 1997.

Compliance with product standard

EN 545: Ductile iron pipes, fittings and accessories and their assemblies for water pipelines. Recommendations and test methods.
EN 15655: Ductile iron pipes, fittings and accessories. Internal polyurethane lining for pipes and fittings.
ISO 2531

ISOPAM Preinsulated pipelines

See also: *page*
- Bridge crossing 270
- Pipe laying above ground 255
- ISOPAM (installation) 352



ISOPAM preinsulated pipelines provide thermal insulation of networks highly exposed to risks of freezing.

These ductile cast iron pipelines are equipped with thermal insulation applied in the factory. They offer the same mechanical and tightness performance as traditional ductile cast iron pipelines.

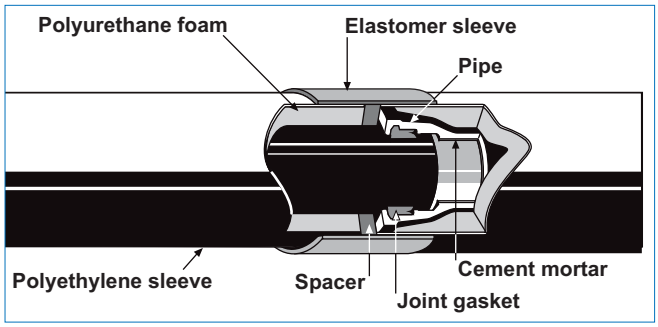
Range: DN 100 to 600.

Principle

Pipelines are sometimes exposed to risks of freezing. When imposed by the conditions (low flow rate, unfavourable weather conditions, above-ground installation), the pipelines must be insulated to minimize the thermal exchanges with the external environment.
To meet this need, PAM proposes a system of factory preinsulated pipelines.

Description

● STANDARD pipes and fittings



- Class 40 pipes (DN 100 to 300) or Class 30 pipes (DN 350 to 600).
- STANDARD push-in joint.
- Internal lining:
  – pipes: cement mortar
  – fittings: bituminous paint or equivalent.

Upon request, PAM can supply joint gaskets of DN 100 to 600 for anchoring (See STANDARD Vi joint).

Insulation of pipe barrels and fittings
- Polyurethane foam injected between the pipe and a polyethylene sleeve.

Insulation of junctions
- A foam spacer is fitted on the pipe spigot before insertion in the previous pipe.
- The external junction is produced using an elastomer sleeve.

ISOPAM Preinsulated pipelines



Field of use

The ISOPAM pipelines are used when there is a risk of the fluid freezing or when the temperature must be kept as low as possible, if crossing a region of high temperature.
For example:

- low depths of cover in cold regions.
- above ground sections on civil engineering structures exposed to the weather.
- discharge columns-distribution in water towers.

Installation rules specific to preinsulated pipelines apply to these different situations. Please contact us.

Performance

ISOPAM pipelines benefit from the qualities specific to ductile cast iron pipes with push-in joints.

● Resistance to internal pressure

The maximum allowable pressures are those applicable to water supply pipelines. See ALLOWABLE OPERATING PRESSURES.

● Leaktightness

The tightness of this joint is based on the recognized qualities of the STANDARD push-in joint. See STANDARD JOINT.

● Angular deflection

The angular deflections of ISOPAM pipelines are different from those of non insulated pipelines due to the stresses produced by the junction insulation.

DN	Angular deflection (°)	
	STANDARD joint	STANDARD Vi joint
100	4	5
125	3.5	5
150	3.5	5
200	3	4
250	3	4
300	2.5	3
350	2.5	3
400	2	2
500	2	2
600	2	2

● Thermal insulation

Thermal conductivity coefficient of the coating: 0.034 W/m.°K
External temperature that the coating can withstand continuously: -40 °C.
For lower temperatures, please contact us.

ISOPAM Preinsulated pipelines



Protecting an above ground pipeline against frost

The thermal insulation coating delays the temperature drop of the water crossing the pipeline section exposed to the cold. It does not prevent it. The table below indicates the minimum time required for the water inside a completely full main, laid above ground, to reach 0 °C (no ice crystals) under the following conditions:

- zero flow rate (Q=0).
- initial water temperature = 4 °C, 10 °C.
- external temperature = -5 °C, -10 °C, -20 °C.
- wind speed 5 m/s to 20 m/s.
- surface transmission coefficient between the external surface of the polyethylene sleeve and the ambient air = 23 W/m².°K.

To prevent the water from freezing, the flow rate Q must be chosen so that the time ΔT for the water to cross the preinsulated section is less than the freezing time ΔT at zero speed, indicated in the following table.

$$\Delta T < \Delta T \text{ freezing}$$

$$Q \geq \frac{L \times S}{\Delta T \text{ freezing}}$$

where:

Q:	flow rate (in m³/h)
S:	cross-section (in m²)
L:	length of the exposed section (in m)
Δ*T* freezing:	freezing time in hours.

Water temperature	External temperature	Minimum freezing time ($\Delta T_{freezing}$) at flow rate Q = 0								
		DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 500
°C	°C	*h*	*h*	*h*	*h*	*h*	*h*	*h*	*h*	*h*
4 °C	– 5 °C	12	16	20	33	56	68	78	96	128
	– 10 °C	7	9	11	18	32	39	44	55	73
	– 20 °C	3	5	6	10	17	21	24	29	39
10 °C	– 5 °C	23	30	38	61	105	127	145	180	240
	– 10 °C	14	19	24	38	66	80	92	113	151
	– 20 °C	8	11	14	22	38	47	53	66	88

Example

Pipeline DN 400, length 100 m, carrying water at a temperature of 4 °C, exposed to a wind of 5 m/s. External temperature: -10 °C.
The freezing time is 55 hours.
The required flow rate *Q* is such that: $Q \geq \frac{100 \times 3.14 \times 0.4^2}{4 \times 55} = 0.23\ m^3/h$

Implementation

See ISOPAM (PREINSULATED PIPELINES - INSTALLATION).

Conformity

ISO 9349: Preinsulated ductile iron pipeline systems.
EN 545: Ductile cast iron pipes, fittings and accessories and their assemblies for water pipelines. Recommendations and test methods.
ISO 2531

KAMELEO range

KAMELEO is a variable angle fitting designed to connect water supply pipelines. It consists of a main component which can take a complete range of accessories sold in kits in order to produce various types of junction.

Advantages

- Pre-assembled outside the trench.
- Inserted by hand.
- Reduced number of bolts whilst guaranteeing the tightness.
- Easily implemented to find the required bend thanks to its variable angle design.
- Different angles can be obtained with the same KAMELEO fitting. It replaces several traditional parts which would have been required on site.

Field of use

Drinking water supply networks

For new works

- The KAMELEO fitting can cope with an angular fault that is too small or too large for traditional fittings.
- Creation of complex angles which would have previously required two bends.
- Extension of a pipe.
- Connection of a new pipeline
- Extension for congested sites or tunnels.

For maintenance and repairs

In its flanged socket and sleeve with mechanical junction versions, KAMELEO slides along the pipe completely. Repair of anchored pipelines and small damaged pipe sections by replacing two sleeves and a pipe section: the "special insertion" KAMELEO EXPRESS Vi kit is used to anchor junctions on a static spigot.

Main characteristics

- Central junction perfectly sealed by O-ring
- Longevity: the fitting is protected by a blue 250 μm fusion bonded epoxy coating, with hot-galvanized nuts and bolts.
- Safety: reduced number of bolts whilst guaranteeing the tightness.
- Resistance to pressure: allowable operating pressure (AOP) of 16 bar.



KAMELEO range



Ergonomic handle.
Fitting with continuously variable angle in 0° position



Fitting with continuously variable angle in 45° position



Continuously variable angle



Angle blocked by tightening the central junction

Versatile and modular

	Junctions				
	STANDARD	**STANDARD Vi**	**Flange**	**EXPRESS type**	**EXPRESS Vi type**
Collar					
Flanged socket			KAMELEO		
Bend					

Compliance with standards and regulations

- Joints made from EPDM quality elastomers.
- PECB 250 μm internal-external coating, in compliance with EN 14901.
- Galvanized steel nuts and bolts.
- Type tests in compliance with EN 545.

BLUTOP



BLUTOP is a brand new range of ductile iron pipelines dedicated to drinking water distribution in small diameters, available in DN/OD 90, 110 and 125. BLUTOP combines the recognized durability and strength performance of ductile iron pipelines with the handling characteristics of plastic pipelines.

***BLUTOP**, why choose between innovation and tradition?*

BLUTOP, performance at the service of drinking water distribution

- 25 bar: Allowable Operating Pressure (AOP)
- 3: pressure resistance safety factor
- 40 bar: works unit test pressure for the pipes
- 90, 110 and 125: DN/OD available
- 6°: maximum angular deflection at the junctions
- 7 m: possible laying depth in the majority of soils

BLUTOP, optimized for laying



- Backfilling possible with native soil, after removal of stones
- Manual laying and implementation
- Rapid on-site cutting
- Compatibility with standard laying tools

ZINALIUM polyvalent external coating



- 400 g/m² Zn/Al 85/15 alloy
- 100 μm ultramarine blue epoxy external layer
- Suitable for the vast majority of soils

High-tech internal lining

- Ultramarine blue Ductan thermoplastic
- Perfectly smooth
- High impact resistance
- Nominal thickness 300 μm
- Average adhesion greater than 15 MPa (minimum 8 MPa)

Range of pipes DN/OD 90, 110 et 125

DN/OD	L	Iron thickness	DE	Weight	PFA	PMA	PEA
	m	*mm*	*mm*	*Kg/m*	*bar*	*bar*	*bar*
90	6	3.0	90	6.1	25	30	35
110	6	3.0	110	7.5	25	30	35
125	6	3.0	125	8.6	25	30	35

BLUTOP





Range of accessories

- Quick and Quick with locking
- Euro 24 gate valve
- Drills for spurs
- Lubricating paste, repair products

Range of fittings

- Elbows, bends, tees, tapers
- Sleeves, plugs
- Socket flange fittings
- Spigot flange fittings
- Blue fusion bonded epoxy

Range of DN/OD 90, 110 and 125 junctions

- 25 bar AOP non-anchored junction
  Compatible on Blutop pipes and fittings and PVC and HDPE pipes
- 16 bar AOP anchored junction
  Compatible on Blutop pipes and fittings only

Conformity

- Designed according to the specifications of standard EN 805
- CSTB technical approval, currently under examination
- French Sanitary Conformity Certificate (ACS) for all materials in contact with drinking water
- Elastomer for the joints in compliance with standard EN 681.1
- Epoxy coating in compliance with standard EN 14901
- Quality system EN ISO 9001-2000



BLUTOP, innovation in ductile iron

A decidedly new concept

- Dedicated to small diameter drinking water distribution
- Fast, manual laying
- Compatibility with PVC and HDPE pipes

A new generation of pipes

- External coating in ZINALIUM alloy
- Ductan internal lining in ultramarine blue thermoplastic
- Increased durability

"Intelligent" fittings

- Ergonomic
- Can be used on BLUTOP, PVC and HDPE

High performance joints

- New highly leaktight BLUTOP joints
- New BLUTOP anchored joints with inserts requiring low insertion force

KLIKSO ductile cast iron fittings PN 10/16 for pressure tubes DN 63 to 225 for water



The fitting that can be anchored or not.

Combined with a locking gland to be screwed by a simple 1/4 turn, KLIKSO fittings can be used to make sections of self-restrained pipelines, with no welding or bolts.

There is a single locking gland for each DN, whatever of the part to be anchored. Depending on the context, the simplicity of this part allows the fitting to be anchored or not.

Field of use

KLIKSO fittings connect PE or PVC tubes whose mechanical properties comply with the following standards:
EN 1452 - 1 to 7: plastic pipe systems for water supply - Unplasticized PVC-U.
EN 12201 - 1 to 7: plastic pipe systems for water supply - Polyethylene (HDPE)

Compliance with standards and regulations

KLIKSO range products comply with standard EN 12842 and pass the type tests defined by this standard.
The joint rings comply with standard EN 681.1.

Drinking water compatibility

KLIKSO fittings are intended for the drinking water supply market.
Their components (coatings and joint gaskets, etc.) have received a Sanitary Compliance Certificate (ACS) and comply with the provisions of the Decree dated 29 May 1997.

Coating

KLIKSO fittings benefit from a fusion bonded epoxy in compliance with standard EN 14901.

Packaging of KLIKSO fittings

KLIKSO fittings are delivered with pre-assembled gaskets. The joint rings are protected by plugs.
The fittings are delivered individually or on pallets.
For information on the pallet packaging units, please contact us.

IRRIGAL



Pipeline system dedicated to irrigation DN 100 to 1000

Agriculture is the main consumer of water in France, primarily for irrigation purposes. Nearly 3 500 million m3 of water are taken every year for agriculture with 60 % going to irrigation.

Agricultural consumption, which is mostly seasonal, has increased significantly over the last 30 years, due to the development of irrigation and changing agricultural practices.
Between 1970 and 2000, France **tripled** its irrigated areas, increasing from slightly over 500 000 hectares to nearly 1 500 000 hectares (i.e. about 6 % of the agricultural areas).

Two broad irrigation techniques are used in France:
- surface or gravity irrigation,
- pressurized irrigation (spraying or micro-irrigation),

In France most irrigation is carried out by spraying.
Numerous studies have shown that pressurized irrigation is much more efficient than surface irrigation (sometimes twice as efficient).

Depending on whether the land is irrigated by fixed spray at low, medium or high pressure, or by automatic spray, the pressure required* varies from 1.5 to 12 bar.
The usual situation is a pressure of 4.5 bar upstream from the irrigation hydrant. In some regions, a pressure of 6 to 7 bar is required everywhere. In this case, water is transported to the land via pressurized distribution networks.
Since spraying techniques, especially hose reel guns, may generate frequent water hammer, constructive precautions are required.



In this demanding context, strong and durable ductile iron pipelines are the ideal solution.

**Pressure required: pressure at the hydrant + geophysical height difference (if the water origin is lower than the hydrants served) + head losses.*

Opt for a global approach



During the period of sharp rise in irrigation in France, PAM monitored and delivered numerous projects. Thanks to its solid knowledge in pressure networks and expertise as manufacturer of valves, in particular those intended for irrigation, the company was able to adopt a system approach.
This experience allows the PAM technical teams to provide the best advice, whether to optimize your networks or the efficiency of your irrigation system; design studies, soil surveys, pressure calculations, thrust block calculations, etc.
To optimize customer satisfaction, PAM decided to privilege proximity: through a strong sales presence in the field and the support of numerous technicians, projects can be monitored accurately and efficiently.

IRRIGAL



Why choose IRRIGAL ductile iron?

Irrigation projects require a large infrastructure and pooling of resources, in often difficult economic climates.
PAM designed the IRRIGAL range, the green pipe, and a line of **optimized ductile iron products dedicated to irrigation, offering excellent value for money.**

IRRIGAL, a system of socketed pipelines laid one after the other, is the ideal solution to build very long pressurized irrigation networks: long pipes, coherent and modular assemblies capable of coping with all types of situation.
Since the elastomer joint gaskets fitted on the junctions withstand high angular deviations, they can follow the curves of the layout or bypass obstacles without additional bends.

The IRRIGAL system is easy to lay, with no on-site operations (welding or cathodic protection), no specialized personnel, using simple tools available on site.



Mechanical strength and resistance to pressure of ductile iron pipelines

Ductile iron is renowned for its excellent mechanical properties.
A semi-rigid material with flexible behaviour, ductile iron pipelines are a technical paradox.
Their solidity simplifies the trench bottom preparation and backfilling operations, with no impact on lifetime; due to their flexibility, they can tolerate land movements or environmental modifications without damage.
Strong, they can withstand low or high depths of cover, earth loads and repeated crossing by agricultural vehicles.

Heavy-duty system

Once buried, pressurized pipelines must sometimes face harsh conditions on site over a long lifetime during which numerous operating or environmental contingencies may occur (excess pressure, water hammer, soil movement, destabilization of the trench bottoms, etc.).



Choosing a pipeline with a high safety factor and strong mechanical properties means securing long-term investments and continuity of service.

IRRIGAL



Safety and adaptation flexibility for your irrigation projects:

Irrigation networks may include a high density of spraying hydrants and have to cope with **serious risks of water hammer**. The safety margin of ductile iron pipelines is large enough for them to absorb these risks and, as a result, the relief valves generally recommended on irrigation networks are no longer required.
This margin also caters for the possibility of upgrading the irrigation equipment in the future, even to higher flow rate requirements, without having to redesign the network.

Leaktight pressurized pipelines and water savings: don't lose a drop…

Irrigation is always associated with a context of seasonal dryness and water resources limited over time.
Irrigation water is billed and may represent a major expense for farms. It is therefore important to combine spraying efficiency and water management without waste.
It is essential to make sure that no water is lost from the pipeline….
IRRIGAL junctions are made by compressing an elastomer joint gasket between two metal elements. Subjected to stringent type tests, the joint gaskets guarantee that the system remains leaktight above the pipe bursting pressure! *
** for anchored junctions, please contact us*

High-performance coatings



Pipelines may have to withstand the corrosivity of soils and backfills. On farmland, soil corrosivity may be increased by the use of phytosanitary products and fertilizers. IRRIGAL pipes benefit from an efficient external coating: a metallic zinc coating (200 g / m2 i.e. 50 % more than the value recommended by standard EN 545) protects the pipes by galvanic effect. Protection is enhanced by a green epoxy finishing layer.
The fittings are coated by cataphoresis.

In case of high corrosivity, additional protection by polyethylene sleeve, to be fitted on site, may prove necessary.
If you suspect this possibility, please consult our teams.

IRRIGAL

Quality and reliability

IRRIGAL pipelines are manufactured in ISO 9001 certified organizations.
The system products - pipes and fittings - undergo individual pressure testing. They comply with European standard EN 545.

Choosing PAM ductile iron systems means choosing quality and reliability for your equipment.

High maximum pressures

Pressure performance of IRRIGAL pipes

DN	PFA	PMA	PEA	DN	PFA	PMA	PEA
mm	*bar*	*bar*	*bar*	*mm*	*bar*	*bar*	*bar*
100	64	77	82	450	29	35	40
125	64	77	82	500	28	33	38
150	62	74	79	600	26	31	36
200	50	60	65	700	29	35	40
250	43	51	56	800	28	33	38
300	38	46	51	900	27	32	37
350	33	39	44	1000	26	31	36
400	30	36	41				



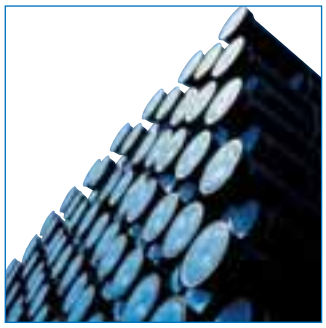
EXPRESS fitting

Range of fittings:

- With EXPRESS mechanical joint from DN 100 to 1000
- With STANDARD push-in joint from DN 100 to 1000
- Range of flanged fittings from DN 100 to 1000

Artificial snow system - ALPINAL

See also: *page*
- UNIVERSAL Ve joint 205
- UNIVERSAL Vi joint 203
- Allowable operating pressures 57



ALPINAL pipes

The ALPINAL range of pipes and fittings is dedicated to the supply of water for artificial snow system, DN 80 to 500, including systems operating under high pressures.
It also includes special parts required for connections to the snow systems.

Advantages of the ALPINAL range

Pipes and fittings of the ALPINAL range are intended for high pressures, above those of the classic range. They are equipped with UNIVERSAL sockets to produce anchored high pressure lines, using the UNIVERSAL Vi or UNIVERSAL Ve anchoring systems.



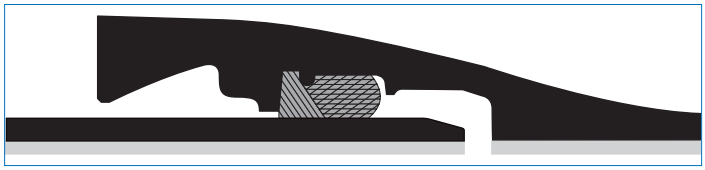
Performance

Pipes, fittings and anchored joints of the ALPINAL range can be used:
- up to 100 bar for DN 80 to 200
- up to respectively 78 and 70 bar for DN 250 and 300
- up to respectively 64 and 55 bar for DN 400 and 500.

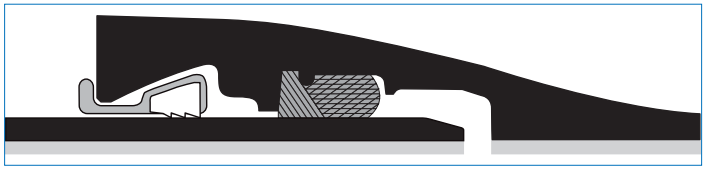
See ALLOWABLE OPERATING PRESSURES

Range

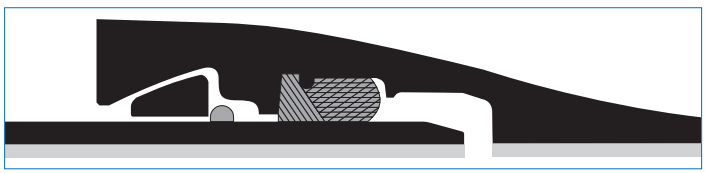
ALPINAL pipes:
- Pipe with non anchored UNIVERSAL socket.



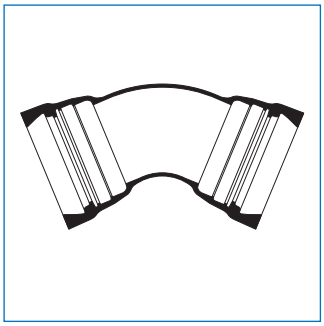
or with UNIVERSAL Vi anchoring



- Pipe with UNIVERSAL Ve socket.



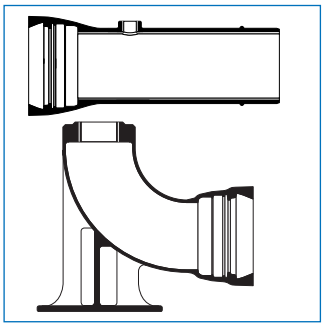
Artificial snow system - ALPINAL



ALPINAL fittings with UNIVERSAL socket suitable for the UNIVERSAL Vi or UNIVERSAL Ve anchoring system:

- 1/8, 1/12, 1/16 or 1/32 bends
- tees with 3 UNIVERSAL sockets
- tapers
- flanged socket, flanged spigots and fixed blank flanges PN 10, 16, 25, 40, 63 or 100 bar.

See PIPES AND FITTINGS



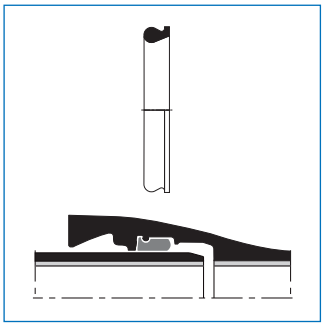
Special parts for connection to artificial snow systems:
- EU fittings (0.6 m) with 2" gas tapped hole
- bends with shoe with spigot or UNIVERSAL socket (at the bottom) and a female 2" gas outlet (at the top)

Description

UNIVERSAL socketed pipes and TYTON or STANDARD joint gasket are:

- thickness K12 (except DN 80: K10)
- coated internally with centrifuged blast furnace cement mortar
- coated externally with zinc (200 g/m2) and bituminous paint.

The fittings are coated externally with bituminous paint and internally with cement mortar.



TYTON joint

The TYTON joint (for ALPINAL in DN 80 to 300) is a push-in joint of design, performance and use similar to those of the STANDARD joint.
See STANDARD JOINT.
The geometry of its joint gasket and the housing of the joint gasket in the socket are different.

Conformity

EN 545
ISO 2531

Fire protection - FM range

The FACTORY MUTUAL (FM) range of pipes and fittings DN 100 to 300 are dedicated to fire protection networks.

Their technical definition is similar to that of the CLASSIC range, but for DN 100 to 300. The production sites and the labelled products are audited annually by FACTORY MUTUAL.

Field of use

The field of use is the same as that of the CLASSIC range. The FM range is dedicated to fire protection networks when FM approval is requested (in particular by insurance companies).

Description DN 100 to DN 300

FM pipes are Class K9 (EN 545 and ISO 2531), with STANDARD joints, coated internally with centrifuged blast furnace cement mortar. The external coating consists of a thick layer of zinc (200 g/m^2) and a layer of bituminous paint.

CLASSIC fittings with EXPRESS or STANDARD joints are coated by cataphoresis with a layer of blue epoxy resin. The average thickness of the coating is very regular and at least 70 microns.

Locking / Anchoring

FM pipes and fittings can be locked by STANDARD Vi or Ve and EXPRESS Vi or EXPRESS NEW Vi joints.

Performance in case of FM approval

The methods implemented by FACTORY MUTUAL to evaluate performance in terms of pressure resistance are different from those used by European EN 545 and international ISO 2531 standards. Different performance values may therefore be obtained, especially in terms of pressure resistance.

Fire protection - FM range

Pressure performances of junctions in case of FM approval

DN	STANDARD/EXPRESS	STANDARD/EXPRESS Vi	STANDARD Ve
	bar		
100	25	20	25
125	25	20	25
150	25	26	25
200	25	14	22
250	25	14	20
300	25	14	16

Standards

Compliance with:
"Approval Standard for Ductile Iron Pipe and Fittings, Flexible Fittings and Couplings", Class Number 1610, September 2006, FM Approvals LLC.
EN 545, ISO 2531

Recycled water - URBITAL

The URBITAL concept: a new pipe designed for the environment

Respect of the environment and use of natural resources are fundamental criteria when we are thinking about a commodity which is scarce in numerous countries… water.

Use of recycled water to irrigate parks and gardens and clean streets is part of a sustainable development policy, by optimizing the use of this precious resource. Transport and distribution of recycled water require a safe, strong network which is leaktight and easy to install… and one which, in addition, **stands out clearly** from the other drinking water or sewerage networks already present in urban areas.

The new PAM URBITAL pipe corresponds perfectly to the technical requirements of a recycled water pipeline. But the URBITAL pipe is much more, offering all the guarantees of a company with a worldwide reputation and a human team which is personally involved in each project. PAM undertakes to provide you with support during project preparation, execution as well as during commissioning. PAM undertakes to supply the product within the contractual delays and occasionally in emergency. PAM can also customize the product.





URBITAL pipes

Environmental awareness

Through its environmental commitment, PAM has obtained **ISO 14001** certification for the production of ductile iron pipes dedicated to water supply. Respect of the environment at every step of its manufacturing process is a constant concern for PAM.

Recycling of our products demonstrates our company's environmental responsibility.

PAM's manufacturing process consumes about 50 % recycled material such as scrap iron and steel, etc.

URBITAL advantages

- **Colour is important**

In urban areas it is extremely important to be able to distinguish between drinking water, sewerage and irrigation networks. With its distinctive purple colour, URBITAL leaves no room for doubt. So that water always goes where it is supposed to.
Its purple colour allows fast differentiation, in compliance with current international identification rules.

Recycled water - URBITAL

● **The right coating**

The centrifuged cement mortar internal lining of URBITAL pipes is the solution for recycled water supply.



The benefits of ductile iron

● **Leaktightness**

The ductile iron pipeline system with its elastomer joints guarantees perfect tightness, with neither leaks nor infiltrations.

● **Safety**

Ductile iron pipes guarantee strengh in all situations.
Thanks to their high safety factor, ductile iron pipes can withstand excess pressures, water hammer, high traffic loads and difficult laying conditions.

● **Savings**

The cost of the ductile iron pipelines is low compared with the total cost of the work site. Assembly is quick and easy, ductile iron tolerates basic installation with no special backfill.
The ductile iron network operates perfectly and does not require any particular maintenance.

● **Longevity**

Public works involve major financial investments. Consequently, it is vital that the pipelines used last as long as possible. The lifetime of ductile iron pipelines, and especially the URBITAL range, exceeds 50 years.

Conformity

EN 545
ISO 2531

PAM

TECHNICAL SOLUTIONS

Dimension features

Non anchored junctions

Anchored junctions

Coatings

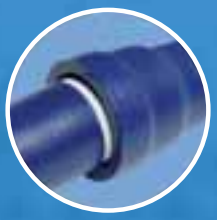
NATURAL



CLASSIC



BLUTOP



KAMELEO



PMI Couplings



IRRIGAL



ALPINAL



URBITAL



SAINT-GOBAIN

PAM

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Dimensions

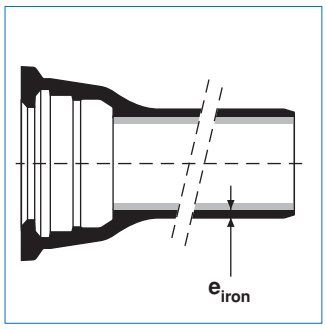
See also: *page*
- Cutting pipe 279
- Maximum allowable pressures 57
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- Standards 98



The principal ductile iron pipes and fittings dimensions and tolerances are standardized:

- *nominal wall thickness (pipes and fittings)*
- *nominal cement mortar lining thickness (pipes)*
- *pipe length*
- *pipe external barrel diameter.*

Ductile iron nominal thickness



Pipes

For DN 60 to 300, nominal thickness of the ductile iron is the one for class 40, C40, defined by EN 545. See PIPES AND FITTINGS.
For DN 350 to 600, NATURAL pipes are class 30, C30.
For DN>700, the nominal thickness of the ductile iron for pipes and fittings is calculated as a function of the DN using the following formula:

$$e_{iron} = K\,(0.5 + 0.001\,DN)$$

Where:

e_{iron} : nominal wall thickness in mm
DN : nominal diameter
K : coefficient selected equal to 9 (for other values of K: please consult us)

For a given DN, the external diameter of a pipe must be identical, whatever the wall thickness class or pressure.

Fittings

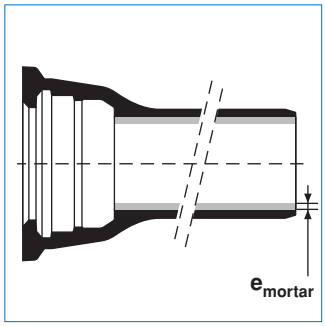
For fittings, the usual thickness is calculated using the above formula with K = 12.

Tolerances for iron thickness

Tolerances are given depending on the device, pipes or fittings, and DN in the table opposite, which gives the tolerance less (for the calculation of the minimum thickness.)
Standards EN 545 and ISO 2531 do not stipulate an upper limit. This thickness complies with EN 545 and ISO 2531.

Type of piece	Nominal wall thickness *(mm)*	Tolerance in *mm*
Spun pipes class 40 and class 30	≤ 5.0	– 1.3
	> 5.0	– (1.3 + 0.001 DN)
Spun pipes class K	≤ 6.0	– 1.3
	> 6.0	– (1.3 + 0.001 DN)
Fittings	≤ 7.0	– 2.3
	> 7.0	– (2.3 + 0.001 DN)

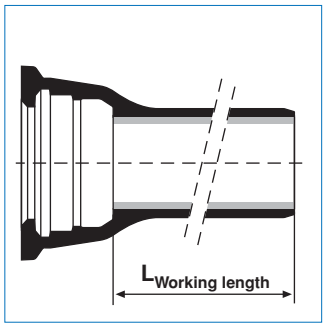
Dimensions



Pipe cement mortar lining thickness

DN	Lining thickness	
	Nominal	Tolerance*
	mm	*mm*
60 to 300	4.0	– 1.5
350 to 600	5.0	– 2.0
700 to 1 200	6.0	– 2.5
1 400 to 2 000	9.0	– 3.0

** There is no upper limit.*



Pipe working length

The pipe working length is used for linear calculations. It is the length of the pipe excluding the socket.
Socket pipes have the following working lengths:

DN	Pipe working length	
	STANDARD EXPRESS	UNIVERSAL and PAMLOCK
60	6.00	-
80	6.00	6.00
100	6.00	5.96
125	6.00	5.95
150	6.00	5.99
200	6.00	5.96
250	6.00	5.96
300	6.00	5.96
350	6.00	5.97
400	6.00	5.97
450	6.00	5.97
500	6.00	5.97
600	6.00	5.97
700	6.95	5.97
800	6.95	6.89
900	6.95	6.87
1000	6.95	6.88
1100	8.19	-
1200	8.18	8.15
1400	8.17	8.12
1500	8.16	8.11
1600	8.16	8.11
1800	8.14	8.08
2000	8.13	NC

The tolerance for these lengths is ± 30 mm.
The percentage of pipes delivered with a shorter working length must not exceed 10 % of the total number for each diameter of socket and spigot pipes supplied (Standards EN 545).

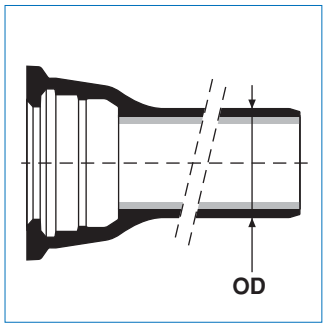
Dimensions

Laid length

To calculate the number of pipes needed to build a pipeline of given length, it is necessary to increase the working length of each pipe gap which must be reserved in the back of fitting after assembling the joint.
See STANDARD JOINT ASSEMBLY

Laid length = working length + gap

Barrel external diameter



The external diameter of the spigot end of socket pipes is indicated in the corresponding product sheets.
See PIPES and FITTINGS.

● External diameter tolerances

The tolerances for pipe external diameters comply with EN 545 and ISO 2531 joint, that is:

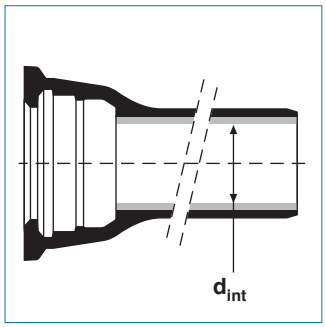
$$\text{OD} \begin{cases} +\ 1 \\ -\ (1.5 + 0.004\ \text{DN}) \end{cases}$$

For DN ≤ 300: the pipe barrel external diameter measured with a circumference tape must be such that at least two thirds of the pipe length from the spigot end can be used for assembly when the pipe has to be cut on site.
For DN > 300, this rule also applies to a percentage of the pipes agreed between the manufacturer and the purchaser.

● Ovality tolerance

Ovality of pipe and fitting spigot ends must:
– remain within the OD tolerance limit for DN 60 to 200;
– not exceed 1 % for DN 250 to 600 or 2 % for DN > 600 (EN 545).
A procedure exists to correct ovality. See DESOVALISATION.
Recommendation : When cutting a pipe, it is recommended you use a circumference tape to first check the outside diameter of the area where the pipe is to be cut. See CUTTING PIPES.

Barrel internal diameter



The pipe internal diameter, expressed in millimetres, corresponds to the DN number (nominal diameter).

Standard EN 545 authorizes the following tolerances:
– DN 60 to 1000 : – 10 mm.
– DN 1100 to 2000 : – 0.01 DN.

For BLUTOP pipes, the DN/OD indicates the external diameter.

DIMENSION FEATURES

Flanges (dimensions – pitch circle)

See also: *page*
- Flanged joints 173
- Flanged joint assembly 307
- Standards 98

Flange dimensions and bolt pitch circle are set in French, European and International Standards, to permit assembly of all types of flanged products.

All flanges (fixed or rotatable) on PAM pipes and fittings may be delivered in accordance with the following standards:





- **Bolts hole pitch circle**

  EN 1092
  ISO 7005

- **Flange dimensions**

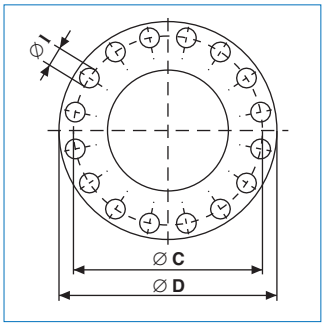
  EN 1092-2
  ISO 7005-2

- **Nuts and bolts**

  EN 24014
  EN 24016
  EN 24032
  EN 24034
  ISO 4014
  ISO 4016
  ISO 4032
  ISO 4034

The geometric features involved are given in the following tables.

Flanges (dimensions – pitch circle)



Pitch circle

EN 1092
ISO 7005

DN	PN 10					PN 16					PN 25				
	Flange			Bolt		Flange			Bolt		Flange			Bolt	
	D	C	l	N^{br}	d	D	C	l	N^{br}	d	D	C	l	N^{br}	d
	mm	*mm*	*mm*		*mm*	*mm*	*mm*	*mm*		*mm*	*mm*	*mm*	*mm*		*mm*
40	See PN 40					See PN 40					See PN 40				
50															
60	See PN 16					175	135	19	4	M16					
65						185	145	19	4	M16					
80	See PN 40					See PN 40									
100	See PN 16					220	180	19	8	M16					
125						250	210	19	8	M16					
150						285	240	23	8	M20					
200	340	295	23	8	M20	340	295	23	12	M20	360	310	28	12	M24
250	400	350	23	12	M20	400	355	28	12	M24	425	370	31	12	M27
300	455	400	23	12	M20	455	410	28	12	M24	485	430	31	16	M27
350	505	460	23	16	M20	520	470	28	16	M24	555	490	34	16	M30
400	565	515	28	16	M24	580	525	31	16	M27	620	550	37	16	M33
450	615	565	28	20	M24	640	585	31	20	M27	670	600	37	20	M33
500	670	620	28	20	M24	715	650	34	20	M30	730	660	37	20	M33
600	780	725	31	20	M27	840	770	37	20	M33	845	770	40	20	M36
700	895	840	31	24	M27	910	840	37	24	M33	960	875	43	24	M39
800	1 015	950	34	24	M30	1 025	950	40	24	M36	1 085	990	49	24	M45
900	1 115	1 050	34	28	M30	1 125	1 050	40	28	M36	1 185	1 090	49	28	M45
1 000	1 230	1 160	37	28	M33	1 255	1 170	43	28	M39	1 320	1 210	56	28	M52
1 100	1 340	1 270	37	32	M33	1 355	1 270	43	32	M39	1 420	1 310	56	32	M52
1 200	1 455	1 380	40	32	M36	1 485	1 390	49	32	M45	1 530	1 420	56	32	M52
1 400	1 675	1 590	43	36	M39	1 685	1 590	49	36	M45	1 755	1 640	62	36	M56
1 500	1 785	1 700	43	36	M39	1 820	1 710	56	36	M52	1 865	1 750	62	36	M56
1 600	1 915	1 820	49	40	M45	1 930	1 820	56	40	M52	1 975	1 860	62	40	M56
1 800	2 115	2 020	49	44	M45	2 130	2 020	56	44	M52	2 195	2 070	70	44	M64
2 000	2 325	2 230	49	48	M45	2 345	2 230	62	48	M56	2 425	2 300	70	48	M64

DIMENSION FEATURES

Flanges (dimensions – pitch circle)

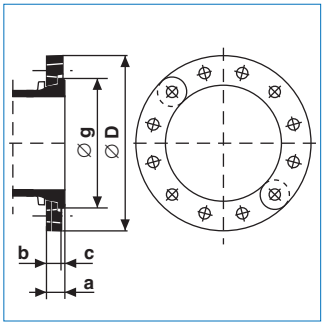


DN	PN 40					PN 63 *					PN 100 **				
	Flange			Bolt		Flange			Bolt		Flange			Bolt	
	D	C	l	N^{br}	d	D	C	l	N^{br}	d	D***	C***	l	N^{br}	d
	mm	*mm*	*mm*		*mm*	*mm*	*mm*	*mm*		*mm*	*mm*	*mm*	*mm*		*mm*
40	150	110	19	4	M16	170	125	23	4	M20	170	125	22	4	M20
50	165	125	19	4	M16	180	135	23	4	M20	195	145	26	4	M24
60	175	135	19	8	M16	190	145	23	8	M20	-	-	-	-	-
65	185	145	19	8	M16	205	160	23	8	M20	220	170	26	8	M24
80	200	160	19	8	M16	215	170	23	8	M20	230	180	26	8	M24
100	235	190	23	8	M20	250	200	28	8	M24	265	210	30	8	M27
125	270	220	28	8	M24	295	240	31	8	M27	315	250	33	8	M30
150	300	250	28	8	M24	345	280	34	8	M30	355	290	33	12	M30
200	375	320	31	12	M27	415	345	37	12	M33	430	360	36	12	M33
250	450	385	34	12	M30	470	400	37	12	M33	505	430	39	12	M36
300	515	450	34	16	M30	530	460	37	16	M33	585	500	42	16	M39

** Dimensions of ductile iron flanges PN 63: EN 1092-2*
*** Dimensions of flanged fittings PN 100: EN 1092-1*
**** Length (L) given as an indication (to be checked before assembly according to the thickness of joints and gaskets used.)*

Flanges (dimensions – pitch circle)





Dimensions of loose flanges

EN 1092-2

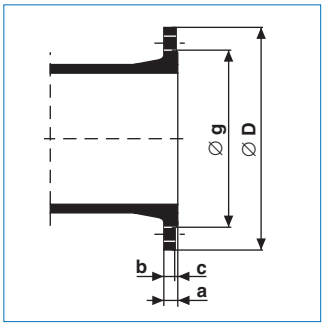
DN	PN 10						PN 16					
	D	g	a	b	c	Weight	D	g	a	b	c	Weight
	mm	*mm*	*mm*	*mm*	*mm*	*kg*	*mm*	*mm*	*mm*	*mm*	*mm*	*kg*
40	See PN 40						See PN 40					
50												
60	See PN 16						175	108	22.5	19.5	3	1.8
65							185	108	22.5	19.5	3	2.3
80	See PN 40						See PN 40					
100	See PN 16						220	156	23	20	3	2.5
125							250	184	24.5	21.5	3	3.2
150							285	211	26	23	3	4.2
200	340	266	29	26	3	6	340	266	29	26	3	5.9
250	400	319	32	29	3	8.6	400	319	32	29	3	8.2
300	455	370	36	32	4	11.3	455	370	36	32	4	10.6
350	505	429	39	35	4	14.1	520	429	39	35	4	14.9
400	565	482	42	38	4	16.5	580	480	42	38	4	21
450	615	527	45	41	4	20.5	640	527	45	41	4	27
500	670	582	48	44	4	25	715	582	48	44	4	38
600	780	682	55	50	5	33	840	682	55	50	5	58

DN	PN 25						PN 40					
	D	g	a	b	c	Weight	D	g	a	b	c	Weight
	mm	*mm*	*mm*	*mm*	*mm*	*kg*	*mm*	*mm*	*mm*	*mm*	*mm*	*kg*
40	See PN 40						150	84	22	19	3	1.4
50							165	99	22	19	3	1.6
60							175	108	22.5	19.5	3	1.4
65							185	108	22.5	19.5	3	2.4
80							200	132	23	20	3	2.3
100							235	156	23	20	3	3
125							270	184	24.5	21.5	3	4.1
150							300	211	26	23	3	5.2
200	360	266	29	26	3	7.4	375	266	33	30	3	9.2
250*	425	319	32	29	3	11.1	450	345	37	34	3	17.9
300*	485	370	36	32	4	14.2	515	409	42	38	4	23.5
350	555	429	39	35	4	21						
400	620	482	42	38	4	30						
450	670	527	45	41	4	35						
500	730	582	48	44	4	44						
600	845	682	55	50	5	61						

Note: Loose flanges in the DN 40 to 200 PN 10-16-25-40 and DN 250 to 600 PN 10-16-25 ranges are interchangeable and fit on the rims of standard manufacture fittings.

**** Loose flanges in the DN 250 to 300 PN 40 range require fittings to be equipped with a special rim.***

Flanges (dimensions – pitch circle)



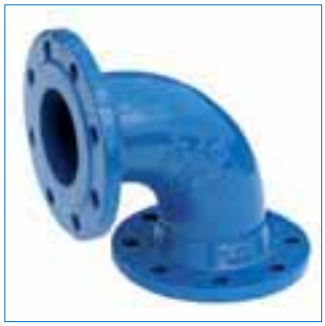
Dimensions of integral flanges

EN 1092-2
ISO 7005-2

DN	PN 10					PN 16					PN 25				
	D	g	a	b	c	D	g	a	b	c	D	g	a	b	c
	mm	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*
60	See PN 40					See PN 40					See PN 40				
80															
100	See PN 16					220	156	19	16	3					
125						250	184	19	16	3					
150						285	211	19	16	3					
200	340	266	20	17	3	340	266	20	17	3	360	274	22	19	3
250	400	319	22	19	3	400	319	22	19	3	360	274	22	19	3
300	455	370	24.5	20.5	4	455	370	24.5	20.5	4	485	389	27.5	23.5	4
350	505	429	24.5	20.5	4	520	429	26.5	22.5	4	555	448	30	26	4
400	565	480	24.5	20.5	4	580	480	28	24	4	620	503	32	28	4
450	615	527	25.5	21.5	4	640	544	30	26	4	670	553	34.5	30.5	4
500	670	582	26.5	22.5	4	715	609	31.5	27.5	4	730	609	36.5	32.5	4
600	780	682	30	25	5	840	720	36	31	5	845	720	42	37	5
700	895	794	32.5	27.5	5	910	794	39.5	34.5	5	960	820	46.5	41.5	5
800	1 015	901	35	30	5	1 025	901	43	38	5	1 085	928	51	46	5
900	1 115	1 001	37.5	32.5	5	1 125	1 001	46.5	41.5	5	1 185	1 028	55.5	50.5	5
1 000	1 230	1 112	40	35	5	1 255	1 112	50	45	5	1 320	1 140	60	55	5
1 100	1 340	1 221	42.5	37.5	5	1 355	1 215	53.5	48.5	5	1 420	1 242	64.5	59.5	5
1 200	1 455	1 328	45	40	5	1 485	1 328	57	52	5	1 530	1 350	69	64	5
1 400	1 675	1 530	46	41	5	1 685	1 530	60	55	5	1 755	1 560	74	69	5
1 500	1 785	1 640	47.5	42.5	5	1 820	1 640	62.5	57.5	5	1 865	1 678	78	73	5
1 600	1 915	1 750	49	44	5	1 930	1 750	65	60	5	1 975	1 780	81	76	5
1 800	2 115	1 950	52	47	5	2 130	1 950	70	65	5	2 195	1 985	88	83	5
2 000	2 325	2 150	55	50	5	2 345	2 150	75	70	5	2 425	2 210	95	90	5

DIMENSION FEATURES

Flanges (dimensions – pitch circle)

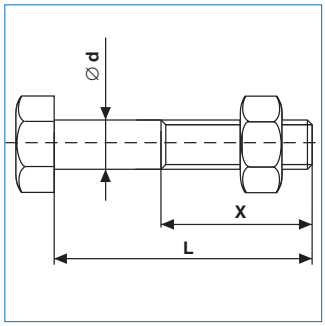


DN	PN 40					PN 63		PN 100*	
	D	g	a	b	c	D	dimensions of the ductile iron flanges - (a)	D*	dimensions of the ductile iron flanges - (a)*
	mm	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*
60	175	108	19	16	3	190	28	-	-
80	200	132	19	16	3	215	31	230	38*
100	235	156	19	16	3	250	33	265	42*
125	270	84	23.5	20.5	3	295	37	315	44*
150	300	211	26	23	3	345	39	355	54*
200	375	284	30	27	3	415	46	430	66*
250	-	-	-	-	-	470	50	please consult us	
300	-	-	-	-	-	530	57	please consult us	

** Dimensions of the ductile iron flanges given as an indication*

DIMENSION FEATURES

Flanges (dimensions – pitch circle)



Dimensions of bolts

EN 24014
EN 24016
EN 24032
EN 24034
ISO 4014
ISO 4016
ISO 4032
ISO 4034

DN	Flange bolts											
	PN 10				PN 16				PN 25			
	Number	Designation HM	Designation d	Designation L/X	Number	Designation HM	Designation d	Designation L/X	Number	Designation HM	Designation d	Designation L/X
			mm				*mm*				*mm*	
40	4	HM	16	85/57	4	HM	16	85/57	4	HM	16	85/57
50												
60												
65												
80	8	HM	16	90/62	8	HM	16	90/62	8	HM	20	100/72
100												
125										HM	24	110/82
150		HM	20	100/72		HM	20	100/72				
200									12			
250	12	HM	20	110/76	12	HM	24	110/82		HM	27	130/90
300		HM	20	120/83		HM	24	130/93	16			
350	16	HM	20	130/93	16					HM	30	140/93
400		HM	24	140/103		HM	27	150/105		HM	33	150/100
450	20	HM	24	130/93	20	HM	27	130/90	20			
500		HM	24	150/110		HM	30	160/110		HM	33	160/100
600		HM	27	170/122		HM	33	180/117		HM	36	180/110
700	24	HM	27	150/105	24	HM	33	150/100	24	HM	39	180/105
800		HM	30	160/110		HM	36	160/92		HM	45	190/110
900	28				28				28			
1 000		HM	33	180/117		HM	39	180/105		HM	52	230/130
1 100	32	HM	33	160/100	32				32			
1 200		HM	36	180/110		HM	45	210/115				
1 400	36	HM	39	180/105	36				36	HM	56	260/133
1 500												
1 600	40	HM	45	190/110	40	HM	52	230/130	40			
1 800	44				44				44	HM	64	300/145
2 000	48				48	HM	56	260/133	48			

DIMENSION FEATURES

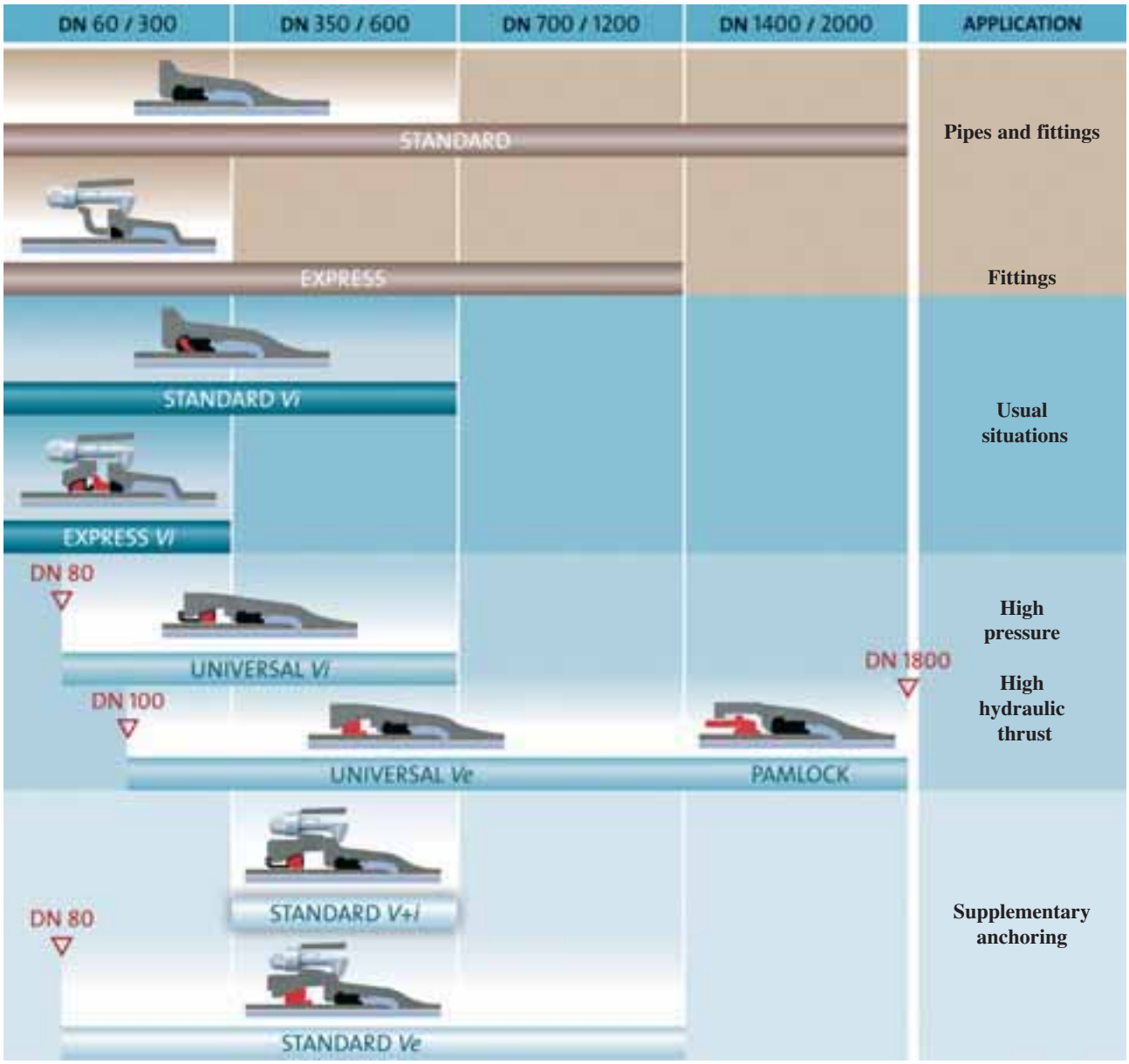
Flanges (dimensions – pitch circle)

DN	Flange bolts											
	PN 40				PN 63				PN 100			
	Number	Designation HM	Designation d	Designation L/X	Number	Designation HM	Designation d	Designation L*	Number	Designation HM	Designation d	Designation L*
			mm				*mm*				*mm*	
40	4	HM	16	85/57								
50												
60	8											
65												
80					8	HM	20	90 *	8	HM	24	110 *
100		HM	20	100/72		HM	24	110 *		HM	27	120 *
125		HM	24	110/82		HM	27	120 *		HM	30	150 *
150						HM	30	150 *		HM	30	150 *
200	12	HM	27	130/90	12	HM	33	180 *	12	HM	33	180 *
250		HM	30	140/93		HM	33	180 *				
300	16				16	HM	33	180 *				
350												
400												
450												
500												
600												
700												
800												
900												
1 000												
1 100												
1 200												
1 400												
1 500												
1 600												
1 800												
2 000												

** Lengths (L) given as an indication (to be checked before assembly according to the thickness of joints and gaskets used.)*

ANCHORED AND NON-ANCHORED JUNCTIONS

A complete range of anchored and non-anchored junctions



Elastomers

See also: *page*
- Storing the joint gaskets 291
- Material in contact with drinking water 99

EPDM (Ethylene Propylene) elastomers are normaly used for the joint gaskets of PAM potable water and irrigation pipes.

They are rigorously selected on the basis of criteria directed at maintaining their long term physico-chemical properties.

Long term performance



Elastomer ageing

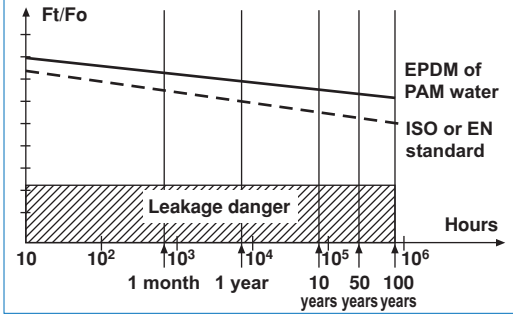
The purpose of elastomers used in jointing systems is to guarantee that the gaskets will be perfectly tight as long as the pipeline is in service. Pipeline experience acquired by PAM has allowed its Research Centre engineers to understand and measure the change in properties with time of various types of elastomers, in order to find the ones with the best performances.
The change in the mechanical properties of elastomers with time can be indicated by two phenomena:

– creep (increasing deformation under constant loading),
– relaxation (compression relaxation under constant deformation).

In the case of socket joints, the seal is obtained by the contact pressure between the metal and gasket. The elastomer deformation produced during jointing remains constant. The relaxation phenomenon is therefore the only one of interest.

Relaxation measurement

Relaxation of elastomers is determined by a procedure which measures the change with time of the force required to compress a specimen of fixed deformation.
The diagram opposite shows the relaxation at ambient temperature of the EPDM used in the joints of PAM potable water supply and irrigation systems.



Relaxations at ambient temperature

$\frac{F_t}{F_0}$: relaxation rate at instant t for a 25 % relaxation rate

F_t : elastomer reaction force at instant t

F_0 : initial elastomer reaction force

Elastomers

It can be seen that:
- the EPDM used by PAM ages less rapidly than a material that exactly meets the requirements of EN 681.1 and ISO 4633,
- long term, the contact pressure remains well above the leakage danger threshold.

Examination of specimens taken from mains after several years service has confirmed the excellent long term performance of PAM gaskets:
all the physical and chemical properties of the gaskets tested had been maintained after many years of service.



Physico chemical properties

The principal properties of elastomers used by PAM are given in the table below.

Properties	EPDM (Ethylene propylene polymer)
Hardness range (Shore A)	40-90
Density (basic product)	0.86
Tear strength	good
Abrasion resistance	good to excellent
Compression set resistance	good
Oxidation resistance	excellent

Unless otherwise specified, EPDM elastomer gaskets are supplied.
Maximum usage temperature: 50 °C.
Certain storage precautions need to be taken (see STORING THE JOINT GASKETS).

Elastomers

Specifications and quality management

Specifications

The properties and minimum fitness for purpose requirements for gaskets are standardized.

Criteria	Reference Standards
	French International
Tensile (strength and elongation at break)	ISO 37
Creep	ISO 815
Relaxation	ISO 3384
Tear strength	ISO 816
Resistance to water and chemicals	ISO 1817
Ageing	ISO 188
Resistance to ozone	ISO 1431-1
Minimal fitness for purpose requirements	ISO 4633 EN 681-1

In view of the importance of gaskets in sealing pipe systems, PAM has instituted a more demanding specific quality control procedure, including:

- supplier acceptability, following an evaluation of his ability to supply a product on a regular basis, meeting PAM's technical requirements,
- proving of the elastomer suitability,
- acceptance of the manufacturing moulds (design and dimensions),
- checking the quality of prototype gaskets, then of pre-production runs,
- constant monitoring of the supplier's quality control results and parallel tests in our own laboratories.

Contact with drinking water

See chapter: MATERIAL IN CONTACT WITH DRINKING WATER.

NON-ANCHORED JUNCTIONS

STANDARD joint

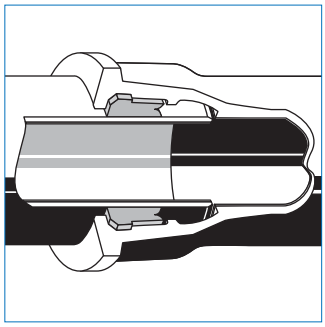
See also: *page*

- STANDARD joint assembly 299
- Anchored STANDARD Ve joint 211
- Anchored STANDARD Vi joint 193
- Joint deflection 77

The STANDARD joint is a push-in joint. The seal is assured during assembly by radial compression of an elastomer joint gasket. Their main features are:

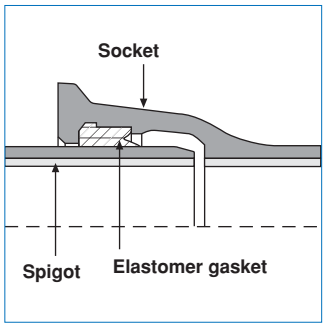
- *ease and rapidity of installation,*
- *high pressure resistance,*
- *possibility of gap and angular deflection.*

Range: DN 60 to 2 000



Principle

The seal is provided by radial compression of the joint gasket, simply achieved during assembly by introduction of a spigot into the socket.



Description

The socket chamber contains:
- a deep housing with an annular anchor groove for the gasket,
- an annular cavity allowing pipe angular and longitudinal movements.

The gasket has:
- an anchoring heel,
- a bulky body with a centering chamfer.

Range

- Pipes: DN 60 to 2 000.
- Fittings: DN 60 to 2 000.

Applications

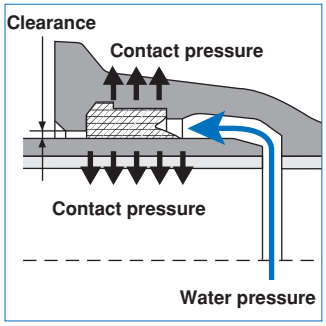
- Buried pipelines.
- High pressures.
- Laying below the water table.

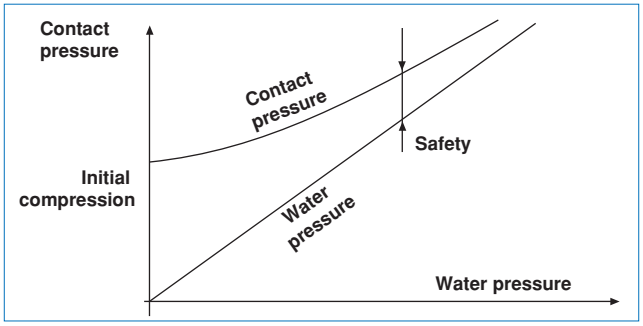
These joints can also be used above ground because of their ability to accommodate expansion and contraction movements.

STANDARD joint

Performances

Pressure resistance



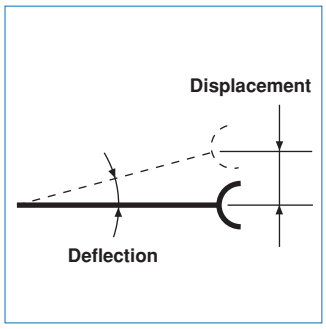


The STANDARD joint is designed so that the contact pressure between the gasket and metal increases as the water pressure increases. A perfect seal is thus guaranteed.
See MAXIMUM ALLOWABLE PRESSURES.

When tested to destruction the pipe bursts before there is any joint leakage.

A feature of the STANDARD joint is its resistance to external pressure: resistant to 3 bars (30 metres head). Please consult us for higher pressures.

Angular deflection and gap



DN	Permitted angular deflection	Pipe end displacement
	degrees	*cm*
60 to 300 (6 m)	5°	52
350 to 600 (6 m)	4°	42
700 to 1 000 (7 m)	4°	49
1 200 (8 m)	4°	56
1 400 to 1 600 (8 m)	3°	42
1 800 (8 m)	2° 5	35
2 000 (8 m)	2°	28

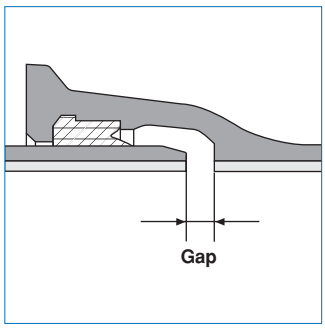
The degree of angular deflection afforded by the STANDARD joint allows great flexibility in design and laying, enabling elimination of some bends.

NON-ANCHORED JUNCTIONS

STANDARD joint

The STANDARD joint accepts gap, enabling it to accommodate small expansion and contraction movements.





DN	Gap		DN	Gap	
	Aligned	Deflected		Aligned	Deflected
	mm	*mm*		*mm*	*mm*
60	36	30	**600**	46	2
80	37	29	**700**	99	41
100	33	22	**800**	100	34
125	35	22	**900**	98	25
150	38	23	**1 000**	98	18
200	42	22	**1 100**	115	26
250	41	17	**1 200**	115	17
300	38	9	**1 400**	96	20
350	43	17	**1 500**	106	25
400	42	12	**1 600**	106	19
450	43	9	**1 800**	103	21
500	43	6	**2 000**	101	28

** Dimensions given for STANDARD pipes.*

The gap must be regarded as a safeguard and not be used to accommodate repeated backward and forward movements.

The degree of angular deflection and withdrawal afforded by the STANDARD joint gives it an excellent performance in cases of ground movement or undermining by soil scouring.

Assembly

See STANDARD JOINT ASSEMBLY.

Standards

This joint complies with the technical specifications of standard **EN 545** and **ISO 2531.**
Performance tests advised by this standard have been performed.
The gasket complies with standard **EN 681.1.**

EXPRESS joint

See also: *page*
- EXPRESS joint assembly 302
- Anchored EXPRESS Vi joint 195
- Joint deflection 77

The EXPRESS joint is a mechanical joint. The seal is obtained by axial compression of an elastomer gasket by means of a gland and bolts. Its main features are:

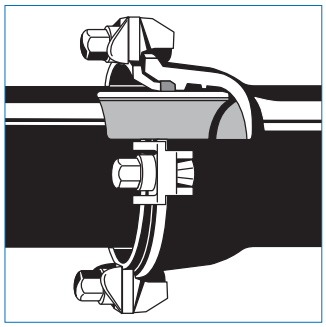
- *assembly without jointing force,*
- *the ability to orientate the castings,*
- *its gap and angular deflection.*

Range: DN 60, 125, 200, 1200 for fittings

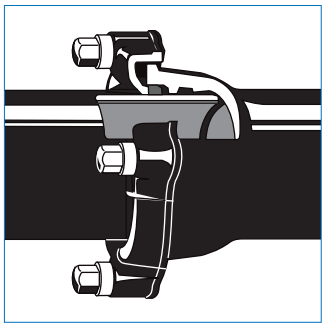
Range: DN 100, 150, 200, 250 and 300 for pipes.

Principle

The seal is obtained by axial compression of an elastomer gasket, by means of a gland clamped by engagement of bolts on the external socket rim.

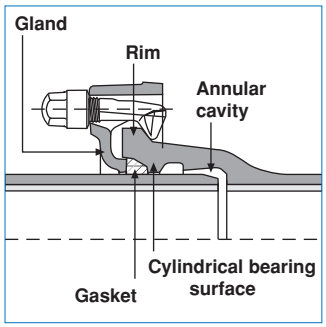


DN 60 to 125



DN 200 to 1200

Description



The socket chamber contains:
- a gasket seat,
- a cylindrical bearing surface to align the spigot,
- an annular cavity allowing angular and longitudinal movement of the pipe or fitting.

The socket has an external rim, which anchors the bolt heads during tightening.

The shape of the gland varies according to nominal diameter.
Both gland and bolts are made of ductile iron.

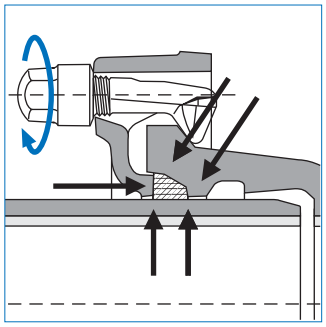
EXPRESS joint

Range

Pipes and fittings: DN 60 to 1200.
Also available in DN 1400 to 2000 for link-pipe sleeves.

Applications

- Mains above or below ground
- The ease of assembly and dismantling of this joint makes it particularly suitable for situations where it is difficult to apply a jointing force: jointing of fittings, overhead mains, laying in congested ground, or in tunnels.



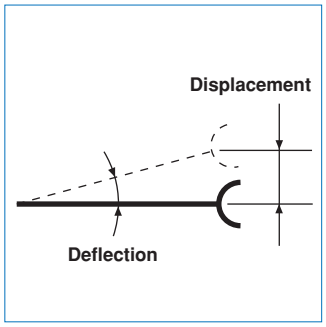
Performances

Resistance to pressure

The joint seal is a direct function of the bolt torque. The values stipulated by PAM must be adhered to. (See EXPRESS JOINT ASSEMBLY).

Orientation during assembly

Before the bolts are tightened, castings can easily be turned around their axis, making the joint particularly practical for connecting fittings.



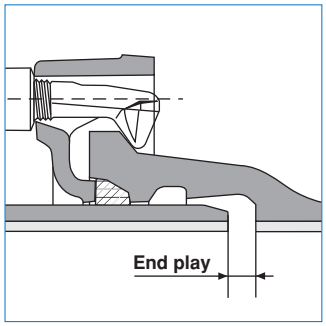
Angular deflection and gap

DN	Allowable laying deflection	Pipe end displacement
	degrees	*cm*
60, 125	5°	52
200 to 300 (6 m)	4°	42
350 to 600 (6 m)	3°	-
700 to 800 (7 m)	2°	-
900 et 1 000 (7 m)	1° 30	-
1 000 to 1 200 (8 m)	1° 30	-

The large deflection of EXPRESS joints allows some bends to be eliminated.

The EXPRESS joint allows some gap, enabling it to accommodate small amounts of expansion.

EXPRESS joint



DN	Gap		DN	Gap	
	Aligned	Deflected		Aligned	Deflected
	mm	*mm*		*mm*	*mm*
60**	41	34	**400****	68	46
80**	See EXPRESS New		**450****	71	46
100*	See EXPRESS New		**500****	72	44
125**	44	32	**600****	75	42
150*	See EXPRESS New		**700****	79	53
200*	52	36	**800****	77	47
250*	65	46	**900****	75	50
300*	65	42	**1 000****	73	46
350**	67	47	**1 200****	76	43

** Pipes and fittings available*
** Fittings available*

The gap must be regarded as a safeguard and not be used to accommodate repeated backward and forward movements.
The gap and angular deflection accepted by the EXPRESS joint ensure excellent performance in the face of ground movements or undermining by soil scouring.

Assembly

See ASSEMBLY - EXPRESS JOINT.
The whole EXPRESS joint (gland, gasket and bolts) are available in kit, in DN 60, 125, 200 to 300.

Standards

This joint complies with technical specifications of standard **EN 545** and **ISO 2531.**
Performance tests advised by this standard have been performed.
The gasket complies with standard **EN 681.1.**

EXPRESS New joint

The EXPRESS NEW junction is a new generation of mechanical junction. It was designed to simplify installation and rationalize the components while retaining the performance of the previous EXPRESS junction.

Main characteristics:

- *Simplified components*
- *Can be pre-assembled outside the trench*
- *Easy to assemble*

Range: DN 60 to 300

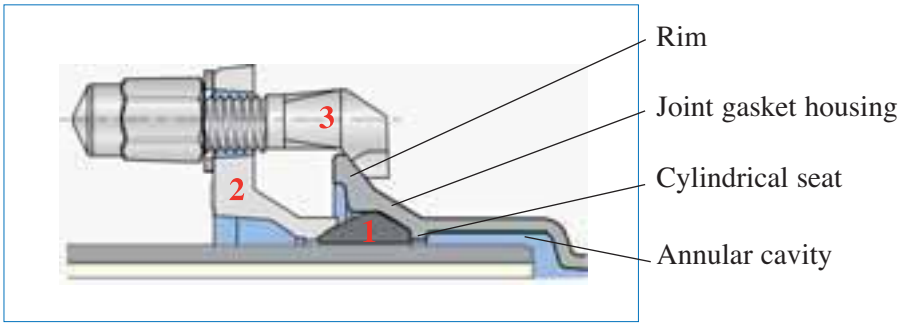
Accessories: gland, joint and bolts

The bodies of the EXPRESS range pipes and fittings are kept

Principle

Watertightness is achieved via radial compression of the elastomer joint gasket, using a gland tightened by bolts hooked on the external rim of the socket.

Description



1: EXPRESS New joint
2: EXPRESS New gland
3: EXPRESS New bolts

The inside of the socket is composed of:

- a housing for the joint gasket
- a cylindrical spigot centring seat
- an annular cavity to allow angular and longitudinal movements of the pipes and fittings.

On the outside, the socket has a rim to hook the clamping bolts onto.
Glands and bolts are made from ductile iron.

EXPRESS New joint

Range

EXPRESS New accessories: DN 60 to 300

Field of use

- Buried or above ground pipelines
- Since this joint is easy to assemble and dismantle, it is especially suitable for situations where axial force is difficult to produce: assembly of fittings, above ground pipelines, laying in unstable grounds, through tunnels, etc.

Performance

Resistance to pressure

Watertightness of this joint depends directly on the tightening torque of the bolts. It is important to respect the values recommended by PAM.
See EXPRESS New JOINT ASSEMBLY.

Positioning parts during assembly

It is easy to position the parts around their axes before tightening the bolts, making this joint particularly practical when assembling the fittings.

PFA, angular deflections and end play

DN	PFA on C40 pipe in bar	Angular deflection
80	40	5°
100		
150		

DN	Gap	
	Aligned mm	**Deflected** mm
80	42	34
100	43	33
150	47	33

The gap must be considered as a safety factor and must not be used in repetitive sliding.



The EXPRESS New joint accepts a high degree of angular deflection, which reduces the number of bends required.



Since the EXPRESS New joint tolerates a certain amount of end play, it can absorb expansions of small amplitude.



The angular deflection and the longitudinal play tolerated by the EXPRESS New joint ensure excellent performance in case of ground movement or settlements.

EXPRESS New joint

Installation



See EXPRESS New JOINT ASSEMBLY.
The EXPRESS New joint assembly (gland, joint gasket and bolts) is available in kits, from DN 60 to 300.

- It can be pre-assembled outside the trench.
- Joint assembly direction: the white ink marking indicates which side of the joint faces the flange.
- Never push fully into the socket and respect the jointing depths indicated on the assembly instructions (ruler supplied).

Standards



This joint complies with the technical specifications of standard **EN 545** and **ISO 2531.**
Performance tests advised by this standard have been performed.
The joint ring complies with standard **EN 681.1.**



Packing

EXPRESS New junction: supplied in kit only, with ruler.

Note: EXPRESS and EXPRESS New components (gland, joint and nuts) **are not interchangeable** since the geometries of the joints, glands and nuts are different.

Flanged joints

See also: *page*
- Flanged joint assembly 307
- Flanges (dimensions - pitch circle) 150
- Pressures (terminology) 54

Flanged joints are composed of two flanges, an elastomer joint gasket, and bolts, whose number and dimensions depend on the PN and DN.

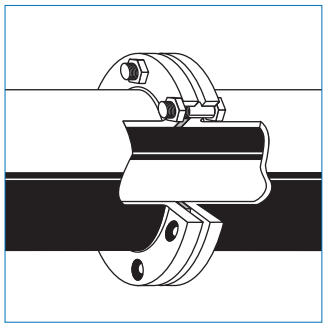
The seal is obtained by tightening the bolts, thus compressing the gasket.

The main features are:

- *precision of assembly,*
- *the ability to assemble and dismantle in line.*

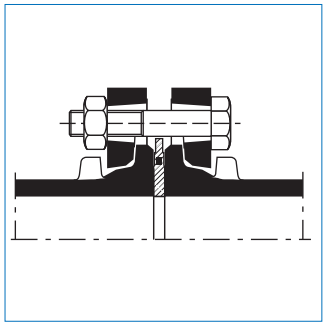
With DN ≤ 600 the flanges can be rotated, facilitating bolts insertion.

Principle



The seal is obtained by compression of a flat elastomer gasket between two flanges. The compression is applied by tightening the bolts, the number of which is a function of the flange PN and DN.
The effective seal is a function of:
- the bolting torque,
- the gasket design (plain, or with reinforcement insert).

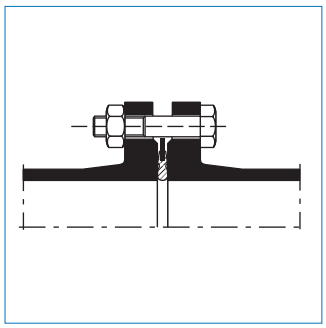
The dimensions, positions and numbers of bolt holes are laid down in French and International Standards, to allow interconnection of all types of fittings, pumps, valves or other accessories. See FLANGES (DIMENSIONS - PITCH CIRCLE).
A distinction is made between:
- rotatable flange joints,
- fixed flange joints.



DN 40 to 600

Rotatable flange joints

Rotatable flange joints have mobile flanges mounted on the body.
Rotation of the flanges facilitates connection and bolts insertion.



DN 700 to 2000

Fixed flange joints

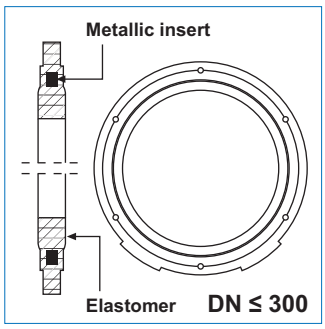
Fixed flange joints have flanges which are integral with the body of the castings. The flanges are either integrally cast, or welded-on.

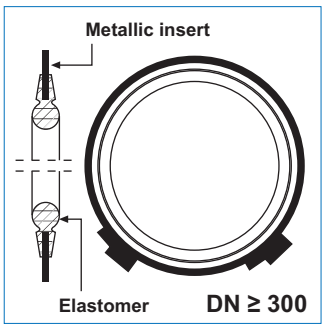
Flanged joints



Gaskets

Because of its stiffness, the metal reinforced gasket helps in assembly and reduces the risk of extrusion in service.





Applications

Flanged pipes and fittings are generally used in above ground assemblies and installations in valve chambers.
The assembly precision of the joint, and the ability for easy dismantling, makes it particularly suitable for surface installations, or accessible manhole chambers:

- pumping stations,
- valve chambers,
- overhead mains,
- inspection ducts,
- reservoirs, tanks.

Performances

Resistance to pressure

The pressure resistance of a flanged component is indicated by its PN.
Flanged pipes and fittings must never be used in service at a maximum pressure greater than that corresponding with their PN.

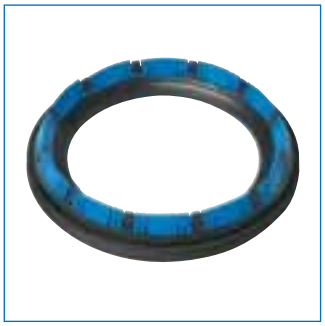
Assembly

See FLANGED JOINT ASSEMBLY.

Standards

ISO 7005: part 2: Metallic flanges - Cast iron flanges.
EN 1092-2 : Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2: cast iron flanges

BLUTOP joint



Leaktightness

Guaranteed leaktightness

Joint performance determines the reliability of the pipelines during the following operations:

- Jointing
- Pressurizing

And also during:

- The product's life cycle,
- All conditions of use

PAM has combined all its design skill and know-how, together with that of the very finest gasket manufacturers, in order to create the BLUTOP joint.

One of BLUTOP's major advantages is the pipeline anchoring system, which eliminates the need for heavy concrete thrust blocks.
The technology developed and patented by PAM has greatly enhanced the competitiveness of its anchoring systems.



Channelling the jointing force

The BLUTOP joint has been specially designed in order to guarantee:

- Easy laying with a lower force requirement to allow for jointing using a crowbar
- Safe laying thanks to a mechanism to prevent the gasket from becoming loose during assembly
- Support points along the fittings make for easy jointing along the correct axis plane

This unique design, which has been perfected in close collaboration with several installers, allows for faster laying without causing additional tiredness and fatigue.

High performance levels

The full use of PAM technologies has made it possible to create high performance BLUTOP joints.

Joint	PFA Allowable operating pressure	PMA Allowable maximum pressure	PEA Allowable Test Pressure
Non-anchored	25 bar	30 bar	35 bar

BLUTOP joint withstands an angular deflection of 6°.

NON-ANCHORED JUNCTIONS

BLUTOP joint



Study of the full range of pressure options

During their useful lifetime, water distribution pipelines are subjected to numerous types of pressure.
This naturally includes standard service pressure, but also the following:

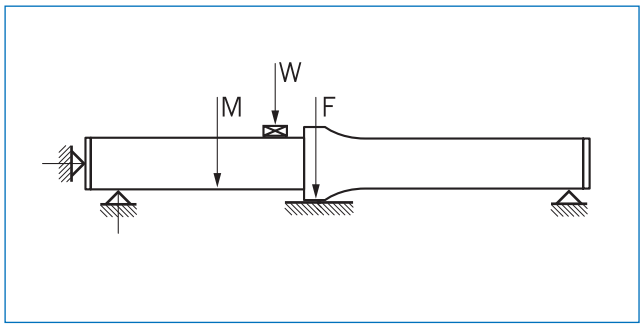
- Day / night time pressure cycles
- Water hammer
- Pressure drops
- External pressure from the earth, groundwater
- Period without pressure prior to commencement of operations
- …

In each of these situations, the joints are subjected to specific types of stress.
For this reason all joints for ductile iron pipelines are designed and tested in accordance with strict methods:

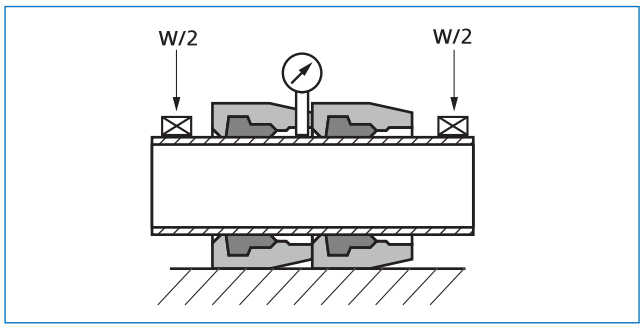
- In accordance with EN 545 testing: 4 tests
- PAM's own specific testing consisting of 4 additional tests

In addition, PAM carefully studies all its new joints using scientific finite element calculus methods similar to those used in the aeronautical and car industries.
These design methods and tests guarantee unbeatable durability and reliability.

Test methods



Method to test resistance to positive, negative and cyclic internal pressure

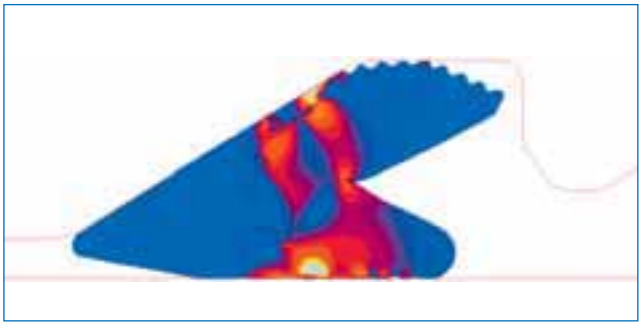


Method to test resistance to external pressure

NON-ANCHORED JUNCTIONS

BLUTOP joint

Method	Conditions	Pressure	Objective	Reference
Positive internal pressure	Maximum deviation Shear force 30 DN	1.5 PFA+5 bar	To prove the joint's capacity to withstand the hydraulic pressure	EN 545
Negative internal pressure	Maximum deviation Shear force 30 DN	-0.9 bar	To prove that the joint is airtight	EN 545
Cyclic internal pressure	Shear force 30 DN	24000 cycles PMA-5 ->PMA	To prove the joint's fatigue performance	EN 545
Positive external pressure	Maximum deviation Shear force 30 DN	2 bar	To prove that the joint is resistant to groundwater	EN 545
Positive internal pressure	Maximum deviation Shear force 30 DN	Set up using seal bush at 1.5 PFA+5 bar	To prove joint performance at all pressure levels	PAM
Ageing	Water at 80°C	3 months of cycles PMA-5 ->PMA	To prove the joint's ageing performance PAM	PAM
Fine sand infestation	Fine sand heavily compacted around the joint prior to pressurizing	First three EN 545 tests	To prove the resistance to sand entering the joint	PAM
Silt infestation	Compaction of silt around the joint prior to pressurizing	First three EN 545 tests	To prove the resistance to mud and silt under the gasket	PAM



Finite element calculus study of the Blutop joint.
Joint modelling.

KLIKSO

See also: *page*
- KLIKSO joint assembly 311
- Anchoring 63



KLIKSO ductile cast iron fittings are intended for assembly on standardized PVC-U or polyethylene pipes.

A completely new design, they can be locked and unlocked as many times as required and comply with standard EN 12842.

Field of use

KLIKSO fittings are used for connections:
- on PE pipes, of thickness not less than series SDR 17, according to draft standard EN 12201, 1 to 7: plastic piping systems for water supply - Polyethylene (PE)
- on PVC pipes, of thickness not less than series SDR 26, according to standard EN 1452, 1 to 7: plastics piping systems for water supply - Unplasticized poly (vinyl chloride) (PVC-U)

Description

KLIKSO fittings are equipped with a handle to:
- carry the fittings
- simplify assembly, by a lever effect in a housing formed in the handle
- simplify anchoring of the fittings in the concrete thrust blocks by inclusion of the handle.

KLIKSO fittings are pre-equipped with a lip seal designed to limit the assembly forces.

They are coated internally and externally with epoxy resin, deposited by cataphoresis.



KLIKSO fittings can be anchored or not.

Combined with a locking gland, to be screwed by a simple 1/4 turn, they can be used to make sections of self-restrained pipelines, with no welding or bolts.

A simple pull-off tab releases a brass locking ring located in the groove of the gland, providing efficient and immediate locking on the tube spigot.

Performances

KLIKSO fittings, anchored or not, are designed for an allowable operating pressure (AOP) of 16 bar. KLIKSO fittings withstand an angular deviation of:
- 4° in non-anchored version
- 3° in anchored version.

KLIKSO

They also withstand application of a shear force equivalent to 20 times their DN in Newton (assembly on PVC-U only).

Range

KLIKSO fittings are available from DN 63 to 225. The range includes bends (1/4 ->1/16), tees with branch PN 10 or PN 16, all socket tees, flanged sockets, tapers, sleeves and plugs. See PIPES AND FITTINGS

Conformity

KLIKSO fittings comply with standard EN 12842 and pass the performance tests defined by this standard.
The joint rings comply with standard EN 681-1.
KLIKSO fittings have received a Sanitary Conformity Certificate (ACS).

Repair

The coating of KLIKSO fittings can be repaired in the same way as that of NATURAL fittings.
See REPAIRING EXTERNAL COATING (NATURAL range).



NON ANCHORED JUNCTIONS

A variety of anchoring techniques



Detail of a STANDARD Vi locking ring.

The anchoring of ductile iron pipelines can be achieved using two technical solutions

Insert type anchoring techniques

With insert type anchoring systems, joint separation is prevented by means of hard stainless steel inserts which fit into sockets in the pipes or fittings. These inserts have teeth which grip the spigot end of the pipe or fitting and lock it against axial displacement. These insert systems rely on the ductile nature of the cast iron which allows the penetration of inserts without any risk of failure.
The main advantage of these systems is that they can be implemented on site without any special preparation.
The inserts can be fitted in the sealing chamber, as in the case of anchoring devices of the STANDARD Vi type, or in a specially designed anchoring chamber, as in the case of the UNIVERSAL Vi anchoring system.

Bead type anchoring techniques

With bead type anchoring systems, joint separation is prevented by pressing a metal locking ring, which fits into socket in the pipe or into the mating flange installed before the socket, onto a metal bead on the spigot end. This bead is made by welding (in the case of pipes) or by casting during manufacture (which is generally the case for fittings).
The main advantage of these anchoring systems is their ability to withstand very high pressure.
With bead type devices, the anchoring mechanism is always located in a specially dedicated chamber.

Main advantages of the two anchoring techniques



STANDARD Vi insert tanchoring



UNI VERSAL Ve bead anchoring

● **Insert type anchoring**

- Quick and easy to install
- Medium or high pressures
- Easy cutting on site
- Competitive costs

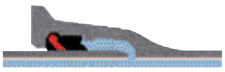
● **Bead type anchoring**

- Very high pressures
- Constant operation with alternating stresses
- Can be used for pulling pipes
- Extreme service conditions

ANCHORED JUNCTIONS

A variety of anchoring Techniques

Self-anchoring technology

	Method of achieving leaktightness		
	STANDARD automatic joint		EXPRESS mechanical joint
	Pipes & Fittings single chamber	Pipes & Fittings double chamber	Fittings
Inserts	**STANDARD Vi**		**EXPRESS Vi**
	 Inserts are positioned in sealing chamber > Simple, easy logistics		 EXPRESS Vi  EXPRESS New Vi  EXPRESS New Vi special insertion > Ideal for fittings
	STANDARD V+i	**UNIVERSAL Vi**	
	 Inserts are positioned in special chamber provided by a counter flange > Decision to anchor a particular pipe/fitting can be made on site	 Inserts are positioned in special chamber which is cast during manufacture > Simple, better performance	
Bead	**STANDARD Ve**	**UNIVERSAL Ve**	
	 Locking ring is positioned in special chamber provided by a counter flange > Decision to anchor a particular pipe/fitting can be made on site	 Locking ring is positioned in special chamber which is cast during manufacture > Very high performance	
		PAMLOCK	
		 Locking ring is positioned in special chamber which is cast during manufacture and fitted with a conformator and steel shot > Extra-high performance in very large diameters	

Our anchoring solutions

A complete range to meet your needs

PAM's anchoring solutions are designed according of two different levels of performance, plus a supplementary range to cater for some specific situations.

Solutions for most common situations

Our solutions are based on the following anchoring techniques:

- STANDARD Vi for pipes, DN 60 to 600 and fittings 350 to 600.
- EXPRESS Vi for fittings, DN 60 to 300.

The performance of these anchoring systems is suitable for the usual water distribution and supply requirements.

Solutions for high pressures and high hydraulic thrusts

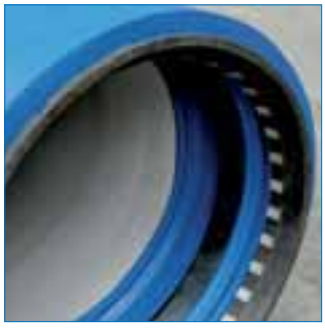


STANDARD Vi anchoring.

Our solutions are based on the following anchoring techniques :

- UNIVERSAL Vi for pipes and fittings, DN 80 to 600.
- UNIVERSAL Ve for pipes and fittings, DN 100 to 1200.
- PAMLOCK for pipes and fittings, DN 1400 to 1800.

UNIVERSAL Vi offers the same simple fitting as the STANDARD Vi range but uses special double chamber fittings and pipes. This very practical solution caters for pressures higher than those withstood by STANDARD Vi.
UNIVERSAL Ve is designed for use at very high pressures or large diameters from DN 700 to 1200 where massive hydraulic thrusts occur.
PAMLOCK is an extension of the UNIVERSAL Ve range for very large diameters from DN 1400 to 1800.



UNIVERSAL Vi anchoring.

Supplementary solutions

Our supplementary solutions are based on the following anchoring techniques:

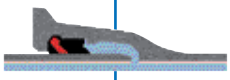
- STANDARD Ve for pipes and fittings, DN 80 to 1200.
- STANDARD V+i for fittings, DN 350 to 600.

With the STANDARD Ve anchoring system, which provides performance close to those of the UNIVERSAL Ve range, the decision to anchor high-pressure pipelines can be taken on site. Pipes or fittings with STANDARD single-chamber joints can be installed by means of counter flanges or by adding a weld bead.

The STANDARD Ve and STANDARD V+i anchoring devices can also be used with UNIVERSAL Ve and Vi pipes, particularly at diameters of DN 350 and 450, for which no UNIVERSAL fittings are currently available.

ANCHORED JUNCTIONS

Our anchoring solutions

DN 60 / 300	DN 350 / 600	DN 700 / 1200	DN 1400 / 2000	APPLICATION
 STANDARD *Vi*				USUAL SITUATION
 EXPRESS *Vi*				
DN 80  UNIVERSAL *Vi*				HIGH PRESSURE
DN 100	 UNIVERSAL *Ve*		 PAMLOCK	HIGH HYDRAULIC THRUST DN 1800
DN 80	 STANDARD *V+i*  STANDARD *Ve*			SUPPLEMENTARY ANCHORING

ANCHORED JUNCTIONS

References for anchored junctions

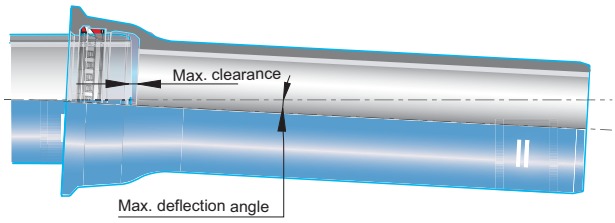
DN	STANDARD Vi (STANDARD Vi gasket)	EXPRESS Vi (EXPRESS gasket + gland + bolts)	EXPRESS NEW Vi (EXPRESS Vi gasket + gland + bolts)	UNIVERSAL Vi (UNIVERSAL Vi locking ring + STANDARD ring)
60	JSA60CA	JEA60L		
80	JSA80CA		JTA80L	ANA80CA6 + JSA80BA
100	JSB10CA		JTB10L	ANB10CA6 + JSB10BA
125	JSB12CA	JEB12L		ANB12CA6 + JSB12BA
150	JSB15CA		JTB15L	ANB15CA5 + JSB15BA
200	JSB20CA	JEB20L		ANB20CA4 + JSB20BA
250	JSB25CA	JEB25L		ANB25CA4 + JSB25BA
300	JSB30CA	JEB30L		ANB30CA4 + JSB30BA
350	JSB35CA			JNB35CA + JSB35BA
400	JSB40CA			JNB40CA + JSB40BA
450	JSB45CA			JNB45CA + JSB45BA
500	JSB50CA			JNB50CA + JSB50BA
600	JSB60CA			JNB60CA + JSB60BA

DN	UNIVERSAL Ve (STANDARD UNIVERSAL Ve locking ring + STANDARD gasket)	STANDARD Ve (STANDARD gasket + gland + anchoring ring + iron bolts)	STANDARD V+i (STANDARD gasket + STANDARD UNIVERSAL Vi locking ring + gland + bolts)	PAMLOCK (PAMKIT anchoring system + STANDARD gasket)
60				
80		JSA80V-E06		
100	110259 + JSB10BA	JSB10V-E06		
125	124151 + JSB12BA	JSB12V-E06		
150	AKB15E + JSB15BA	JSB15V-E06		
200	AKB20E + JSB20BA	JSB20V-E06		
250	AKB25E + JSB25BA	JSB25V-E06		
300	AKB30E + JSB30BA	JSB30V-E06		
350	JKB35E + JSB35BA	JSB35V-E10	JSB35V-E11	
400	JKB40E + JSB40BA	JSB40V-E10	JSB40V-E11	
450	JKB45E + JSB45BA	JSB45V-E10	JSB45V-E11	
500	JKB50E + JSB50BA	JSB50V-E10	JSB50V-E11	
600	JKB60E + JSB60BA	JSB60V-E10	JSB60V-E11	
700	110671 + JSB70BA	JSB70V-E06		
800	JFB80S + JSB80BA	JCB80V-E07 JCB80V-E08 (**)		
900	JFB90S + JSB90BA	JCB90V-E07 JCB90V-E08 (**)		
1000	JFC10S + JSC10BA	JCC10V-E07 JCC10V-E08 (**)		
1100		JSC11V-E00 JSC11V-E06 (**)		
1200	JFC12S + JSC12BA	JSC12V-E00 JSC12V-E06 (**)		
1400				JPC14L + JSC14BA
1500				JPC15L + JSC15BA
1600				JPC16L + JSC16BA
1800				JPC18L + JSC18BA
2000				

(**) References are to be used if PFA 25 is required (the kit includes STANDARD gasket, gland, ring, support, and iron bolts.)

DN 60 to 600
Anchoring solutions for the NATURAL range





STANDARD Vi junction with maximum deflection



The NATURAL ductile iron pipeline range comprises:

● **Pipes:**

- With 400 g/m² external coatings of 400 zinc (85%) and aluminium (15%) alloy and a coat of light blue epoxy.
- Pressure class C40, DN 60 to 300, and C30, DN 350 to 600, with STANDARD joint.
- Thickness class K9 with UNIVERSAL joint.

● **Fittings:**

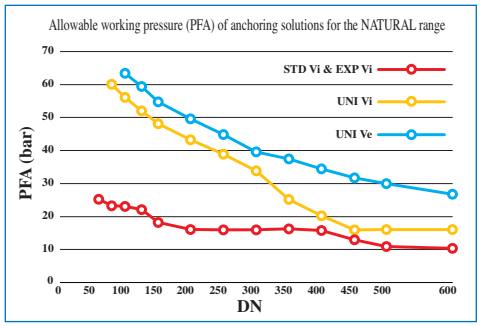
- With EXPRESS and STANDARD joints with epoxy coating deposited by cataphoresis (in compliance with EN 545).
- With STANDARD or UNIVERSAL joints with epoxy powder coating (in compliance with EN 14901).

The NATURAL range's durability and scope of use are considerably greater than those of cast iron pipelines with only a 130 g/m² zinc coating as prescribed by standard EN 545.

The anchoring solutions in the NATURAL range are as follows:

● **STANDARD Vi and EXPRESS Vi – For most common situations:**

- STANDARD Vi for pipes, DN 60 to 600 and STANDARD fittings, DN 350 to 600.
- EXPRESS Vi for fittings, DN 60 to 300.



● **UNIVERSAL Vi – For very high pressures:**

- For UNIVERSAL pipes and fittings, DN 80 to 600.

● **UNIVERSAL Ve – For extreme pressures:**

- For UNIVERSAL pipes and fittings, DN 100 to 600.

ANCHORED JUNCTIONS

DN 60 to 600
Anchoring solutions for the NATURAL range

For aggressive situations, the following pipeline systems:

● TT for aggressive soils

- Suitable for very corrosive soils or when there are stray currents (See standard EN 545 appendix D.2 to check when it is advisable to use this external coating).
- The STANDARD TT-PE solution has a thick extruded polyethylene coating in accordance with European standard EN 14628. This is the most commonly used solution in this range.

● NATURAL PUR for aggressive water

- Suitable to carry water that is aggressive to cement mortars (See standard EN 545 appendix E to check when it is advisable to use this internal coating).
- The PUR solution has an internal polyurethane coating in accordance with standard EN 15655.

	NATURAL	NATURAL	NATURAL PUR	TT-PE	NATURAL UNIVERSAL	UNIVERSAL TT-PE
Field of use	**All soils barring exceptions**		**Aggressive water**	**Aggressive soils**	**High pressures**	**High pressures Aggressive soils**
Jonction	**STANDARD**	**EXPRESS**	**STANDARD**	**STANDARD**	**UNIVERSAL**	**UNIVERSAL**
Pipe	DN 60 - 600	DN 100, 150, 200 , 250, 300	DN 100 - 600	DN 60 - 600	DN 80 - 600 Uni Vi - Uni Ve	DN 80 - 600 Uni Vi - Uni Ve
Bend	DN 350 - 600	DN 60 - 600	DN 60 - 600		DN 80 - 600	
Taper	DN 350 - 600	DN 60 - 600	DN 60 - 600		DN 100 - 600	
Sleeve	-	DN 60 - 600	-		-	
Tee, 2- socket (EB)	DN 350 - 600 PN10, PN16, PN25	DN 60 - 600 PN10, PN16, PN25	DN 60 - 600 PN10, PN16, PN25		DN 80 - 600 PN10, PN16, PN25	
Tee, 3-socket (E)	DN 350 - 600	DN 60 - 600	DN 60 - 600		DN 100 - 300	
Drain tee	DN 350 - 600	DN 60 - 600	DN 60 - 600		-	
Flanged socket	DN 350 - 600	DN 60 - 600	DN 60 - 600		DN 80 - 600	
Flanged spigot	DN 60 - 600		DN 60 - 600 Non verrouillé, STD Vi et UNI Vi - Verrouillé : UNI Ve			
Blank flange	DN 60 - 600		DN 60 - 600			
Reducing flange	DN 100 - 600 PN10, PN16, PN25		DN 100 - 600 PN10, PN16, PN25			
Non-anchored joint	DN 60 - 600	DN 60 - 600	DN 60 - 600		DN 80 - 600	
Anchored joint	DN 60 - 600	DN 60 - 300	DN 100 - 600	DN 60 - 600	DN 80 - 600 Uni Vi - Uni Ve	

DN 60 to 600
Anchoring solutions for the NATURAL range

Technical specifications of NATURAL range, DN 60 to 600

	NATURAL	NATURAL UNIVERSAL	TT UNIVERSAL TT	NATURAL PUR
Pipes **EN** 545	- External coating: 400 g/m² Zn/Al 85/15 + blue epoxy sealer - Internal lining: blast furnace cement mortar	- External coating: 400 g/m² Zn/Al 85/15 + blue epoxy sealer - Internal lining: blast furnace cement mortar	- External coating: Zn + coat of HDPE in compliance with EN 14628 - Internal lining: blast furnace cement mortar	- External coating: 400 g/m² Zn/Al 85/15 + blue epoxy sealer - Internal lining: Polyurethane as per EN 15655
Fittings **EN** 545	- Epoxy coating deposited by cataphoresis	- Epoxy powder coating in compliance with EN 14901	- Epoxy powder coating in compliance with EN 14901	- Epoxy powder coating in compliance with EN 14901
Attaching hardware **EN** 545	- Epoxy coating deposited by cataphoresis	- Without bolt	- Without bolt	- Epoxy coating deposited by cataphoresis

Pipe specifications: NATURAL 1, TT and NATURAL PUR

DN	Lu	Class	e	OD	DI	P	B max	Weight NATURAL	Weight TT	Weight PUR
	m		mm	mm	mm	mm	mm	Kg	kg	kg
60	6.00	C40	4.8	77	80	89	145	60	63	-
80	6.00	C40	4.8	98	101	92	168	78	81	-
100	6.00	C40	4.8	118	121	94	189	95	99	79
125	6.00	C40	4.8	144	147	97	216	118	122	97
150	6.00	C40	5.0	170	173	100	243	145	150	119
200	6.00	C40	5.4	222	225	106	296	203	210	169
250	6.00	C40	5.8	274	277	105	353	267	277	224
300	6.00	C40	6.2	326	329	107	410.5	337	351	285
350	6.00	C30	6.3	378	381	110	465.5	407	430	328
400	6.00	C30	6.5	429	432	112	517.5	476	501	385
450	6.00	C30	6.9	480	483	115	575.5	562	590	460
500	6.00	C30	7.4	532	535	117	630.5	659	697	546
600	6.00	C30	8.6	635	638	132	740	895	933	759

Pipe specifications: NATURAL UNIVERSAL 2 and UNIVERSAL TT

DN	Lu	Class	e	OD	DI	P	B max	C* bead	Weight NAT UNI	Weight UNI TT
	m		mm	mm	mm	mm	mm	mm	kg	kg
80	5.97	K9	6.0	97.8	100.5	112	159	-	93	96
100	5.97	K9	6.0	117.8	121.4	140	188	90	115	118
125	5.97	K9	6.0	143.7	147.4	140	215	87	142	147
150	5.97	K9	6.0	169.7	173.4	148	230	95	169	175
200	5.97	K9	6.3	221.6	225.2	155	290	100	233	241
250	5.97	K9	6.8	273.0	276.8	166	350	110	311	320
300	5.97	K9	7.2	324.9	328.8	180	408	115	393	405
350	5.97	K9	7.7	376.8	380.9	184	463	115	498	508
400	5.97	K9	8.1	427.7	431.9	176	510	113	586	600
450	5.97	K9	8.6	478.6	483.0	190	570	120	700	709
500	5.97	K9	9.0	530.5	535.0	200	625	125	810	820
600	5.97	K9	9.9	633.3	638.2	209	740	135	1039	1067

** For UNIVERSAL Ve only.*

ANCHORED JUNCTIONS

DN 60 to 600
Anchoring solutions for the NATURAL range

Performance details

DN	Class	STANDARD Vi				EXPRESS Vi				UNIVERSAL Vi					UNIVERSAL Ve				
		PFA*	PMA*	PEA*	Deflection**	PFA*	PMA*	PEA*	Deflection**	Class	PFA*	PMA*	PEA*	Deflection**	Class	PFA*	PMA*	PEA*	Deflection**
		Bar	Bar	Bar	°	Bar	Bar	Bar	°		Bar	Bar	Bar	°		Bar	Bar	Bar	°
60	C40	25	30	35	5	25	30	35	4	-	-	-	-	-	-	-	-	-	-
80	C40	23	27	32	5	23	27	32	4	K9	60	72	77	3	-	-	-	-	-
100	C40	23	27	32	5	23	27	32	4	K9	56	67	72	3	K9	64	76	81	3
125	C40	22	26	31	5	22	26	31	4	K9	52	62	67	3	K9	60	72	77	3
150	C40	18	21	26	5	18	21	26	4	K9	48	57	62	3	K9	55	66	71	3
200	C40	16	19	24	4	16	19	24	3	K9	43	51	56	3	K9	50	60	65	3
250	C40	16	19	24	4	16	19	24	3	K9	39	46	51	3	K9	45	54	59	3
300	C40	16	19	24	4	16	19	24	3	K9	34	40	45	3	K9	40	48	53	3
350	C30	16	19	24	3	-	-	-	-	K9	25	30	35	3	K9	38	45	50	3
400	C30	16	19	24	2	-	-	-	-	K9	20	24	29	3	K9	35	42	47	3
450	C30	13	15	20	2	-	-	-	-	K9	16	19	24	3	K9	32	38	43	3
500	C30	11	13	18	2	-	-	-	-	K9	16	19	24	2	K9	30	36	41	2
600	C30	10	12	17	2	-	-	-	-	K9	16	19	24	2	K9	27	32	37	2

** see Anchoring* *** Maximum angular deflection*

Important supplementary information

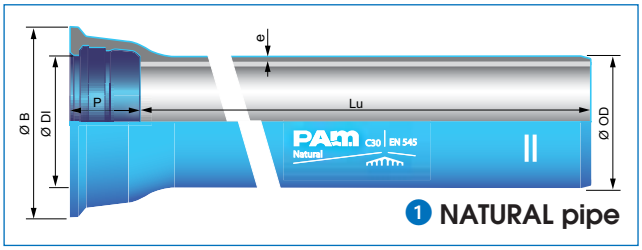
Angular deflection

Ensure compliance with the maximum angular deflection specified in the table, and note the angular deflection of anchored joints is generally slightly less than that of joints that are not anchored.

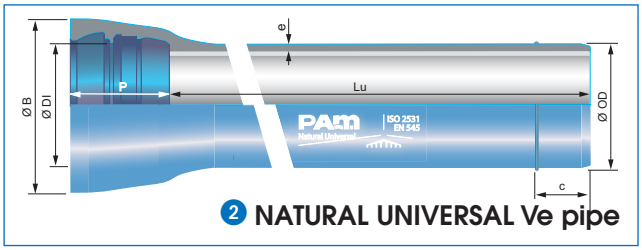
Fittings

UNIVERSAL fittings are not available in DN 350 and 450. STANDARD V+i anchoring fittings should be used with UNIVERSAL Vi pipes, and STANDARD Ve fittings should be used with UNIVERSAL Ve pipes in these 2 DN.

Combined use of NATURAL STANDARD and NATURAL UNIVERSAL pipes



1 NATURAL pipe



2 NATURAL UNIVERSAL Ve pipe

When performing cutting operations on site, be sure to distinguish cuts performed on UNIVERSAL pipes from cuts made on STANDARD pipes (by applying paint to mark cuts on UNIVERSAL pipes, for example). Only UNIVERSAL cut sections can be fitted in UNIVERSAL sockets with the anchoring pressure levels specified in the table.

Higher pressure

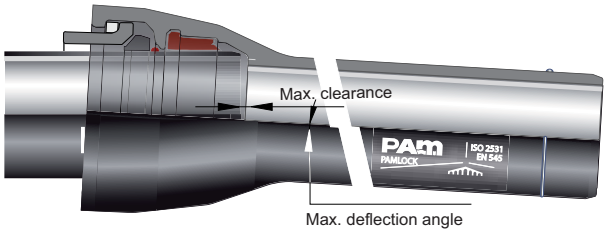
For pressures higher than those specified in the table, please consult us.

NATURAL PUR

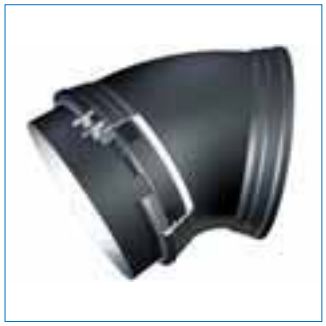
See the NATURAL PUR range.

DN 700 to 1800
Anchoring solutions for the CLASSIC range





PAMLOCK junction with maximum deflection



The CLASSIC ductile iron pipeline range comprises:

● **Pipes:**

- With 200g/m² external coating of pure zinc (99,99%) and a coat of varnish.
- With STANDARD joint, class K9, DN 700 to 2000.
- With UNIVERSAL Ve joint, class K9, DN 700 to 1200.
- With PAMLOCK joint, class K9, DN 1400 to 1800.

● **Fitting:**

- With EXPRESS, STANDARD, UNIVERSAL and PAMLOCK with epoxy coating deposited by cataphoresis or bituminous coating (in compliance with EN 545).
- With STANDARD, UNIVERSAL and PAMLOCK joints with epoxy powder or spray coating (in compliance with EN 14 901).

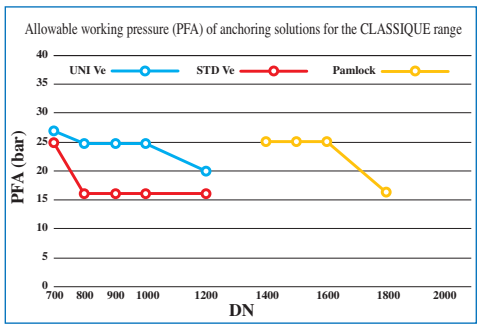
The CLASSIC range's durability is considerably greater than that of cast iron pipelines with only a 130 g/m² zinc coating as prescribed by standard EN 545 owing to the thicker application of zinc at 200 g/m².

The anchoring solutions for the CLASSIC range, DN 700 to 1800 are:

● **UNIVERSAL Ve - for large diameters:**

For UNIVERSAL pipes and fittings, DN 700 to 1200

● **PAMLOCK - for very large diameters:**



For UNIVERSAL pipes and fittings, DN 1400 to 1800

● **STANDARD Ve - for large diameters:**

STANDARD Ve supplementary solution for STANDARD Ve pipes and fittings, DN 700 to 1200

DN 700 to 1800
Anchoring solutions for the CLASSIC range

For aggressive situations, the following pipeline systems:

● TT PE or TT PUX for aggressive soils

Suitable for very corrosive soils or when there are stray currents (PE, polyethylene with diameter DN 700, in compliance with standard EN 14628, and PUX, polyurethane in compliance with standard EN 15189 with DN from 800 to 2000) (See standard EN 545 appendix D.2 to check when it is advisable to use this external coating).

● PUR for aggressive water

- Suitable to carry water that is aggressive to cement mortars (See standard EN 545 appendix E to check when it is advisable to use this internal lining).
- The PUR solution has an internal polyurethane coating in accordance with standard EN 15655.

	CLASSIC	CLASSIC	PUR	TT PE - PUX	UNIVERSAL PUR PAMLOCK PUR	UNIVERSAL TT PE-PUX PAMLOCK TT PUX
Field of use	**All soils barring exceptions**		**Aggressive water**	**Aggressive soils**	**High pressures**	**High pressures Aggressive soils**
Jonction	**STANDARD**	**EXPRESS**	**STANDARD**	**STANDARD**	**UNIVERSAL**	**UNIVERSAL**
Pipe	DN 700 - 2000	-	DN 700 - 2000	DN 700 - 2000	DN 700 - 1200 UNI Ve DN 1400 - 1800 PAMLOCK	
Bend	DN 700 - 2000	DN 700 - 1200	DN 700 - 2000		DN 700 - 1200 UNI Ve DN 1400 - 1800 PAMLOCK	
Taper	DN 700 - 2000	DN 700 - 1200	DN 700 - 2000		DN 700 - 1200 UNI Ve DN 1400 - 1800 PAMLOCK	
Sleeve	-	DN 700 - 1200	-		-	
Tee, 2- socket (EB)	DN 700 - 2000 PN10, PN16, PN25	DN 700 - 2000 PN10, PN16, PN25	DN 700 - 2000 PN10, PN16, PN25		DN 700 - 1200 UNI Ve DN 1400 - 1800 PAMLOCK	
Tee, 3-socket (E)	-	DN 700 - 1200	DN 700 - 2000		-	
Drain tee	DN 700 - 2000	DN 700 - 1200	DN 700 - 2000		-	
Flanged socket	DN 700 - 2000	DN 700 - 1200	DN 700 - 2000		DN 700 - 1200 UNI Ve DN 1400 - 1800 PAMLOCK	
Flanged spigot	DN 700 - 2000		DN 700 - 1200 Uni Ve DN 1400 - 1800 PAMLOCK			
Blank flange	DN 700 - 2000		DN 700 - 2000			
Reducing flange	DN 700 - 2000 PN10, PN16, PN25		DN 700 - 2000 PN10, PN16, PN25			
Non-anchored joint	STANDARD	EXPRESS	STANDARD		-	
Anchored joint	STANDARD Ve 700 - 1200	-	STANDARD Ve 700 - 1200		DN 700 - 1200 UNI Ve DN 1400 - 1800 PAMLOCK	

DN 700 to 1800
Anchoring solutions for the CLASSIC range

Technical specifications of CLASSIC range DN 700 to 2000

	STANDARD	UNIVERSAL PAMLOCK	TT UNIVERSAL TT PAMLOCK TT	PUR
Pipes EN 545	- External coating: Zn, 200 g/m ^{2} + bituminous varnish sealer - Internal lining: blast furnace cement mortar	- External coating: Zn, 200 g/m ^{2} + bituminous varnish sealer - Internal lining: blast furnace cement mortar	- External coating: Zn + coat of HDPE on DN 700 in compliance with EN 14628 - External coating: polyurethane on DN 800 to 2000 in compliance with EN 15189 - Internal lining: blast furnace cement mortar	- External coating: Zn, 200 g/m + bituminous varnish sealer - Internal lining: polyurethane in compliance with EN 15655
Fittings EN 545	- Epoxy coating deposited by cataphoresis, or bituminous coating	- Epoxy coating deposited by cataphoresis, or bituminous coating	- Epoxy powder coating in compliance with EN 14901	- Epoxy powder coating in compliance with EN 14901
Attaching hardware EN 545	- Epoxy coating deposited by cataphoresis	- Without bolt	- Without bolt	

Pipe specifications: STANDARD 1, TT and PUR

DN	Lu	Class	e	OD	DI	P	B max	Weight	Weight TT	Weight PUR
	m		mm	mm	mm	mm	mm	kg	kg	kg
700	6.95	K9	10.8	738	741	192	863	1520		1323
	6.00	K9	10.8	738	741	192	863		1399	
800	6.95	K9	11.7	842	845	197	974	1863	1883	1636
900	6.95	K9	12.6	945	948	200	1082	2230	2253	1976
1000	6.95	K9	13.5	1048	1051	203	1191	2635	2655	2347
1100	8.19	K9	14.4	1151	1154	225	1300	3605	3647	2819
1200	8.18	K9	15.3	1255	1258	235	1412	4117	4201	3269
1400	8.17	K9	17.1	1462	1465	245	1592	5643	5599	4754
1500	8.16	K9	18.0	1565	1568	265	1710	6327	6296	5492
1600	8.16	K9	18.9	1668	1671	265	1816	7049	7006	6165
1800	8.14	K9	20.7	1875	1878	275	2032	8581	8511	7566
2000	8.13	K9	22.5	2082	2085	290	2253	10189	10173	9125

Pipe specifications: UNIVERSAL Ve 2 and PAMLOCK 3

DN	Lu	Class	e	OD	DI	P	B max	C bead	Weight UNI-PK	Weight UNI-PK TT	Weight UNI-PK PUR
	m		mm	mm	mm	mm	mm	mm	kg	kg	kg
700	5.97	K9	10.8	738	741	256	855	158	1367	1399	1206
800	6.88	K9	11.7	842	845	261	984	150	1914	1941	1697
900	6.87	K9	12.6	945	948	280	1091	155	2331	2367	2094
1000	6.88	K9	13.5	1048	1051	279	1195	165	2774	2814	2510
1200	8.15	K9	15.3	1255	1258	279	1419	170	4240	4288	3866
1400	8.12	K9	17.1	1462	1465	300	1620	170	5600	5656	4910
1500	8.11	K9	18.0	1565	1568	315	1757	180	6329	6389	5591
1600	8.11	K9	18.9	1668	1671	325	1868	195	7068	7132	6297
1800	8.08	K9	20.7	1875	1878	350	2082	222	8601	8672	7736
2000	Please consult us										

The specifications of the various ranges of fittings are available on our website: www.pamline.com

ANCHORED JUNCTIONS

DN 700 to 1800
Anchoring solutions for the CLASSIC range

Performance details

DN	Class	UNIVERSAL Ve				PAMLOCK			
		PFA*	PMA*	PEA*	Deflection **	PFA*	PMA*	PEA*	Deflection **
		Bar	Bar	Bar	°	Bar	Bar	Bar	°
700	K9	27	32	37	2	-	-	-	-
800	K9	25	30	35	2	-	-	-	-
900	K9	25	30	35	1.5	-	-	-	-
1000	K9	25	30	35	1.2	-	-	-	-
1200	K9 ***	20	24	29	1.1	-	-	-	-
1400	K9	-	-	-	-	25	30	35	1
1500	K9	-	-	-	-	25	30	35	1
1600	K9	-	-	-	-	25	30	35	1
1800	K9	-	-	-	-	16	19	24	0.8
2000	K9	-	-	-	Please consult us				

** see Anchoring ** Maximum angular deflection*
**** UNIVERSAL Ve DN 1200 - PFA 25 bar in K10*

Important supplementary information

Angular deflection

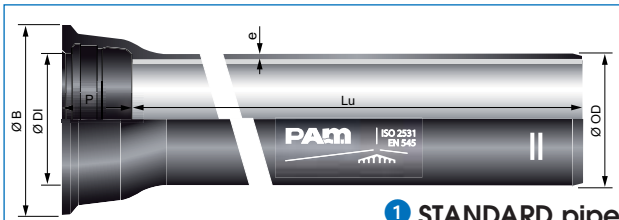
Ensure compliance with the maximum angular deflection specified in the table, and note the angular deflection of anchored joints is generally slightly less than that of joints that are not anchored.

Fittings

The UNIVERSAL and PAMLOCK fittings ranges are not as extensive as the STANDARD joint ranges. All the possibilities offered by the STANDARD range can be obtained by combining UNIVERSAL or PAMLOCK fittings with flanged fittings.

Tee fittings

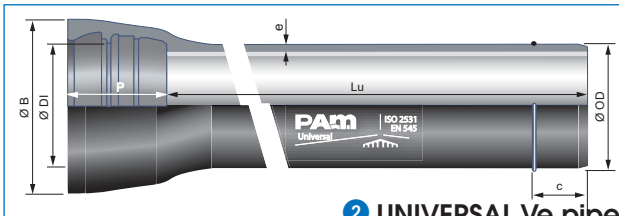
The pressure resistance of tees with tube diameters greater than DN 600 is lower than that of the pipes. Please consult us for further information.



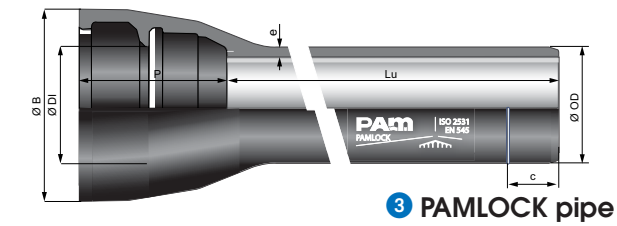
1 STANDARD pipe

Higher pressure

For pressures higher than those specified in the table, please consult us.



2 UNIVERSAL Ve pipe



3 PAMLOCK pipe

STANDARD Vi joint

See also: *page*
- STANDARD joint 164
- STANDARD Vi joint assembly 315
- Anchoring joint 63
- Joint deflection 77

The anchored STANDARD Vi joint is a push-in anchored joint for laying anchoring pipes.

The anchoring is designed to take up axial forces and allows laying without the need for concrete blocks.

It is suitable for all STANDARD sockets and all smooth spigots.

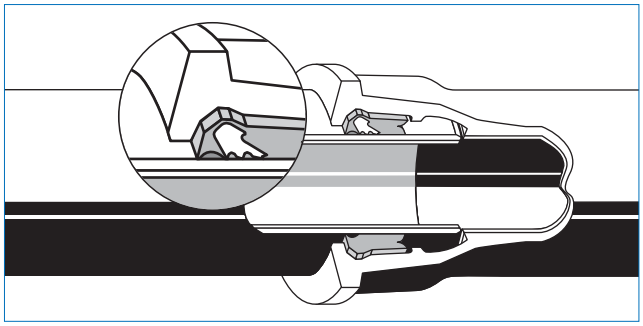
Range DN 60 to 600

Principle

The basic principle of anchoring joints consists in transmitting the axial forces from one pipeline component to the next, thus ensuring that the joint does not come apart. The STANDARD Vi joint gasket with its inserts anchors the socket joint by hooking onto the pipe spigot and so avoids having to install concrete blocks.

This anchoring system also avoids the need for a weld bead on the spigot, and so can be used with smooth spigots and in all STANDARD sockets.





Description

The inserts are embedded in the elastomer joint gasket. They hook onto the spigot when the pipeline is pressurized, and anchor the joint.
The joint gasket has a lip on the front which protects the inserts from the outside environment.

Range

STANDARD pipes and fittings DN 60 to 600.

STANDARD Vi joint

Applications

The anchored STANDARD Vi joint is of particular interest in congested conditions that preclude the construction of concrete anchor blocks or in poorly cohesive soils, as well as laying pipes on a steep slope or in a casing.

Warning
The use of the anchored STANDARD Vi joint is not recommended when the joints are subjected to uncontrolled and repeated traction or joint deflection.
The anchored STANDARD Vi joint cannot be used on FGL iron pipes (grey iron).

Installation

Assembled in the same way as the STANDARD joint.
See ASSEMBLY - Anchored STANDARD Vi joint.

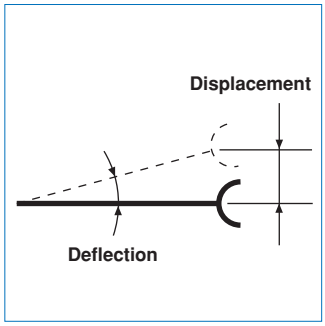
Performances

The anchored STANDARD Vi joint combines the advantages of flexible joint pipelines with welded joint pipelines.

Pressure performance

The leaktightness of these joints relies on the recognized qualities of push-in joints.
The allowable operating pressure (PFA) is as follows:

DN	PFA *(bar)*	DN	PFA *(bar)*	DN	PFA *(bar)*
60	25	**200**	16	**450**	13
80	23	**250**	16	**500**	11
100	23	**300**	16	**600**	10
125	22	**350**	16		
150	18	**400**	16		



Joint deflection

DN (length)	Allowable laid deflection	Pipe end displacement
	degrees	*cm*
60 to 150 (6 m)	5	52
200 to 300 (6 m)	4	42
350	3	
400 to 600	2	

Disassembly

The anchored STANDARD Vi joint cannot be disassembled after pressure build-up.

Anchored EXPRESS Vi joint

See also: *page*
- EXPRESS joint 167
- Anchored EXPRESS Vi joint assembly 319
- Anchoring joint 63
- Joint deflection 77

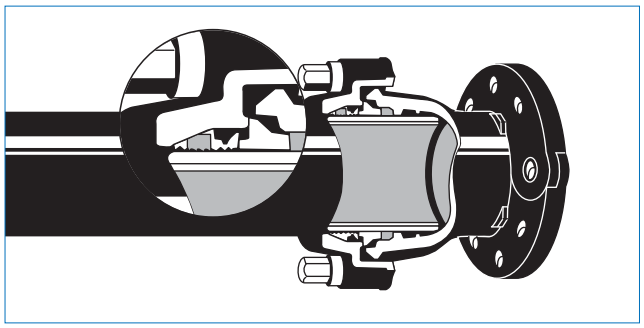
The ANCHORED EXPRESS Vi joint is a mechanically anchored joint for laying anchoring pipes.

The anchoring is designed to take up axial forces and allows laying without the need for concrete blocks.

It is suitable for EXPRESS socket pipes and all smooth spigot ends.

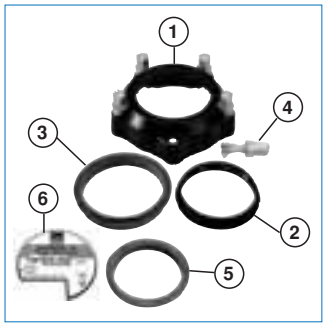
Range DN 60 to 300.

Principle



The basic principle of anchoring joints consists in transmitting the axial forces from one pipeline component to the next, thus ensuring that the joint does not come apart.
The inserts in the EXPRESS Vi anchoring gasket anchor fittings (bends, tees, tapers, collars, etc.), by hooking onto the pipe spigot end, and thus avoid having to install concrete anchoring blocks.
This anchoring system also avoids the need for a weld bead on the spigot and so can be used with all smooth spigot ends and in EXPRESS sockets.

Description



1 - Gland
2 - Anchoring gasket with inserts
3 - Spacer
4 - (n) Bolts
5 - Joint sealing gasket
6 - Tracing gauge to mark the insertion depth, which also has the joint assembly instructions.
All these parts are delivered in kit form.

Range

NATURAL EXPRESS pipes and EXPRESS fittings from DN 60, 125, 200 to 300.

Anchored EXPRESS Vi joint

Applications

Buried or above-ground pipelines.
Replacement of concrete anchoring blocks when they require too much space or are difficult to install. Installation on steep slopes or in a casing.
Savings in laying time.
The EXPRESS Vi joint can be used with all EXPRESS fittings, and anchors to spigot ends of all pipes or ductile iron fittings presented in this catalogue.
The thickness of the spigot coating should not exceed 600 microns.

Warning
The EXPRESS Vi joint is not suitable for pipes in FGL iron (grey iron).

Installation

See ASSEMBLY - JOINT EXPRESS Vi.
The ease with which this joint can be assembled and disassembled makes it particularly suitable for situations where it is difficult to achieve an axial force, assembling fittings, pipe laying in congested ground, tunnels, etc.

Performance

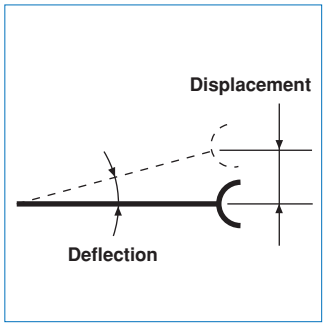
Leaktightness

The leaktightness of this joint is a direct function of the bolt tightening torque, and adherence to PAM's assembly instructions.
The allowable operating pressures (PFA) are the following:
- DN 60 : 25 bar.
- DN 125 : 22 bar.
- DN 200, 250 and 300 : 16 bar.

Orientation of parts on assembly

Parts can be easily orientated around their axis before final tightening of the bolts. This is particularly useful when assembling fittings.

Angular deflection and end play



DN	Allowable laid deflection	Pipe end displacement
	degrees	*cm*
60, 125	4	42
200 to 300 (6 m)	3	32

The EXPRESS Vi joint can be disassembled.

EXPRESS NEW Vi and EXPRESS New Vi "special insertion" junctions

The EXPRESS NEW Vi junction is a new generation of mechanical junction. The EXPRESS NEW Vi and EXPRESS NEW Vi "special insertion" junctions were designed to simplify installation and rationalize the components while retaining the performance of the EXPRESS junction.

The EXPRESS New Vi joint is an anchored mechanical joint used to make self-restrained pipelines.

Anchoring takes up the axial forces, making concrete thrust blocks unnecessary.

It adapts to all EXPRESS sockets and all smooth spigots.

● **Main characteristics:**

– Simplified components:
  • a single joint for both tightness and locking
  • no spacer (unlike the EXPRESS Vi joint)
  • gland and nuts are similar to the non-anchored version
– It can be pre-assembled outside the trench
– Easy to assemble

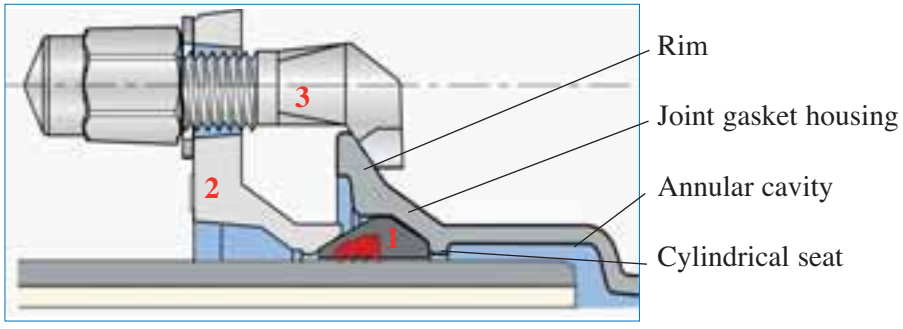
Range: DN 60 to 300
Accessories: gland, joint and bolts
The bodies of the EXPRESS range pipes and fittings are kept

Principle

The basic principle of the anchored joint consists of transferring the axial forces from one pipeline element to the next, therefore making it impossible to separate the junction.
The locking ring with inserts on the EXPRESS New Vi joint is used to anchor the fittings (bends, tees, tapers, sleeves, etc.) by hooking onto the pipe spigot, thereby avoiding the need for concrete thrust blocks.
With this type of anchoring, there is no weld bead on the spigot. It can therefore be fitted on all smooth spigots and EXPRESS sockets.

Description

● **EXPRESS New Vi**



1: EXPRESS New Vi joint
2: EXPRESS New gland
3: EXPRESS New bolts

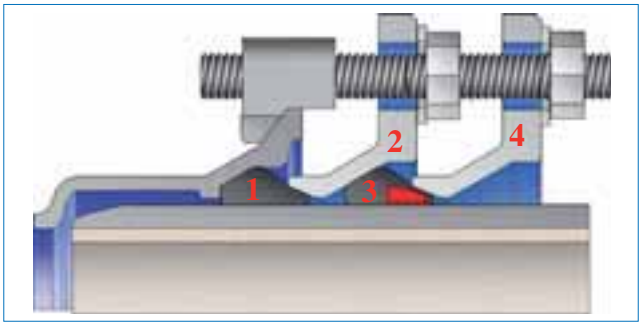
ANCHORED JUNCTIONS

EXPRESS NEW Vi and EXPRESS New Vi "special insertion" junctions

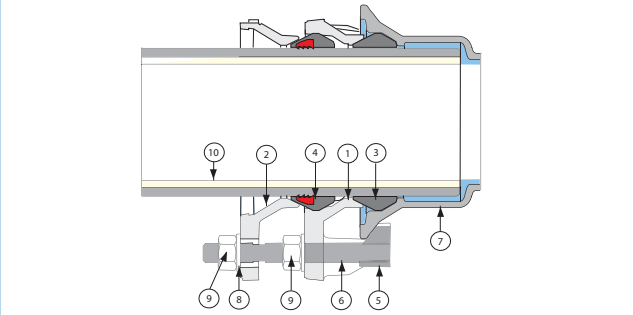
Since the EXPRESS New and EXPRESS New Vi glands are similar, it will no longer be possible to distinguish between non-anchored and anchored junctions after installation. A ring identifying anchored junctions can be inserted on the spigot, against the side of the flange.

DN	Reference
80	179139
100	179140
150	180992

● EXPRESS New Vi "special insertion"



1. EXPRESS New joint
2. EXPRESS New gland
3. EXPRESS New Vi joint
4. Express New gland "special insertion"



Reference	Designation	Material
1	EXPRESS New gland	Ductile iron
2	“Special insertion” gland	Ductile iron
3	EXPRESS New joint	EPDM
4	EXPRESS New Vi joint	EPDM
5	Shoe	Ductile iron
6	M16 rod	Steel class 6-8
7	EXPRESS socket	Ductile iron
8	Washer	Mild steel
9	Hexagonal nuts	Steel class 6-8
10	Pipe	Ductile iron

Range

EXPRESS New accessories: DN 60 to 300

EXPRESS NEW Vi and EXPRESS New Vi "special insertion" junctions

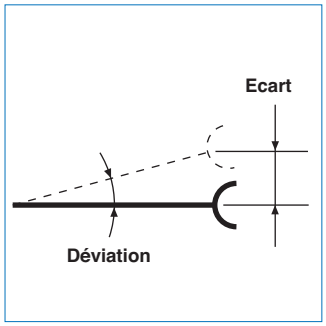
Field of use

Buried or above ground pipelines.
Replacement of concrete thrust blocks when space is limited or when they are difficult to produce. Laying on a steep slope or in a casing. Faster installation.
The EXPRESS New Vi joint is suitable for all EXPRESS fittings and anchors on all the spigots of ductile cast iron pipes and fittings presented in this catalogue.
The thickness of the spigots' coatings must not be greater than 600 microns.

Caution
The EXPRESS New Vi joint cannot be used on lamellar graphite cast iron pipes ("grey cast iron").

Performance

● **Resistance to pressure, PFA , Angular deflection and gap**



Tightness of this joint depends directly on the tightening torque of the bolts and on the compliance with the assembly instructions determined by PAM.
The allowable operating pressures (PFA) on class 40, c40 NATURAL pipes are as follows:

DN	PFA on C40 pipe in bar	Angular deflection
80	23	5°
100		
150	18	

DN	Gap	
	Aligned mm	**Deflected** mm
80	42	34
100	43	33
150	47	33

The angular deflection of the EXPRESS New Vi junction is 1° greater than the current version.

Installation

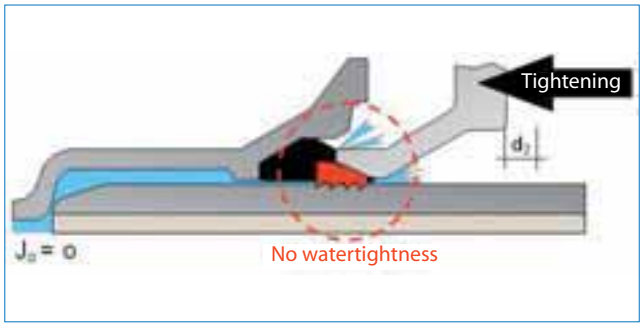


See EXPRESS New Vi JOINT ASSEMBLY.
The EXPRESS New Vi joint assembly (gland, joint gasket and bolts) is available in kits, from DN 60 to 300.

- It can be pre-assembled outside the trench.
- Joint assembly direction: the white ink marking indicates which side of the joint faces the flange.
- Never push fully into the socket and respect the jointing depths indicated on the assembly instructions (ruler supplied).

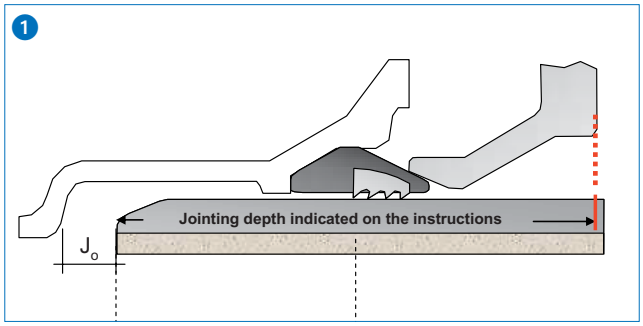
EXPRESS NEW Vi and EXPRESS New Vi "special insertion" junctions

A minimum end play must be kept between the pipe and the fitting, to prevent a serious risk of leakage

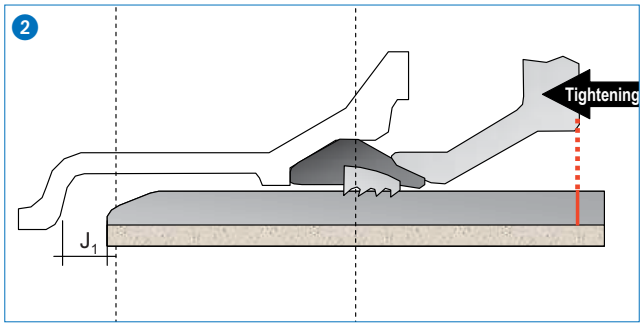


It is essential to respect the jointing depths indicated on the assembly instructions.

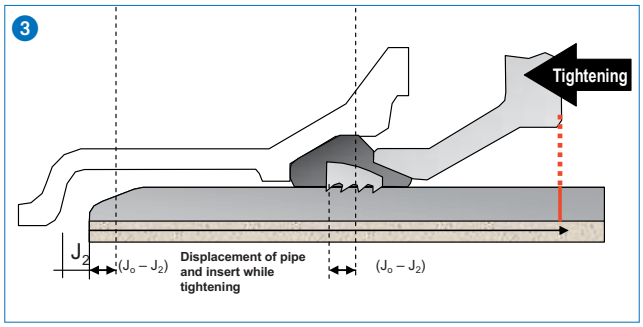
If the pipe is pushed fully into the socket, there is a serious risk of leakage.



Start of tightening (0 Nm)
- No anchoring
- No watertightness



Intermediate tightening
- Insert-pipe anchoring
- No watertightness



Complete tightening (12 Nm)
- Insert-pipe anchoring
- Watertightness

EXPRESS NEW Vi and EXPRESS New Vi "special insertion" junctions



Standards

This joint complies with the technical specifications of standard **EN 545** and **ISO 2531.**
Performance tests advised by this standard have been performed.
The joint ring complies with standard **EN 681.1.**

Packing

EXPRESS New junction: supplied in kit only, with ruler.

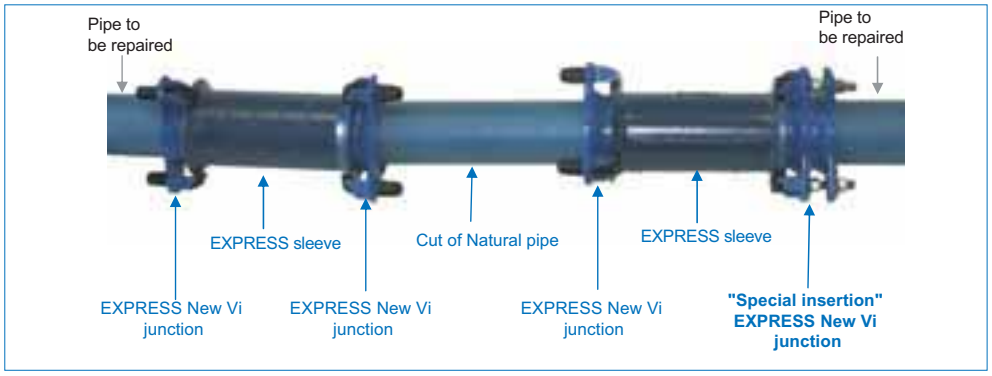
Note: EXPRESS Vi and EXPRESS New Vi components (gland, joint and nuts) **are not interchangeable** since the geometries of the joints, glands and nuts are different.

"Special insertion" Express New Vi for maintenance and repair

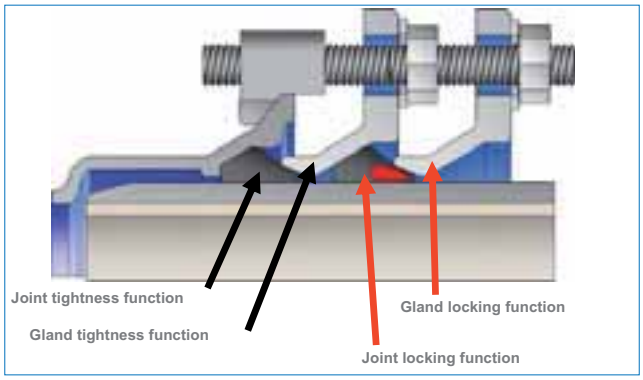
The EXPRESS New Vi kit cannot be used alone for insertion between two static spigots since:

- The EXPRESS Vi junction requires movement (of the spigot or the sleeve) when tightening to ensure watertightness and anchoring.
- Using the EXPRESS Vi in insertion creates serious risks of leakage. When tightening, anchoring is activated before the joint is correctly compressed to ensure watertightness.

The "special insertion" Express New Vi kit is the technical solution required if the two elements to be connected are completely static.



Implementation



● Tightness function

Firstly, tightness is guaranteed by the EXPRESS New locking joint and its EXPRESS New gland.

● Locking function

Secondly, locking is guaranteed by the EXPRESS New Vi joint plus a second "special insertion" EXPRESS New "gland.

Packing

"Special insertion" Express New Vi junction: supplied in kit only.

Anchored UNIVERSAL STANDARD Vi joint

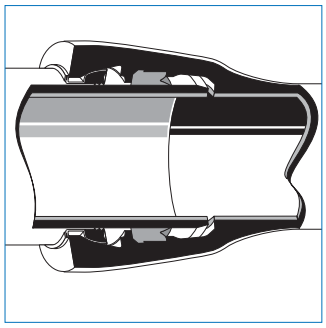
See also: *page*
- STANDARD joint 164
- Anchored UNIVERSAL Vi joint assembly 319
- Anchoring joint 63
- Joint deflection 77

The ANCHORED UNIVERSAL STANDARD Vi joint is a push-in anchored joint for laying anchoring pipes.

The anchoring is designed to take up axial forces and allows laying without the need for concrete blocks.

It is suitable for UNIVERSAL STANDARD double chamber socket pipes and smooth spigot ends.

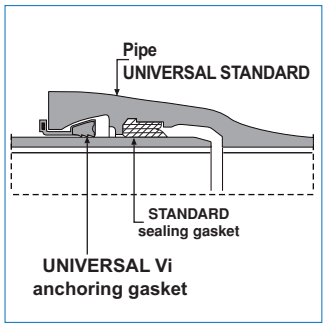
Range: DN 80 to 600 (pipes).



Principle

The basic principle of anchoring joints consists in transmitting the axial forces from one pipeline component to the next, thus ensuring that the joint does not come apart. The inserts in the UNIVERSAL Vi anchoring gasket hook onto the pipe spigot, and thus avoid having to install concrete anchoring blocks.

This anchoring system also avoids the need for a weld bead on the spigot, and so can be used with all smooth spigot ends and in double-chamber sockets.



Description

The UNIVERSAL STANDARD Vi joint requires the use of UNIVERSAL STANDARD pipes with double chamber socket.

- Leaktightness is provided by a STANDARD joint gasket.
- The axial force transmission takes place through an anchoring ring with inserts embedded in the elastomer. They hook onto the spigot end when the pipe is pressurized, thus ensuring joint anchoring.

Warning
The UNIVERSAL STANDARD Vi joint is not suitable for pipes in FGL iron (grey iron).

Range

UNIVERSAL pipes with DN 80 to 600 to be used with UNIVERSAL fittings with similar DN (except DN 350 and 450, use fittings with STANDARD joint and STANDARD V+i anchoring solution.)

Anchored UNIVERSAL STANDARD Vi joint

Applications

Anchored joints are of particular interest in congested conditions that preclude the construction of concrete anchor blocks, or in poorly cohesive soils.

Installation

See ASSEMBLY - Anchored UNIVERSAL STANDARD Vi joint.

Performance

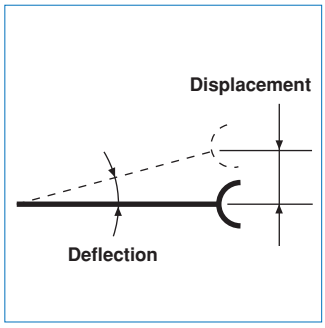
Leaktightness

The leaktightness of these joints relies on the proven qualities of push-in joints.

Pressure

See MAXIMUM ALLOWABLE PRESSURES.

Joint deflection



DN	Allowable laid deflection	Pipe end displacement
	degrees	*cm*
80 - 450	3	32
500 - 600	2	25

Disassembly

The UNIVERSAL STANDARD Vi joint cannot be disassembled after pressure has been applied.

Anchored UNIVERSAL STANDARD Ve joint

See also: *page*
- STANDARD joint 164
- UNIVERSAL STANDARD Ve joint assembly 329
- Anchoring joint 63
- Joint deflection 77

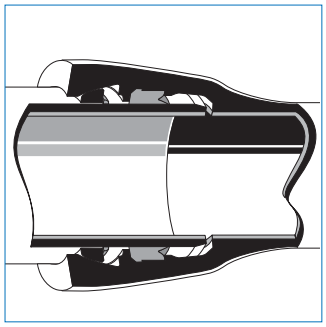


The UNIVERSAL STANDARD Ve joint is a push-in anchored joint for laying anchoring pipes.

The anchoring is designed to take up axial forces and allows laying without the need for concrete blocks.

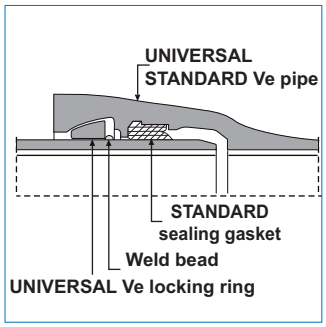
It is suitable for double chamber socket pipes with a weld bead on the UNIVERSAL STANDARD Ve spigot end.

Range DN 350 to 600 (pipes).



Principle

The basic principle of anchoring joints consists in transmitting the axial forces from one pipeline component to the next, thus ensuring that the joint does not come apart.
Anchored joints can be used to distribute, over one or more pipes, the axial force arising at particular points (bends, tapers, tees, blank flanges, etc.), thus avoiding the need to install concrete anchor blocks.



Description

The UNIVERSAL STANDARD Ve joint requires the use of UNIVERSAL STANDARD pipes with a weld bead and double chamber socket.
- Leaktightness is provided by a STANDARD joint gasket.
- The axial force transmission takes place through a mechanical arrangement, independent from that providing the seal, comprising:
  – works applied weld bead on the pipe spigot,
  – a one-piece anchoring locking ring with a curved external profile that abuts against the weld bead.

Range

UNIVERSAL Ve pipes DN 350 to 600 to be used with UNIVERSAL fittings of similar DN (except DN 350 and 450, use STANDARD fittings.)

Applications

Anchored joints are of particular interest in congested conditions that preclude the construction of concrete anchor blocks or in poorly cohesive soils.

Anchored UNIVERSAL STANDARD Ve joint

Installation

See ASSEMBLY - Anchored UNIVERSAL STANDARD Ve joint..

Performances

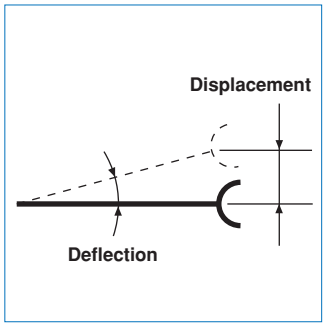
Leaktightness

The leaktightness of these joints relies on the proven qualities of push-in joints.

Pressure

See MAXIMUM ALLOWABLE PRESSURES.

Joint deflection



DN	Allowable laid deflection	Pipe end displacement
	degrees	*cm*
100 - 450 (6 m)	3°	32
500 - 700 (6 m)	2°	21
800 (7 m)	2°	25
900 (7 m)	1.5°	18
1000 (7 m)	1.2°	15
1200 (8 m)	1.1°	15

Anchored PAMLOCK joint

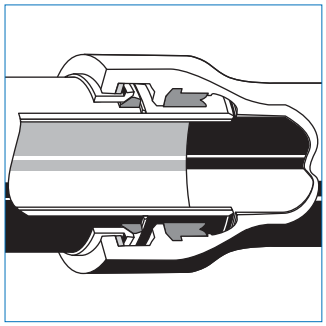
See also: *page*
- STANDARD joint 164
- PAMLOCK Joint assembly 333
- Anchoring joint 63
- Joint deflection 77

The ANCHORED PAMLOCK (Pk) joint is a STANDARD joint equipped with an anchoring system especially designed for large diameters. The novelty of the system lies in the use of shot particles, which hold the joint together without recourse to bolts.

The anchorage takes up the axial forces and allows concrete anchor blocks to be dispensed with.

Range: DN 1400 to 1800 (for 2000, please consult us.)

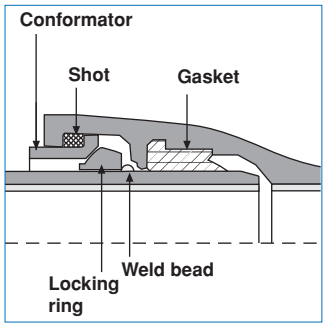
Principle



The basic principle of joint anchoring consists of transferring the axial forces from one pipeline component to the next, thus rendering joint separation impossible.

Anchored joints allow the axial thrusts arising at particular points (bends, tapers, tees, blank flanges) to be distributed over one or more pipes, thus avoiding construction of concrete anchor blocks.

Description



- The seal is provided by a STANDARD joint gasket.
- The axial forces are transmitted by a mechanical arrangement, independent of the sealing function, comprising:
  - a weld bead, applied at works,
  - a locking ring, consisting of several segments held together by elastomer connectors,
  - a device known as a conformator, which transmits the axial force to the internal socket surface by means of shot filling the annular gap formed by the socket and conformator.
- The shot behaves like a fluid and ensures:
  - distribution of the axial force on the socket surface and conformator,
  - automatic stretching of the main on assembly.

Any subsequent movement of the main during testing is consequently restricted to residual shot settlement.

Range

Pipes and fittings: DN 1400 to 1800.
For DN 2000, please consult us.

Anchored PAMLOCK joint

Applications

The ANCHORED PAMLOCK joint is of particular interest where congested conditions preclude the construction of anchor blocks, or in poorly cohesive soils.

Performance

The ANCHORED PAMLOCK joint combines the advantages of flexible joint pipes with welded joint pipes.

- **Leaktightness**



The leaktightness of the joint relies on the proven qualities of the push-in STANDARD joint.

- **Angular deflection:**



– 1° (pipe end displacement 14 cm), DN 1400 to 1600.
– 0.5° (pipe end displacement 7 cm), DN 1800

- **Allowable operating pressure (PFA):**

– DN 1400 to 1600 : 25 bars
– DN 1800 : 16 bars

Installation

ANCHORED PAMLOCK joint assembly is dealt with in a special leaflet. Please consult us.
See also: PAMLOCK JOINT ASSEMBLY.

Anchored STANDARD V+i joint

See also: *page*
- STANDARD joint 164
- STANDARD V+i Joint assembly 335
- Anchoring joint 63
- Joint deflection 77

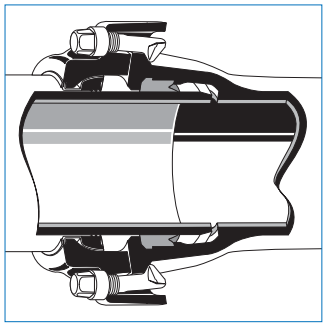
The anchored STANDARD V+i joint is a push-in anchored joint for laying anchoring pipes.

The anchoring is designed to take up axial forces and allows laying without the need for concrete blocks.

It is suitable for all STANDARD sockets and all smooth spigots.

Range DN 350 to 600.

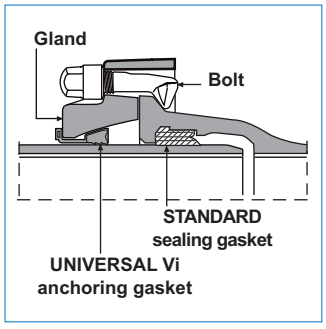
Principle



The basic principle of anchoring joints consists in transmitting the axial forces from one pipeline component to the next, thus ensuring that the joint does not come apart.
The anchored STANDARD V+i joint gasket with its inserts anchor the socket joint by hooking onto the pipe spigot and so avoid having to install concrete blocks.

This anchoring also avoids the need for a weld bead on the spigot, and so can be used with smooth spigots and in all STANDARD sockets.

Description



Leaktightness is provided by a STANDARD joint gasket.
The axial force is transmitted by a mechanical device that is independent from the actual leaktightness, which includes:
- an anchoring gasket with inserts embedded in the elastomer. They hook onto the spigot end when the pipe is pressurized, and so ensure joint anchoring;
- a special gland (different from that used for the EXPRESS joint), which blocks the anchoring gasket in place;
- iron bolts.

Range

STANDARD fittings DN 350 to 600 to be used with UNIVERSAL Vi pipes with similar DN, especially for DN 350 and 450.

Anchored STANDARD V+i joint

Applications

Anchored joints are of particular interest in congested conditions that preclude the construction of concrete anchor blocks, or in poorly cohesive soils.

Warning

The anchored STANDARD V+i joint cannot be used on FGL iron pipes (grey iron). STANDARD joint V+i cannot be used on c30 pipes from NATURAL range DN 350 to 600.

Installation

See ANCHORED STANDARD V+i JOINT ASSEMBLY.

Performance

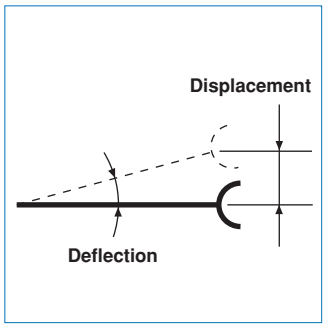
Leaktightness

The leaktightness of these joints relies on the recognized qualities of push-in joints.

Pressure

See MAXIMUM ALLOWABLE PRESSURES.

Joint deflection



DN	Allowable laid deflection	Pipe end displacement
	degrees	*cm*
350 (6 m)	3°	32
400 (6 m)	3°	32
450 (6 m)	3°	32
500 (6 m)	2°	25
600 (6 m)	2°	25

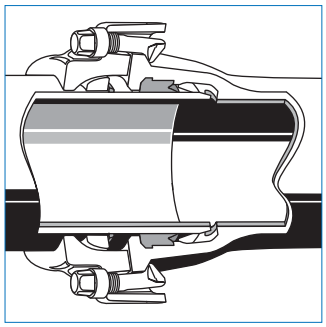
Anchored STANDARD Ve joint

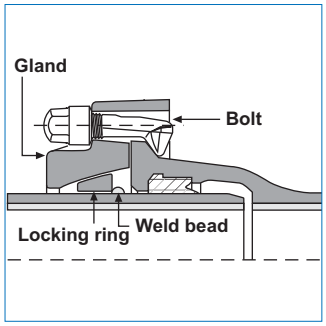
See also: *page*
- STANDARD joint 164
- STANDARD Ve joint assembly 338
- Anchoring joint 63
- Joint deflection 77

The ANCHORED STANDARD Ve joint is a push-in anchored joint.

The anchoring mechanism takes up the axial forces and allows concrete anchor blocks to be dispensed with.

Range: DN 80 to 1200





Principle

The principle of joint anchoring consists in transmitting the axial forces from one pipeline component to the following one, thus ensuring that the joint does not come apart.
Anchored joints allow the axial thrusts arising at particular points (bends, tapers, tees, blank flanges) to be distributed over one or more pipes, thus avoiding installation of concrete anchor blocks.

Description

- The seal is provided by a STANDARD gasket.
- The axial force transmission is through a mechanical arrangement, independent of that providing the seal, comprising:
  - works applied weld bead on the pipe spigot,
  - a one-piece or segmented anchoring locking ring (depending on the diameter), with a curved external profile, which abuts against the weld bead,
  - a special gland (different from the EXPRESS gland), which blocks the locking ring,
  - iron bolts (possibly special steel with bearing plates in iron for high pressure and large diameter applications).

See ALLOWABLE OPERATING PRESSURE.

Range

The anchored STANDARD Ve joint must be used only on STANDARD pipes class K9 and STANDARD fittings DN 80 to 1200.

Applications

NATURAL pipes DN 60 to 300 (class 40) cannot be used for this anchoring solution.

To use it on C30 pipes from NATURAL range DN 350 to 600, please consult us.

Anchored STANDARD Ve joint

The use of anchored joints is of particular interest where congested conditions preclude concrete anchor block construction or in poorly cohesive soils.

Installation

See ANCHORED STANDARD Ve JOINT ASSEMBLY.

Performance

Anchored joints combine the advantages of flexible joint pipes and welded joint pipes.

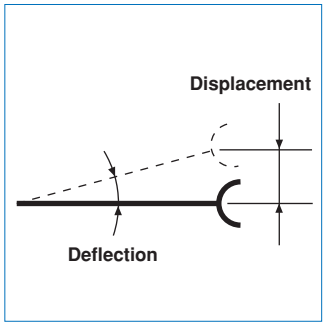
Leaktightness

The leaktightness of the push-in joints is well recognized.

Pressure

See MAXIMUM ALLOWABLE PRESSURES.

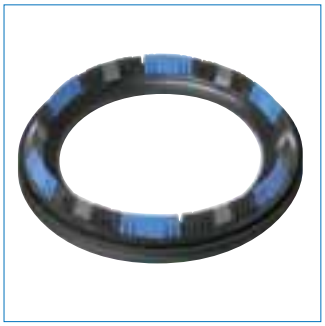
Joint deflection



DN	Allowable laid deflection	Pipe end displacement
	degrees	*cm*
80 to 150 (6 m)	5°	52
200 to 300 (6 m)	4°	42
350 to 600 (6 m)	3°	32
700 to 800 (7 m)	2°	25
900 et 1 000 (7 m)	1° 5	19
1 000 to 1 200 (8 m)	1° 5	21

The angular deflections accepted by the ANCHORED STANDARD joint are the same as those of the ordinary STANDARD joint (the curved exterior of the locking ring acts like a pivot).

BLUTOP Vi joint



Anchored BLUTOP joint

BLUTOP Vi joint is the anchored version of BLUTOP joint.

It was designed and tested in the same conditions as for the non-anchored BLUTOP, for PFA 16 bar.

Study of the full range of pressure options

During their useful lifetime, water distribution pipelines are subjected to numerous types of pressure, but also the following:

- Day/night time pressure cycles
- Water hammer
- Pressure drops
- External pressure
- Period without pressure prior to commencement of operations
- …

In each of these situations, the joints are subjected to specific types of stress. For this reason all joints for ductile iron pipeline are designated and tested in accordance with strict methods:

- In accordance with EN 545 testing : 2007 - 4 tests
- PAM's own specific testing - 4 additional tests

These tests are carried out on both non-anchored and anchored joints, taking into account the full impact of said tests, with a safety factor of 1.5 x PFA + 5 , namely 29 bar, in the case of 16 bar pressure.

Joint	PFA Allowable operating pressure	PMA Allowable maximum pressure	PEA Allowable test pressure
Anchored	16 bar	19 bar	20 bar

BLUTOP joint withstands a maximum angular deflection of 6°.



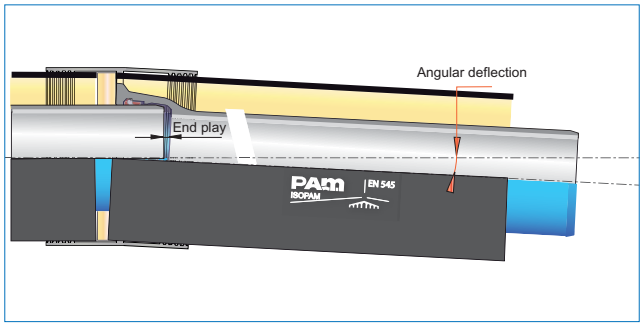
Locking insert for BLUTOP joint

High performance inserts

Anchoring is obtained with stainless steel inserts according to PAM's rigorous specification.

ANCHORED JUNCTIONS

ISOPAM



ISOPAM pre-insulated pipelines are designed to provide heat insulation for networks that are especially exposed to risks of freezing. They consist of ductile iron pipes with heat insulation fitted in the factory. Their mechanical and leaktightness properties are identical to those of standard ductile iron pipes.

Pipelines can sometimes be subjected of the risks of freezing. When required by current conditions (low flow rate, unfavourable weather conditions, above ground installation), pipelines have to be insulated to minimize heat exchanges with the outside environment. PAM offers a factory pre-insulated pipe system to cater for that need.

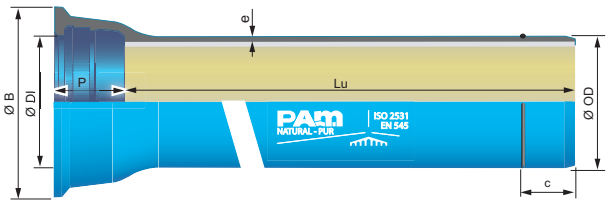
The angular deflections of ISOPAM pipelines are different from those of non-insulated pipelines owing to the geometric constraints imposed by insulation of the joints.

DN	Class	ISOPAM - STANDARD Vi			
		PFA	PMA	PEA	Deflection*
		Bar	Bar	Bar	°
100	C40	23	27	32	5
125	C40	22	26	31	5
150	C40	18	21	26	5
200	C40	16	19	24	4
250	C40	16	19	24	4
300	C40	16	19	24	3
350	C30	16	19	24	3
400	C30	16	19	24	2
450	C30	13	15	20	2
500	C30	11	13	18	2
600	C30	10	12	17	2

** for pipes of 6 m*

For operating conditions where STANDARD VI anchoring is unsuitable, please consult our technical sales staff.

NATURAL PUR range and CLASSIC PUR range anchoring systems



STANDARD Ve anchoring on NATURAL PUR pipe

NATURAL PUR ductile iron pipes with polyurethane internal coating, in compliance with standard EN 15655, and corresponding fittings are to be used for the transportation of water of the following types only:

- Very soft water (hardness less that 5°F), combined with long dwell times (more than 3 days) when a standard cement mortar coating is unsuitable (risk of increasing the water's alkalinity).
- Mineral water, i.e. water whose chemical specifications must remain unchanged between the pipeline inlet and outlet.

The utilization of insert type anchoring systems such as STANDARD Vi, EXPRESS Vi or UNIVERSAL Vi is not recommended for the transport of water with these characteristics. Please consult us.

PAM recommends the use of bead type anchoring solutions:

- For DN 100 to 600, a NATURAL PUR offering is available for K9 class pipes with bead type anchoring. The performance is the same as that for STANDARD Ve anchoring on pipes with internal coatings of blast furnace cement mortar
- To use UNIVERSAL anchoring solutions on pipes coated with PUR, in range 100 to 600, please consult us.
- In the range DN 700 to 1800, the CLASSIC PUR range is available and UNIVERSAL Ve, PAMLOCK and STANDARD Ve anchoring solutions can be used.

The internal coating should be repaired if pipes are cut or weld beads are made on the work site.

External coatings (selection)

See also: *page*
- Soil aggressivity 88
- ZINALIUM 218
- Zinc 220
- Polyethylene sleeving 222
- TT PE 224
- TT PUX 226
- Repairing external coating 361

The purpose of an external coating is to provide a durable protection against corrosive soils.

PAM *offers a complete range of external coatings to meet all cases of corrosive soils.*

Standard: EN 545.

The external coatings of PAM pipes and fittings, according to the EN 545 specifications, can be divided into three categories according to the soil corrosivity:
- **standard coatings** suitable for the vast majority of soils,
- **supplementary protections**, for highly corrosive soils,
- **special coatings**, for extremely corrosive environments.

See SOIL AGGRESSIVITY

Specification on the field of use of ductile iron pipes' external coatings according to European standard EN 545

	External coating		
Situation	**ZINALIUM ZnAl 85-15 400g/m² + Pore sealer**	**CLASSIC Zn 200 g/m² + Pore sealer**	**TT PE or PUX**
Above the water table	No limit (except situations mentioned below)	Authorized for soil resistivity above 1500 Ω.cm	Authorized
In the water table	Authorized for soils in marine water table with a resistivity above 500 Ω.cm	Authorized for soils in water table with a resistivity above 2500 Ω.cm	Authorized
Acidic soils	Forbidden in soils with high acidic reserve (including acidic peaty soils)	Forbidden in soil with pH below 6 or with high acidic reserve	Authorized
Mixed soils	Authorized	Not authorized	Authorized
Soils containing refuse, cinders, slag or polluted by wastes or industrial effluents	Not authorized	Not authorized	Authorized
Occurrence of stray currents	Not authorized	Not authorized	Authorized
Availability in the PAM ranges	**DN 60 to 600***	**DN 700 to 2000****	**DN 60 to 2000**

** For DN above 600, please consult us. ** For DN below 700, please consult us*

External coatings

For NATURAL range DN 60 to 600

Ductile iron pipes of the NATURAL range are coated externally with a thick layer of ZINALIUM (85 Zn – 15 Al) with a minimum mass of 400 g/m² and finished with a blue epoxy layer.

Ductile iron fittings of the NATURAL range are coated with an electro-deposited epoxy with a regular thick layer of at least 70 microns, applied on a blast cleaned and phosphated surface.

Pipes and fittings of the NATURAL range can be buried in a vast majority of soils, except:

- acidic peaty soils
- soils containing refuse, cinders, slag or polluted by wastes or industrial effluents
- soils under the marine water table.

as well as, if relevant, soils where occur stray currents.

The table below outlines the external coatings for pipes and fittings from DN 60 to 600.

Protection	Pipes	Fittings
● **NATURAL range** (DN 60 to 600)		
NATURAL	ZINALIUM (Zn Al 400 g/m² + blue epoxy)	Blue cataphoresis
● **TT pipeline** (DN 60 to 600)		
Special	TT PE	Blue epoxy in compliance with EN 14901

For CLASSIC range DN 700 to 2000



PAM technical teams carry out soil surveys at customers' request in order to recommend the most suitable protection.

The table below outlines the external coatings for pipes and fittings from DN 700 to 2000.

Protection	Pipes	Fittings
● **Basic solution** (DN 700 to 2000)		
CLASSIC	Zinc + Bituminous coating	Bituminous coating or Equivalent*
Reinforced	**Basic** solution + polyethylene sleeving layed on site	
● **TT pipeline** (DN 700 to 2000)		
Special	• TT PE DN = 700 • TT PUX DN 800 to 2000	Blue epoxy or polyurethane

** For DN 700 to 1200, bituminous coating can be replaced by an electro-deposited synthetic resin in compliance with standard EN 545.*

ZINALIUM

See also: *page*

- External coatings (selection) 216
- Soil aggressivity 88
- NATURAL 119
- TT PE 224
- TT PUX 226

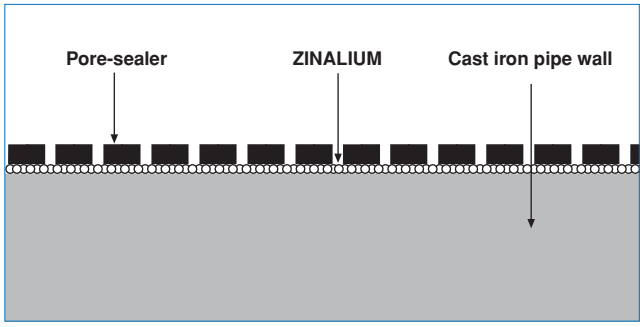
The coating of NATURAL pipes from DN 60 to 300 consists of a layer of ZINALIUM (minimum 400 g/m²) deposited by metallisation and covered by a blue epoxy paint. This active coating is suitable for all types of land, except in case of stray currents and some acid or polluted soils and marine sludges.

Coating composition

The ZINALIUM coating consists of:
- a layer of ZINALIUM two-phase 85-15 alloy deposited by metallisation (minimum quantity: 400 g/m2)
- a blue epoxy coating (pore-sealer) of average thickness 100 microns.

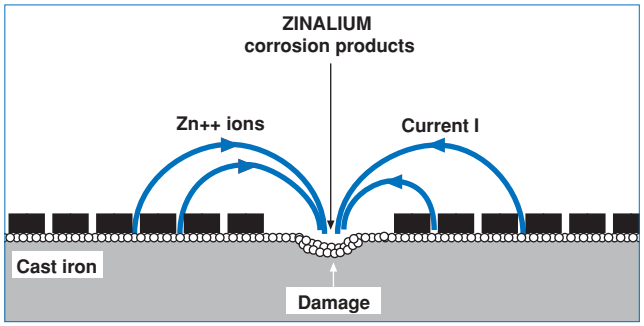
Protective mechanisms

The metallic ZINALIUM coating offers active protection due to the galvanic action of the alloy.
The mechanism has two effects:



Formation of a stable protective layer

In contact with the surrounding soil, the metallic ZINALIUM slowly changes into a dense, adherent, impermeable and continuous layer of insoluble zinc salts. This forms a protective screen. The presence of aluminium increases the passivation effect even in highly corrosive soils, reducing the zinc consumption rate.
Whilst allowing galvanic protection and self-healing, the epoxy paint promotes the formation of a stable, insoluble layer of ZINALIUM conversion products.



Damage self-healing

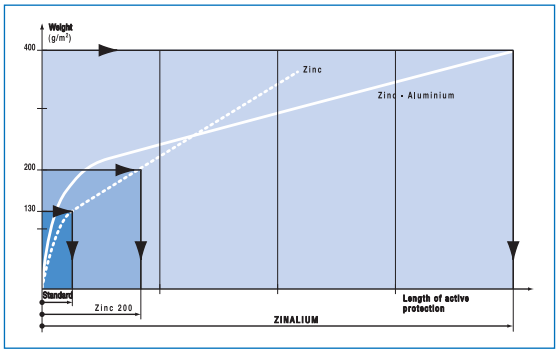
This mechanism occurs first.
One of the features of the ZINALIUM external coating is its ability to restore the continuity of the protective layer at small areas which have suffered local damage.

The Zn++ ions migrate through the pore-sealer to heal the damage, then form stable, insoluble corrosion products.

ZINALIUM

Advantages of the 400 g/m² ZINALIUM coating

PAM decided to increase the quantity of ZINALIUM to 400 g/m² (instead of 130 g/m² of zinc prescribed in the standards). This considerably extends the time during which the zinc provides active protection to the pipe.



Field of use



The ZINALIUM-based coating is compatible with more than 95 % ground types. PAM decided to use this product, proven over many years, as the basic coating for its entire range of pipes from 60 mm to 600 mm.
Capitalizing on the company's research and knowledge of soils, PAM proposes with NATURAL a full range of ductile cast iron pipelines which:

- removes the need for systematic soil surveys
- can cross corrosive sections without risk, with no need for additional protection using a polyethylene sleeve, and therefore with no extra site cost
- simplifies the management of small diameter pipeline inventories.

For extremely corrosive soils, the section of pipeline in contact with the highly corrosive area must be completely insulated. See chapters EXTERNAL COATING (SELECTION) and TT (SPECIAL COATING)

In addition, the ZINALIUM protective coating is ideal to withstand the rough conditions experienced during transport, handling, storage and backfilling: this heavy-duty coating guarantees long-term protection for the pipes.

Standards

EN 545: Ductile cast iron pipes, fittings and accessories and their assemblies for water pipelines. Recommendations and test methods.

Drinking water compatibility

The blue epoxy pore sealer has received a Sanitary Conformity Certificate (ACS) and complies with the provisions of the Decree dated 29 May 1997.

COATINGS

Zinc

See also: *page*

- External coating (selection) 216
- Soil aggressivity 88
- Polyethylene sleeving 222
- TT PE 224
- TT PUX 226

The standard PAM pipe coating consists of a layer of sprayed metallic zinc (200 g/m² minimum), covered with bituminous paint (pore-sealer).

It is an active coating, suitable for the majority of soils.

Coating composition

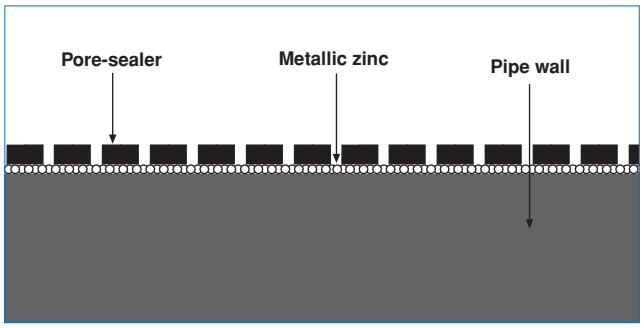
The zinc coating comprises:

– A layer of metallic zinc applied by electric arc spray gun (minimum quantity: 200 g/m², which represents a 50 % increase over the French, European and International Standards, which prescribe 130 g/m²),

– A bituminous paint finish (pore-sealer), (minimum thickness 100 microns) or equivalent.

Protection mechanism

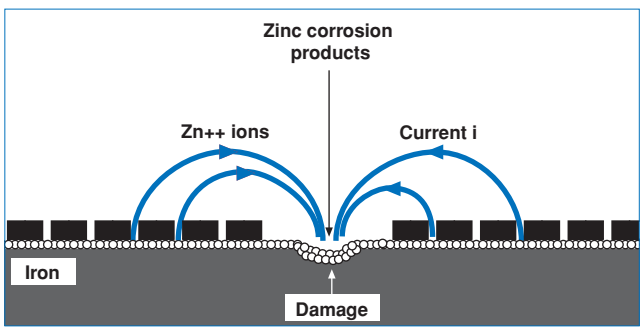
Zinc coating is an active protection, due to the galvanic action of the zinc/iron couple. It performs by a dual mechanism:



● Formation of a stable protective layer

On contact with the surrounding soil, the metallic zinc slowly changes to a dense, adhesive, impermeable, and continuous layer of insoluble zinc salts. This provides a protective screen.

The pore-sealer, while facilitating galvanic protection and healing, also promotes a stable and insoluble layer of zinc conversion products.



● Damage self-healing

This mechanism occurs first.

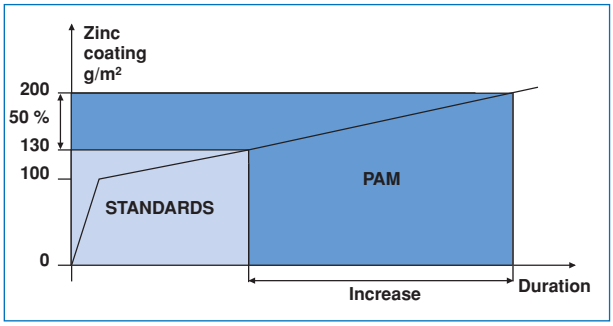
One of the particular features of external zinc coating is its capacity for restoring the continuity of the protective layer at points where it is locally damaged. The Zn++ ions migrate through the pore-sealer to plug the damage and are then converted into stable insoluble zinc products.

Zinc



Advantages of 200 g/m² zinc coating

PAM has chosen to increase the quantity of zinc to 200 g/m² (instead of the 130 g/m² recommended in standards).
This significantly increases the period during which zinc provides active protection for the pipe.



A 50% increase in the thickness of the zinc coating significantly increases the duration of the galvanic protection.

Applications

Standard EN 545 recommends using zinc-based coatings for most soil types. Backed by its extensive experience, PAM has selected zinc as the basic standard coating for all pipes it manufactures.
There are, however, certain cases where the zinc coating needs to be enhanced with a polyethylene sleeve.
In extreme cases of very aggressive soils, the pipe will need to be completely isolated where it passes through highly corrosive areas.
See SOIL AGGRESSIVITY - EXTERNAL COATING (SELECTION).

PAM's technical staff can carry out soil surveys at the customer's request in order to recommend the most suitable protection.
Also, because of its strength, the zinc coating is particularly well suited for transport, handling, storage and protection against falling backfill, thus providing lasting protection for pipes.

● Contact with drinking water

See MATERIAL IN CONTACT WITH DRINKING WATER.

Standards

EN 545: Ductile iron pipes, fittings and accessories and their assembly for water pipes.
Recommendations and test methods.
ISO 8179: Ductile iron pipes: external zinc coating.
Part 1: Metallic zinc and finishing coat.

Alimentarity

Pore-sealer varnish has received a Sanitary Conformity Certificate (ACS) and complies with the provisions of the Decree dated 29 May 1997.

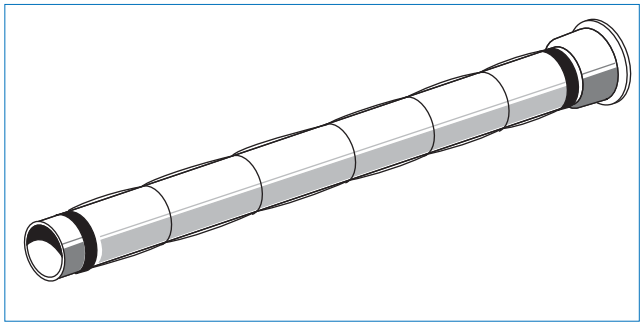
Polyethylene sleeving

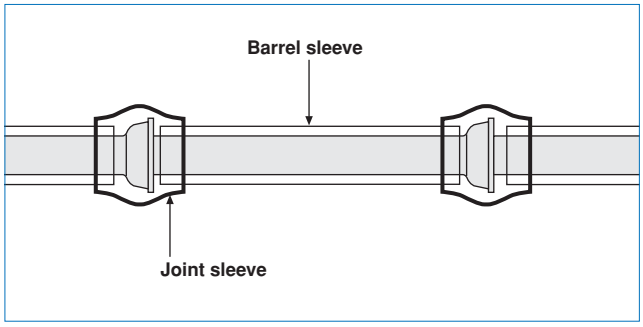
See also: *page*
- Soil aggressivity 88
- External coating (selection) 216
- Polyethylene sleeving (application) 354
- Zinc 220
- TT PE 224
- TT PUX 226

Polyethylene sleeving is a tubular film of low density polyethylene slipped over and snugly fitted to a pipe at the time of laying. It is used to supplement the basic pipe coating (metallic zinc + bituminous paint) in certain cases of highly corrosive soils, or in the presence of stray currents.

To make the installation easier the polyethylene sleeving is delivered precut for pipe sizes DN 60 to 600.

Description





The polyethylene film is made of low density polyethylene (LDPE) in tubular film and is slipped over and snugly fitted to a pipe by means of:
- adhesive plastic tape at each end,
- intermediate tie fasteners.

The technique using a barrel sleeve (applied outside the trench) and separate joint sleeve (applied in the trench after jointing) is preferable to the technique using a single sleeve (socket and barrel), since it provides better protection.

Protection mechanism

Polyethylene sleeving supplements the zinc coating. Its protective mechanism consists of insulating the pipes from corrosive soil (suppression of electro-chemical cells) and from the ingress of stray currents.
Even if a small amount of water infiltrates the sleeving it still provides protection by substituting a homogeneous environment (ground water) with a heterogeneous environment (soil).

Polyethylene sleeving



Application

PAM recommends the use of this additional protection in corrosive soils (See SOIL AGGRESSIVITY), such as:

- low resistivity soils (an indication of high corrosivity),
- stray current areas,
- soils where analysis shows high chloride or sulphate contents, or bacterial activity.

It can be applied after the trench has been opened if the local conditions justify its use.

Use of the Polyethylene sleeving is, generally, not necessary for NATURAL pipes and fittings (DN 60 to 600), their field of use being similar.

If the environment is extremely corrosive (sea inlet crossings, marshes, saline ground waters etc.), complete insulation of the main is essential, restricted to the high corrosivity area. See STANDARD TT (Special coating).

PAM technical teams carry out soil surveys at customers' request, in order to recommend the most suitable protection.
See POLYETHYLENE SLEEVING (APPLICATION) .

In order to make the installation easier, PAM provides the polyethylene sleeving in precut lengths.

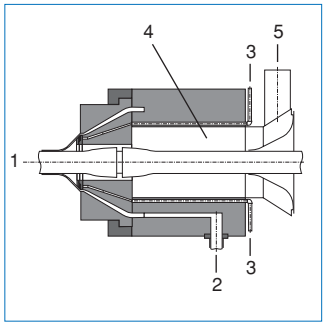
Standard

EN 545: Ductile iron pipes, fittings, accessories and their joints for water pipelines requirements and test methods.
ISO 8180: Ductile iron pipes - Polyethylene sleeving.

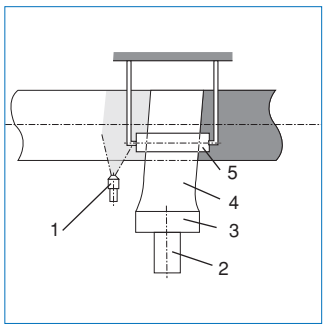
TT PE - External polyethylene

The TT PE range from DN 60 to 700 features a high-density polyethylene coating coextruded onto the pipes in the factory.

The TT PE range is intended for use with highly aggressive soils.



Coextrusion
1 - Pipe direction
2 - PE supply
3 - Adhesive supply
4 - Vacuum
5 - Suction



Lateral extrusion
1 - Adhesive
2 - PE extruder
3 - Flat die
4 - PE band
5 - Presser roller

A high-density polyethylene coating deposited in PAM plants

The polyethylene coating is extruded onto the pipes in the Saint-Gobain PAM plants. Internal manufacture ensures rigorous control of the coating application conditions.

Each pipe is tested individually after coating by a "Holiday detector" test in order to check the protective quality of the coating (barrier forming a seal against the external environment).

Two manufacturing processes are used, depending on the diameter ranges:
- Coextrusion for DN 60 to 500
- Lateral extrusion for DN 600 and 700

Highly demanding technical specifications

Due to the thickness of its polyethylene layer, the ductile cast iron pipe is fully protected in the most aggressive soils as well as during transport and handling operations.

● Thickness of the HDPE layer according to EN 14628

DN	Minimum thickness µm
60 to 100	1800
125 to 250	2000
300 to 450	2200
500 to 700	2500

The coating of the TT PE ranges meets highly detailed technical specifications to guarantee outstanding performance.

The TT PE coating complies with European standard EN 14628

TT PE - External polyethylene

Technical specifications of the high-density polyethylene coating according to EN 14628

N°	Parameter	Requirement Refer to EN 14628 15189 for the precise definition of the test methods
1	Peel strength	10 N (on zinc plated surface)
2	Impact strength	Figure 2, category A
3	Resistance to indentation	< 0.3 mm
4	Elongation at break	> 200 %
5	Specific resistance of the coating in 0.1 m NaCl solution	> 108 Ωm²
6	Resistance ratio	> 0.8
7	Thermal ageing, 100 d, 100 °C	< ±35 %
8	Light ageing, 100 d, xenon arc radiation	< ±35 %
9	Saponification properties of the adhesive	Saponification index < 3 mg KOH/g

Technical specification of high-density polyethylene according to EN 14628

Property	Standard	Requirement
Fluidity index	EN ISO 1133	0.2 g/10 min to 1.0 g/10 min
Density	EN ISO 1183-1	0.910 g/cm3 to 0.960 g/cm3

Adhesion of polyethylene is provided on the whole pipe by a regular layer of high performance adhesive specially selected for its durability.

Technical specification of the adhesive according to EN 14628

Property	Standard	Requirement
Viscosity	EN ISO 3219	> 4000 mPa at 180 °C Thermosel Brookfield Sp 21/5 min-1

The outer surface of the pipe is completely sprayed with metallic zinc to form a coating of 200 g/m².
The TT PE coating can be used at permanent operating temperatures up to 50 °C. For high storage temperatures please contact our sales engineers.

Specific protection for the junctions

The protective system for the junctions consists of:
- DN 60 to 300 - elastomer sleeve
- DN 350 to 700 - heat-shrink sleeve

If a pipeline with anchored joint (STANDARD Vi, UNIVERSAL Vi or VE, PAMLOCK, STANDARD Ve) is used in saline exterior environment, the elastomer sleeve must be replaced by a heat-shrink sleeve.

Remark



STANDARD Ve and STANDARD V+i anchored joints cannot be used with TT PE pipes, which do not have a rim. STANDARD Vi, UNIVERSAL Vi or Ve anchored joints must be used.

TT PUX - External polyurethane

The TT PUX range from DN 800 to 2000 features a polyurethane coating deposited on the pipes in the factory. The ends, socket and spigot, are protected by a thick epoxy coating.
The TT PUX range is intended for use with highly aggressive soils. It completes the TT PE range in large diameters.

A polyurethane coating applied in PAM plants

The polyurethane coating is deposited on the pipes in the PAM plants. Internal manufacture ensures rigorous control of the coating application conditions. Each pipe is tested individually after coating by a "Holiday detector" test in order to check the protective quality of the coating (barrier forming a seal against the external environment).

The polyurethane used by PAM is a solvent-free two-component system. The pipe is heated to a temperature at which the coating can be sprayed on.

For pipes in the TT PUX range:
- the pipe barrel is coated with polyurethane,
- the spigot and socket are coated with thick epoxy.

The epoxy, compliant with standard EN 14901, is used instead of polyurethane on the spigot and in the socket since this product provides equivalent protection, for a thinner coating, to obtain better control over the jointing conditions.

Highly demanding technical specifications

Due to the thickness of its polyurethane layer, the ductile cast iron pipe is fully protected against the most aggressive soils as well as during transport and handling operations.

● TT PUX pipe coating thicknesses

DN	Average thickness µm	Minimum thickness µm	Material
Barrel	900	700	Polyurethane
Socket	250	200	Epoxy
Spigot	250	200	Epoxy

The TT PUX coating complies with European standard EN 15189

TT PUX - External polyurethane

Technical specifications of the Polyurethane coating according to EN 15189

N°	Parameter	Requirement Refer to EN 15189 for the precise definition of the test methods
1	Chemical resistance	Less than 15 % weight increase after immersion in deionised water Less than 2 % weight loss after drying
1	Chemical resistance	Less than 10 % weight increase after immersion Less than 4 % weight loss after drying
2	Impact strength	8 J/mm of PU on the pipe barrel coated with polyurethane
3	Resistance to indentation	< 10 % to 10 MPa
4	Elongation at break	> 2.5 %
5	Specific resistance of the coating in 0.1 m NaCl solution	> 108 Ω.m²
6	Resistance ratio	> 0.8
7	Adhesion	> 8 MPa at 23 °C
8	Non-porosity	No breakdown with Holiday detector

The TT PUX coating can be used at permanent operating temperatures up to 50°C.

Simplified specific protection for the junctions

The TT PUX pipelines retain the ease of installation inherent to ductile iron pipelines. They require no additional protection on site after jointing. In case of anchoring fittings, a special coating must be applied on the junction (see INSTALLATION section).

"Hot climate" countries

In countries with hot climates (some African and Middle-East countries, in particular), TT PE coating is not recommended regarding the risks of creep of the HDPE coating during storage in the sun (temperatures may exceed 80 °C).

In this case, for diameters from 60 to 700 PAM recommends the use of TT PUX pipes.

Please contact our sales engineers to obtain the precise characteristics of these complementary products and the conditions in wich the TT PUX range should be used.

Remark

STANDARD Vi, UNIVERSAL Vi or Ve, PAMLOCK, STANDARD Ve and STANDARD V+i anchored joints can be used with TT PUX pipes.

Internal lining (selection)

See also: *page*
- Aggressive or corrosive water 29
- Cement (mortar lining) 229
- Drinking water 28
- PUR 233
- DUCTAN 235

The purpose of an internal protection is to:

- *guarantee that the hydraulic performance of the pipe is maintained long term,*
- *prevent any risk of internal attack by the waters carried,*
- *maintain the quality of water carried.*

PAM *offers a complete range of internal protections to meet all types of water carried.*

The linings and internal coatings of PAM pipes and fittings can be divided into three categories, according to the aggressivity of the waters carried:

- **standard coatings**, suitable for the vast majority of raw and potable waters,
- **reinforced protections**, for waters aggressive to ordinary cement (soft and acidic waters, highly abrasive waters...),
- **special coatings** adapted to very special conditions and water corrosivity (industrial effluents...).

See AGGRESSIVE OR CORROSIVE WATER.

PAM analyses water quality on request, in order to recommend the most suitable protection.

The table below outlines the internal linings range.

Protection	Pipes	Fittings
Classic	Blast furnace cement mortar	Cataphoresis epoxy or bituminous coating
Special	Polyurethane resin	Powder epoxy

Classic protections are offered by NATURAL range (DN 60 to 600) and CLASSIC range (DN 700 to 2000). Special protections are offered by PUR (see this chapter).

Sanitary conformity

Internal coating materials used have received a Sanitary Conformity Certificate (ACS) and comply with the provisions of the Decree dated 29 May 1997.

Cement (mortar lining)

See also: *page*

- Aggressive or corrosive water 29
- Internal lining (selection) 228
- Repairing internal lining 366
- Head losses 39
- Drinking water 28
- Material in contact with drinking water 99



The standard internal protection for PAM pipes consists of a cement mortar lining. Applied by a centrifugal process, this lining provides:

- *excellent hydraulic flow conditions,*
- *preservation of carried water's quality,*
- *effective protection of pipe wall against aggressive waters.*

Standards: EN 545, ISO 4179.

Application

The cement mortar lining is applied by a centrifugal process. With this process, chosen by PAM, the mortar is introduced into the pipe and rotated at high speed, ensuring good lining compaction.
The lining is then treated under controlled temperature and humidity conditions, giving it the optimum mechanical strength. The spinning process has the advantage of producing a smooth internal surface layer consisting of very fine particles (laitance). The process gives the following properties:

- high mortar compaction,
- low roughness,
- good mortar key.

Flow Hydraulic performance

The cement mortar has a very smooth inner surface, which favours flow, reduces head losses and guarantees long term hydraulic efficiency.
The roughness coefficient of a single pipe (COLEBROOK formula) is k = 0.03. However, PAM recommends the use of the value k = 0.1 in designing a pipe system, to take any exceptional head losses into account.
(See HEAD LOSSES).

Protective mechanism

The cement mortar lining is an active coating. It is not merely a barrier coating but provides chemical protection through the phenomenon of passivation. When the pipe is filled, the mortar gradually absorbs water, which becomes enriched in alkaline substances; it is therefore non-corrosive when it reaches the proximity of the metal wall.

Cement (mortar lining)

Crack plugging

Crack plugging is recognized and is covered in the standards.
Crazing (shrinkage), and indeed small cracks formation, often occur during transport, storage or laying, but it heals up under the combined effect of two reactions:

- swelling (rapid) of the mortar in water,
- hydration (slow) of the cement compounds.

Mechanical properties

Expansion

The linear coefficient of thermal expansion of cement mortar linings is approximately 12 x 10^{-6} m/m/°C, a value virtually identical to that of ductile iron (11 x 10^{-6} m/m/°C), thus eliminating the risk of cracks formation through differential thermal expansion.

Cement mortar mechanical performance

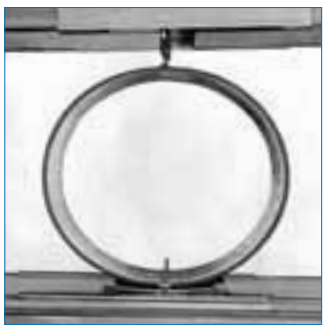


The quality of the adhesion to the ductile iron wall gives to the lining two important qualities:

- a good resistance to vacuum,
- a good resistance to longitudinal bending and to ovality.

Longitudinal bending tests on small diameter pipes have demonstrated the ability of the cement mortar lining to withstand limited pipe diametral deflection.
For large diameter pipes, which are more susceptible to ovality effects, ring bending tests have confirmed the good performance of the mortar lining under high top loads.

Abrasion



Cement mortar has good abrasion resistance, which allows the pipes to be used for carrying raw waters with high abrasive particle content.
Please consult us for these applications.

Material in contact with drinking water

See the chapter MATERIAL IN CONTACT WITH DRINKING WATER.

Standards

EN 545: Ductile iron pipes, fittings, accessories and their joints for water pipelines. Requirements and test methods.
ISO 4179: Centrifugal cement mortar lining. General requirements.

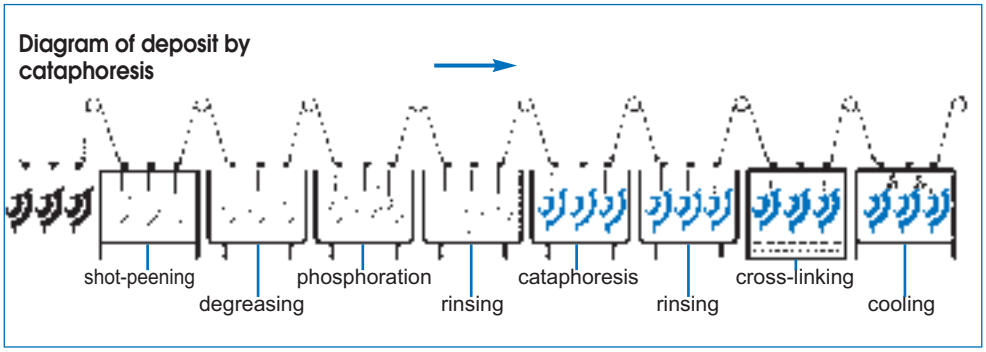
Cataphoresis epoxy (coating for fittings)

See also: *page*
- NATURAL 119
- External coatings (selection) 216
- Internal lining (selection) 228

NATURAL fittings are coated by cataphoresis with a layer of blue epoxy resin.

This process produces a coating of highly regular thickness.

Coating process



Cataphoresis is an electrodeposition process:
- on leaving the foundry, the fittings are carefully shot-peened (degree of care: SA 2.5).
- they then undergo surface passivation (zinc phosphating) by passing through a chemical bath.
- the blue resin layer is then electrodeposited: the fitting is immersed in a bath containing the resin in suspension and forms the cathode with respect to the bath. The coating is created by deposition of paint particles on the cathode under the force of the electric field in the bath.

Advantages of cataphoresis

Using this process enables to obtain, especially on parts with complex geometry, a highly regular thickness of the coating, including in areas difficult to access by traditional coating processes.

Characteristics

The average thickness of the coating is at least 70 microns. Its adhesion is excellent thanks to the chemical surface treatment carried out beforehand.

Drinking water compatibility

The epoxy coating deposited by cataphoresis is compatible with drinking water and has a Sanitary Conformity Certificate (ACS).
See the chapter MATERIALS IN CONTACT WITH DRINKING WATER.

Standards

EN 545

Powder epoxy (coating for fittings)

See also: *page*
- External coating (selection) 216
- Internal lining (selection) 228
- TT PE 224
- TT PUX 226
- Soil aggressivity 88
- Aggressive or corrosive water 29



Powder epoxy coating of a fitting

The epoxy resin powder coating provides reinforced protection of the fittings. These fittings are intended for use with TT pipes (highly corrosive soils) or PUR pipes (corrosive water).

Coating process

The coating is produced by applying an epoxy powder on a previously shot-peened and heated fitting. The powder is applied by:
- electrostatic spray gun or
- dipped in a fluidized bed bath.

Coating characteristics

The blue epoxy coating has an average thickness of at least 250 microns.

Field of use

Fittings with this type of coating can be used buried in corrosive or highly corrosive soils or to transport aggressive or corrosive water.

Drinking water compatibility

The blue epoxy powder coating is compatible with drinking water and has a Sanitary Conformity Certificate (ACS).
See the chapter MATERIALS IN CONTACT WITH DRINKING WATER.

Conformity

EN 545
EN 14901

Repairing the blue epoxy powder coating

- Strip the damaged area and remove the oxidation.
- Sand the coating with abrasive cloth around the damaged area to ensure good adhesion.
- Clean, degrease and heat the surface before applying the epoxy (temperature about 50 °C).
- Mix equal quantities of resin and hardener. Prepare small quantities (very short working time: 30 min at 40 °C).
- Apply the epoxy with a spatula or a brush.
- Allow to harden in a dry area and avoid handling.

PUR - Internal polyurethane

See also: *page*
- Internal lining (selection) 228
- Aggressive or corrosive water 29
- PUR 125

The PUR range from DN 100 to 2000 features a polyurethane coating deposited on the pipes in the factory. The ends, socket and spigot, are protected by a thick epoxy coating.

This PUR range is intended for use with highly aggressive water with respect to cement mortar. It completes the NATURAL or CLASSIC ranges where the cement mortar coating cannot be used.

A polyurethane coating applied in PAM plants

The polyurethane lining is deposited inside the pipes in the PAM plants. Internal manufacture ensures rigorous control of the coating application conditions.

The polyurethane used by PAM is a solvent-free two-component system.
The pipe is heated to a temperature at which the coating can be sprayed on.

For pipes in the PAM PUR range:
- the inside of the pipe barrel is coated with polyurethane,
- the outside of the spigot and socket are coated with zinc-rich paint and epoxy.

Highly demanding technical specifications

Due to the thickness of its polyurethane layer, the ductile iron pipe is fully protected against the most aggressive water as well as during transport and handling operations.

Thickness of polyurethane coating on PUR pipes

DN	Average thickness µm	Minimum thickness µm
100-200	1300	800
200 - 2000	1500	800

The PUR coating complies with European standard EN 15655

PUR - Polyurethane lining

Technical specifications of the Polyurethane coating according to EN 15655

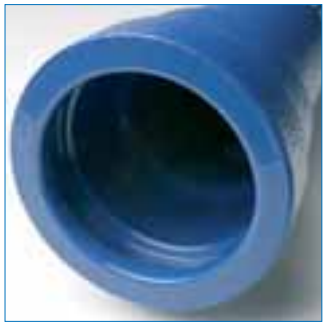
N°	Parameter	Requirement Refer to EN 15655 for the precise definition of the test methods
1	Chemical resistance	Less than 15 % weight increase after immersion in deionised water Less than 2 % weight loss after drying
1	Chemical resistance	Less than 10 % weight increase after immersion Less than 4 % weight loss after drying
2	Indirect impact strength	8 J/mm of PU on the pipe barrel coated with polyurethane
3	Resistance to ovalisation	Static deformation test 2 % from DN 100 to 250, then 4 % 3 % from DN 300 to 600, then 6 % 4 % from DN 700 to 2000, then 8 % After examination, no damage to the coating
4	Elongation at break	> 2.5 %
5	Specific resistance of the coating in 0.1 m NaCl solution	> 10^8 Ω.m2
6	Resistance ratio	> 0.8
7	Resistance to light ageing	Adhesion greater than 8 MPa after 6 months' outdoor storage
8	Non-porosity	No breakdown with Holiday detector at 3 kV
9	Hardness	Shore hardness > 70
10	Adhesion	> 8 MPa at 20 °C

The PUR coating can be used for water at permanent operating temperatures up to 45 °C.

The PUR coating is suitable for water of pH between 1 and 13.

DUCTAN

The BLUTOP range in DN 90, 110 and 125 features a new internal lining, DUCTAN, deposited on the pipes in the factory. The DUCTAN internal coating lines the inside of the pipe completely from the socket to the end of the spigot.



Cross-section of BLUTOP pipe protected internally by DUCTAN coating

Protection provided by DUCTAN lining

Since potable water may prove aggressive for pipelines, due to its mineral composition or to treatment products such as oxidizing agents, ductile iron pipelines are lined with an internal coating. Traditionally, the internal lining of cast iron pipeline is blast furnace cement mortar.

For the BLUTOP range, the cement mortar is replaced by an innovating ultramarine blue thermoplastic coating called DUCTAN. It is deposited by a hot powder process on a surface carefully prepared beforehand.

This coating features the same functional characteristics as the powder epoxy coating on gate valves.
Main characteristics:

- Perfectly adherent, with an average adhesion value of 14 MPa (140 kg/cm²) and a minimum value of 8 MPa, DUCTAN withstands without damage:
  - perforation under load
  - cuts on site
- Totally smooth, DUCTAN minimizes head losses
- With no discontinuity from socket to spigot, DUCTAN guarantees 100 % protection for the barrel
- Extra-light, DUCTAN reduces the pipe weight by 25 %
- Thinner than the cement coating, DUCTAN increases the pipe's hydraulic cross-section.

In addition, the DUCTAN lining is impact resistant and therefore does not flake in case of point impact.

DUCTAN characteristics

The characteristics of DUCTAN thermoplastic material used for the internal lining of BLUTOP pipes are listed in the following table:

Characteristics of DUCTAN thermoplastic material used for pipes' internal lining

Characteristic	Values
Colour	Ultramarine blue (similar to RAL 5002)
Density (dry film)	0.96 g/cm³
Adhesion (ISO 4624)	≥ 10 MPa on shot peened steel
Shore hardness D	44
Elongation at break (ISO 527)	≥ 400%
Stress cracking (ASTM D1693)	> 1000h
Induction time before oxidation at 200 °C (NF EN 728)	> 10 min under O_2

DUCTAN

Inert in contact with water

Tests on the migration of organic products in the water indicate very low levels of migration and migration rate, reflecting the high purity of DUCTAN.

Results of migration tests on DUCTAN coating

	Total organic carbon TOC (mg/L)	Migration rate mg/dm-2/day
Chlorine-free water		
1st immersion	0.06	< 0.01
2nd immersion	0.01	< 0.01
3rd immersion	< 0.01	< 0.01
Chlorinated water (1 mg/L)		
1st immersion	0.19	0.01
2nd immersion	0.38	0.03
3rd immersion	0.11	0.01

Durable internal surfaces

The internal surfaces of BLUTOP pipelines consist of DUCTAN for pipes and epoxy for fittings. These 2 coatings uniformly line the inside of the pipelines and the sealing surfaces. Epoxy is renowned as a coating for valves and highly appreciated for its chemical inertia in water. In addition to displaying properties which are similar to epoxy, DUCTAN also withstands impacts, making it more suitable for pipes.

These surfaces are perfectly smooth and inert, thereby limiting the formation of deposits in the pipes.

DUCTAN's behaviour has been studied for several thousand hours in contact with disinfection products such as:
- Hypochlorite
- Chlorine dioxide.

The chlorine content of the water was 10 ppm, i.e. 100 times the value used. The temperature was 40 °C. These two factors accelerate possible ageing and are used to estimate the protection durability.

Study of the behaviour in contact with hypochlorite and chlorine dioxide

	Hypochlorite	Chlorine dioxide	Pure water
Duration	4000 h	3000 h	8424 h
Temperature	40°c	40°C	40°C
Chlorine content	10 ppm	10 ppm	-
Surface cracking	No	No	No
Erosion	No	No	No
Breaking stress*	> 15 MPa	> 15 MPa	> 15 MPa

* Initial breaking stress measured, between 15 MPa and 17 MPa

DUCTAN

The main conclusions of these studies are given below:
- Good stability of the chemical structure
- No chemical change, confirmed by the absence of surface cracking or erosion
- Mechanical elongation-traction properties are not significantly affected.

Bacterial growth

As regards the water bacteriological quality, the DUCTAN internal lining is inert and durable and therefore does not stimulate bacterial growth (confirmed by Hydrocheck tests in Belgium).

Due to its inertia, the DUCTAN internal lining does not transmit carbon compounds likely to favour the growth of bacterial colonies by providing nutrients.

European approvals

BLUTOP range plays at European scale: it has now also obtained drinking water approvals for the DUCTAN internal lining in several European countries:
- Conformity with the "Hydrocheck" approval procedure in Belgium, issued by Belgaqua
- Conformity with the UBA-Guideline and DVGW-W260 approval procedures in Germany, issued by the Hygiene-Institute of the Ruhrgebiets, Gelsenkirchen
- Conformity with standard BS 6920 issued by the WRAS in the United Kingdom
- Conformity with "regulation 31 (4)(a)" of the DWI in England, Wales and Scotland, issued by the DWI, on the basis of the WRc report.

Other approvals are in progress in other European countries.

Appendix

Extract from the CSTB Technical Approval draft - Conformity with reference standards

DUCTAN thermoplastic internal lining of pipes is a novel product not yet covered by any specific standard. However, the main functional performance characteristics of this coating are equivalent to those of epoxy type coating in compliance with EN 14901-2006.

The following epoxy specifications do not apply:
- Resistance to indentation: since DUCTAN coating is deposited inside the pipe, there is no risk of perforation by the soil
- Resistance to air ageing: during use, DUCTAN coating is only in contact with water. The pipes are plugged before laying, thereby avoiding any exposure to solar radiation.
- Cross-linking: DUCTAN coating is a thermoplastic which does not undergo heating treatment to cross-link the material.

DUCTAN

Resistance to water and impact strength are not covered by any particular specification.

Performance tests

The average adhesion of the DUCTAN thermoplastic internal lining must reach at least 8 MPa and a minimum individual value of 6 MPa when it is measured according to EN ISO 4624-2003. The minimum number of measurement points is 9. In practice, values in the region of 15 MPa or more are measured.

Performance tests on the DUCTAN internal lining of BLUTOP pipes

Performance test	Criterion
Non-porosity	When measured under a voltage of 1500 V, the pipe internal surface must be free from porosity (see note a)
Reverse impact strength (opposite side)	No breakdown with Holiday detector under an impact of 10 J (see note b)
Durability - Resistance to thermal ageing in water	(see note c)

Note a:
When measured under a voltage of 1500 V, the pipe internal surface must be free from porosity. Porosities are allowed in the designated areas, the ends, i.e. spigot and socket.

Note b:
The impact resistance of the internal protection is checked with respect to standard EN ISO 6272-1-2004 with impact on the side opposite the coating.
The 1 kg mass with spherical indenter of diameter 20 mm must be dropped from a height of 1 m. The mass must fall perpendicular to this surface.

Note c:
The durability of the DUCTAN internal anticorrosion protection is measured after a water immersion test according to EN ISO 2812-2-1995, but at a temperature of 50 °C (instead of 40 °C). The exposure duration is 480 h.
On each test specimen, the coating shall be incised down to the metal in the form of an upside-down V, the line to be 1 mm wide, the mark to be incised 50 mm high at least and form an angle of about 60°. 2 areas are evaluated (see the table).

Evaluation criteria of pipes' protection durability

On the damage	Off the damage
Width of blistering each side of the scratch: requirement < 5 mm	Blistering Di<2 and Do<2 according to EN ISO 4628-2
Width of rust propagation each side of the scratch: requirement < 5 mm	Rusting < Ri1 according to EN ISO 4628-3
	Average adhesion by traction test according to EN ISO 4624-2003: requirement ≥ 6 MPa (9 measurement points, see 5.3.2.)

PAM

MANUFACTURING AND QUALITY

Manufacturing

Ductile iron

Quality management

Self-anchoring solutions that are fully tried and tested

Works Testing

Certification

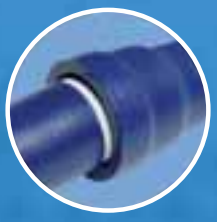
NATURAL



CLASSIC



BLUTOP



KAMELEO



PMI Couplings



IRRIGAL



ALPINAL



URBITAL



SAINT-GOBAIN

PAM

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MANUFACTURING AND QUALITY

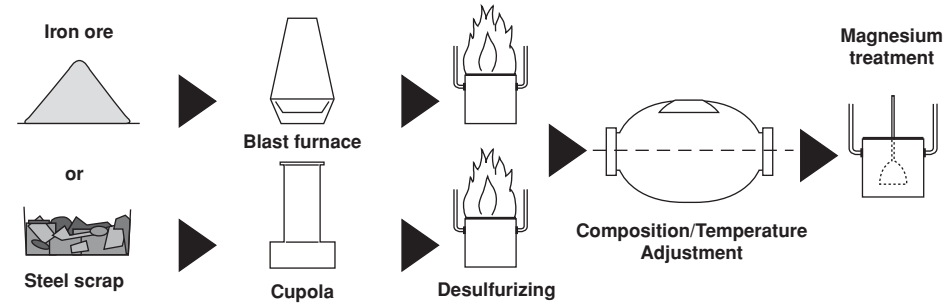
Manufacturing

See also: *page*
- Ductile iron 244
- Quality management 247
- Works testing 251

Three main stages are involved in the manufacture of pipes and fittings:
- *metal preparation: blast furnace, cupola, metal treatment,*
- *pipe spinning/foundry casting,*
- *finishing/coatings.*

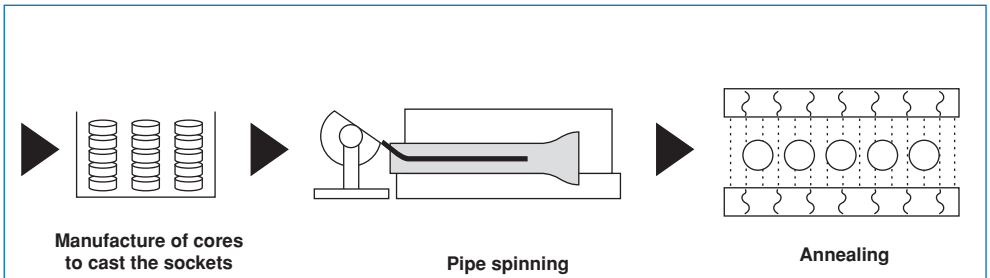
Metal preparation





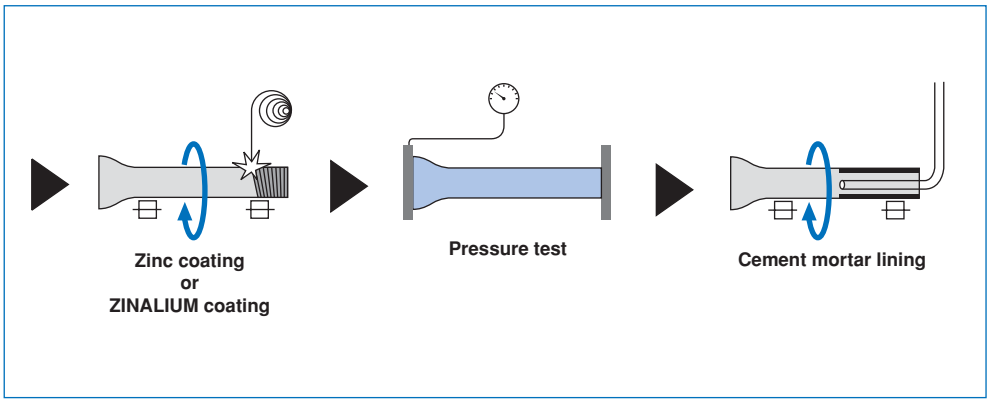
Pipe spinning





Finishing/Coatings



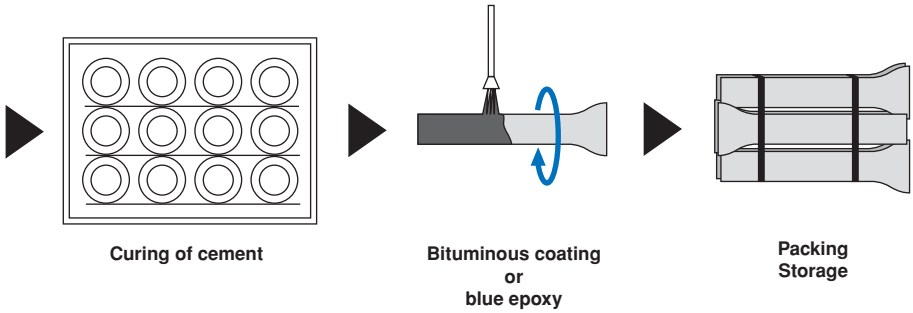


MANUFACTURING AND QUALITY

Manufacturing



Finishing/Coatings



Pipes manufacturing



Metal preparation

Molten metal can be obtained directly by reduction of iron ore in a blast furnace, or by melting pig iron and scrap in a cupola (or electric furnace). In all cases the materials have to be selected and checked carefully, in order to produce a very high purity base metal suitable for the treatments described below.
After desulfurization, the iron temperature is adjusted in an electric furnace, to provide the optimum casting temperature.
At this stage, corrections can be made to the chemical composition by additions of scrap metal, or specific ferro-alloys. Magnesium is introduced into the molten metal, to render it ductile.
(see DUCTILE IRON).



Pipe spinning

The pipe spinning process consists in spreading a layer of molten iron inside a rapidly rotating cylindrical mould, and solidification of the metal by continuous mould cooling.
The principal methods used are the “de LAVAUD” process and the “WET SPRAY” process.
In the “de LAVAUD” process, molten metal is poured into an uncoated steel mould and is subjected to rapid cooling. A graphitizing, then ferritizing heat treatment is necessary to obtain pipes with the required structure and mechanical properties.
In the “WET SPRAY” process, before the iron is poured, the internal surface of the mould is coated with a fine layer of powdered refractory silica, which reduces the thermal conductivity of the molten metal / mould interface. The pipe therefore cools at a slower rate than in the “de LAVAUD” process and consequently only a ferritizing heat treatment is required.

MANUFACTURING AND QUALITY

Manufacturing

● Finishing/Coatings

On leaving the heat treatment furnace, the pipes receive an external coating of pure metallic zinc, applied by electric arc melting zinc wire and then by spraying compressed air.
Many types of inspections and tests are carried out to guarantee quality: checking the structure and mechanical properties of the metal, visual inspection, dimensional checks, individual hydrostatic tests. Particular attention is paid to spigots and sockets because of their importance in joint sealing.



The mortar lining is centrifugally applied. In the method used by PAM, the mortar is poured into the pipe and then spun at high speed, which has the effect of giving the lining good compaction.
The cement mortar is then heated under controlled temperature and humidity conditions. After maturation of the mortar, the pipes move on to the coating lines. A layer of bituminous paint is then applied by spraying on top of the zinc.
The pipes are then bundled (DN ≤ 300) and put into stock to await dispatch.



Fittings manufacturing

Production of ductile iron fittings and accessory items follows the same pattern (metal preparation, casting, finishing and coating), except heat treatment.

● Casting

Various moulding processes are used in casting, depending on the dimensions and type of casting being made.
The principal processes used by PAM are:

- compacted sand moulding (flask less or box) on high output automatic lines, for small diameters,
- vacuum sand moulding (V-Process) on an automatic line for medium diameters,
- self-setting sand moulding, for large diameters.

● Finishing/Coatings



On leaving the casting shop, the castings have their running systems removed, then are shot blasted and fettled. Finally they are air tested before being given a dipped or sprayed bituminous or epoxy coating.

MANUFACTURING AND QUALITY

Ductile iron

See also: *page*
- Manufacturing 241
- Safety factor 73

Ductile iron is distinguished from ordinary grey iron by its remarkable mechanical properties (elasticity, impact strength, elongation...). These are due to the spheroidal nature of the graphite particles.

Definition of irons



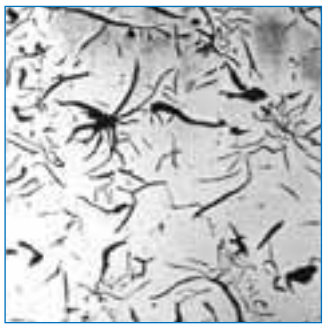
A ferrous product classification can be established in terms of the carbon content of the basic metal:
- iron: 0 to 0.1% C,
- steel: 0.1 to 1.7% C,
- cast iron or ductile iron: 1.7 to 5% C

Below 1.7 % carbon, solidification produces an austenitic single phase material, with the carbon present in the structure in solid solution.
Above 1.7% carbon, the carbon cannot all be dissolved in the iron structure and consequently solidifies in the form of a secondary phase, either as graphite (pure C), or iron carbide (Fe3C). Iron is a multi-phase material, of complex structure: the most common constituents are ferrite (Feα) and pearlite (Feα + Fe3C).
Other elements present in iron in very low proportions have an effect on the structure, mechanical properties and casting of the metal. Silicon (usually 1 to 3 %) plays a particular part and makes the iron in reality a ternary alloy: iron, carbon, silicon.

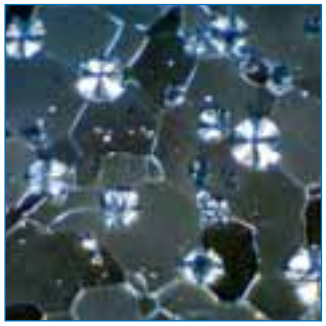
Different types of cast iron

The term “Cast iron” covers a wide variety of Fe-C-Si alloys. It is usual to class them in groups according to the graphite condition, making an additional differentiation based on the structure of the metal matrix (ferritic, pearlitic).

Effect of graphite shape



Grey cast iron microstructure



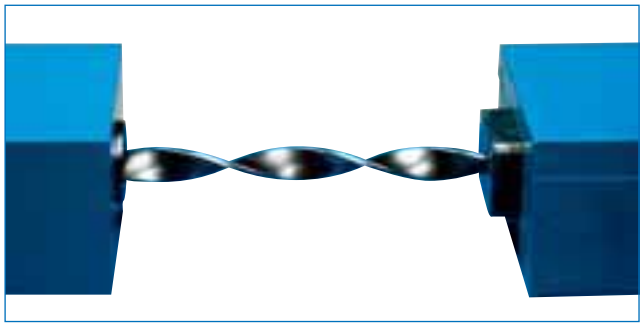
Ductile iron microstructure

In so called “grey irons” the graphite is present in the form of flakes, hence their metallurgical name: flake graphite irons (sometimes called lamellar graphite irons). By concentrating abnormal stresses at certain points, each of these flakes may initiate cracking.
Metallurgists have therefore sought to diminish, or eliminate, this effect by changing the size or distribution of the flakes.
In a first stage, the adoption of the centrifugal process to cast flake graphite iron pipes (so called “grey iron pipes”), led to an appreciable improvement, by producing very fine graphite flakes.
A decisive advance was then made in 1948, when research in both the U.S.A. and Great Britain led to the discovery of spheroidal graphite iron, more commonly known as ductile iron.
The graphite no longer exists in flake form but precipitates in a spherical form. The possibility of crack propagation lines is therefore eliminated. Graphite precipitation in spheroidal form is obtained by the controlled addition of a small amount of magnesium to the previously desulfurized base iron.

MANUFACTURING AND QUALITY

Ductile iron

Ductile iron properties



Ductile iron owes its remarkable mechanical properties to the spheroidal shape of its graphite:

- tensile strength,
- impact resistance,
- high elastic limit,
- good elongation.

These properties are further enhanced by control of the chemical analysis and heat treatment of the metal matrix.

Ductile iron maintains the traditional qualities of cast irons, resulting from the high carbon content:

- compression strength,
- castability,
- abrasion resistance,
- machinability,
- fatigue strength.

PAM ductile iron

All PAM pipes and fittings are manufactured from ductile iron complying with Standards EN 545 and ISO 2531.

Type of product	Minimum tensile strength Rm *MPa*	Minimum elongation after failure A *%*	
	DN 40 to 2 000	DN 40 to 1 000	DN 1 100 to 2 000
Pipes centrifugally cast	420	10	7
Pipes not centrifugally cast, fittings and accessories	420	5	5

Note 1:
By agreement between the manufacturer and the customer, the conventional elastic limit at 0.2 % ($R_{p0,2}$) can be measured. It should not be less than:
– 270 MPa when A ≥ 12 % for DN 40 to 1000 or ≥ 10 % for DN > 1 000 ;
– 300 MPa in all other cases.

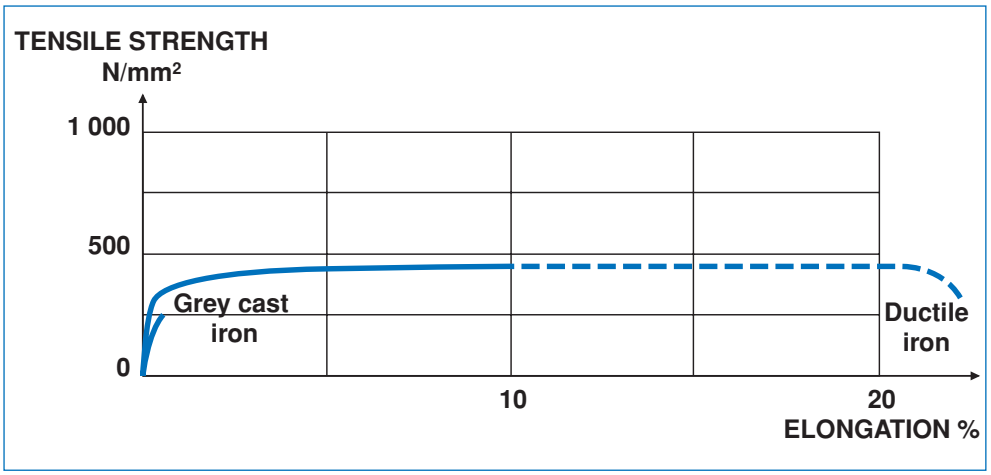
MANUFACTURING AND QUALITY

Ductile iron



Comparison of properties of different types of cast iron for spun pipes

The Brinell hardness should not exceed 230 HB for pipes and 250 HB for fittings and accessories. For welded components, a higher Brinell hardness is admissible in the area affected by heat adjacent to the weld.



Quality management

See also: *page*
- Standards 98
- Certification 252

PAM has instituted a quality control organization complying with Standard ISO 9001.

Its objective is to provide customers with products meeting perfectly their stated requirements.

Quality policy

The PAM quality policy is based on improving products and services for its customers.

To meet this level of excellence, PAM:
- defines the specifications of, designs and improves products in order to adapt them to customer and environmental requirements;
- implements "capable" manufacturing means;
- buys materials and manufactures products in compliance with specifications;
- guarantees on-time delivery of its products and services.

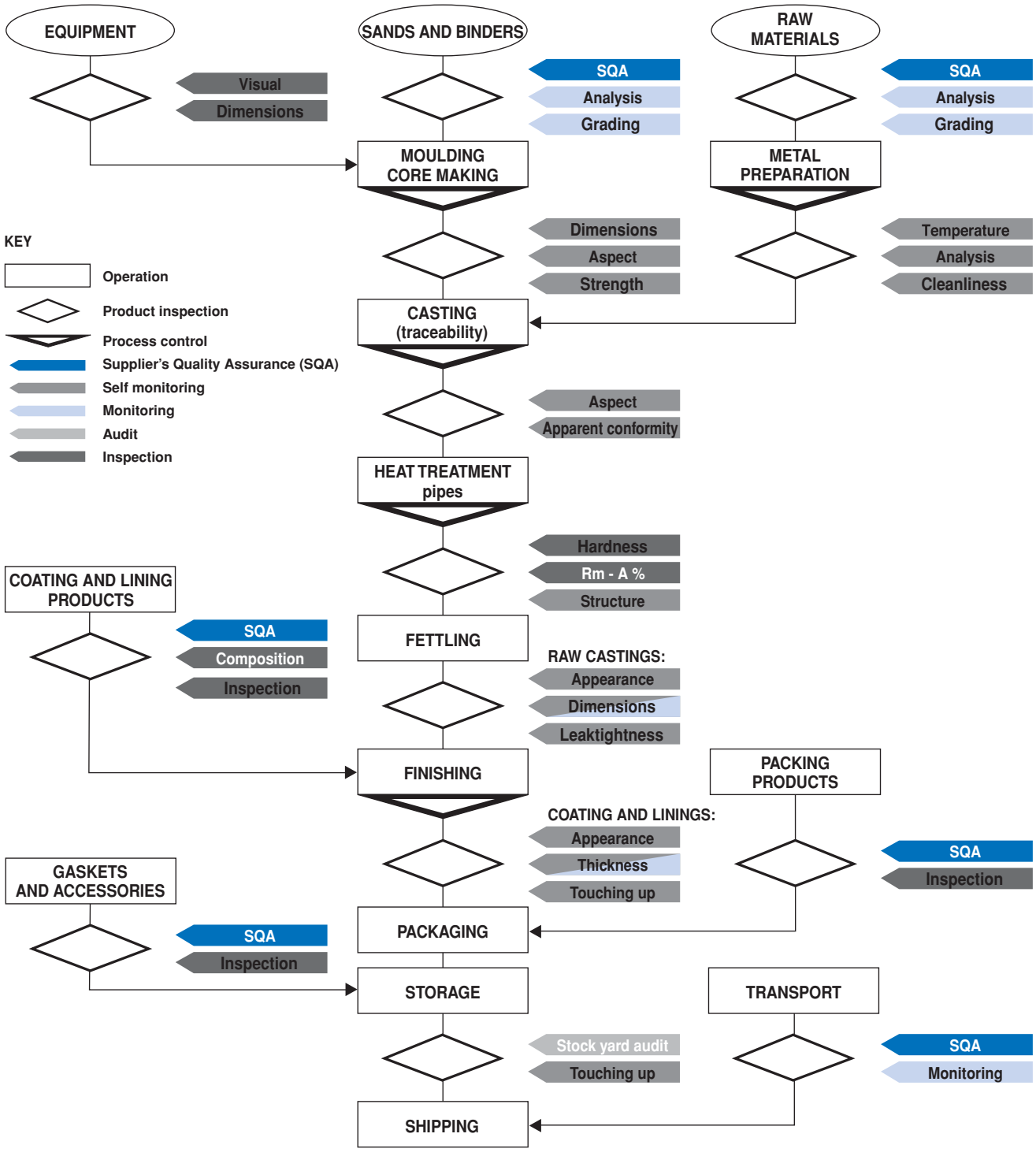
To improve performance, the teams:
- systematically measure results;
- eliminate malfunctions;
- undergo ongoing training.

PAM's aim is to be the world leader in its area of business: this objective is reflected in our Quality Policy.

MANUFACTURING AND QUALITY

Quality management

Manufacturing Inspection and control chart (pipes and fittings)



MANUFACTURING AND QUALITY

Quality management

Quality policy

The PAM quality management system not only covers production and marketing, but also product design. This is the best possible guarantee that our products meet their intended use.

The PAM quality system is ISO 9001 certified.

This standard is the reference for quality management applied to design/development, production, installation, and after-sales support.



For design, systematic project reviews are used to ensure that targeted new needs for the product being developed are met.
Each project involves three main phases prior to release on the market:

- functional specifications,
- technical definition of the product,
- industrialization and qualification of the product.

For production, the aims of the quality organization are to:

- check the consistency of incoming raw materials, constituents and other items required for the production and usage of our products;
- control the manufacturing process by formalizing our expertise, automating process, and training operatives while making ongoing improvements through analysis of the measurements made throughout the manufacturing cycle;
- check at every stage of production that the products meet the specifications, thus providing early detection of any aberration, and enabling it to be corrected.

This quality management organization is founded on:

- statistical control of processes which, based on regular measurements, allows process and product performance to be quantified against established objectives;
- self-monitoring, which is the basis of the system in production and consists in delegating to operatives the monitoring of the results of their own work within pre-established parameters;
- auditing, which ensures, in a systematic manner, that everyone is obeying the rules laid down, and checks on their efficiency. This applies to PAM and all its suppliers and sub-contractors, with whom it collaborates on quality assurance;
- checking, if necessary, of particular properties of products, raw materials or constituents, not covered by the preceding arrangements.



MANUFACTURING AND QUALITY

Self-anchoring solutions fully tried and tested



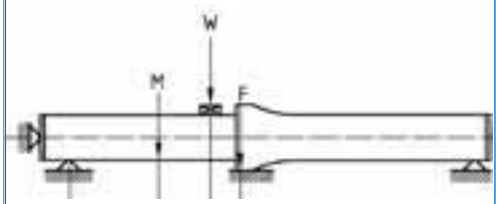
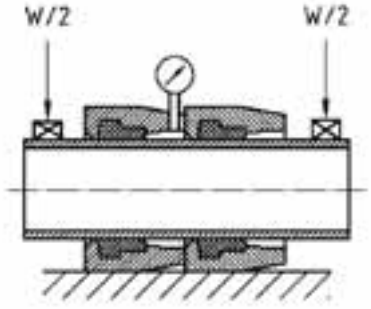
PAM self-anchoring systems are designed and tested in strict compliance with the quality assurance procedures specified by standard ISO 9001-2000 and based on the standards applicable to ductile iron pipelines including, in particular, standards EN 545 and ISO 10804-1, as well as PAM's specific internal specifications.

These tests are conducted in a COFRAC approved laboratory and various combinations of mechanical conditions are applied in order to reproduce all the installation conditions (not only average conditions). For the design of new products, PAM goes further than the requirements specified in applicable standards:

- Each diameter (DN) is individually tested (rather than just one diameter for each product range).
- The durability of joints is assessed by internal pressure testing at 80°C for six months.

Thanks to this strict approach, PAM is able to provide its customers with self-anchoring solutions of outstanding reliability.
The self-anchoring devices are submitted, specifically, to four essential tests prescribed by European standard EN 545 and international standard ISO 10804-1.

Method	Conditions	Pressure	Why ?
Positive internal pressure	Maximum deflection Shearing force 50 DN	1.5 PFA+5 bar	To check joint's ability to withstand the hydraulic thrust
Negative internal pressure	Maximum deflection Shearing force 50 DN	-0.9 bar	To check joint's air tightness
Cyclic internal pressure	Shearing force 50 DN	24000 cycles PMA-5 ->PMA	To check joint's fatigue behaviour
Positive external pressure	Maximum deflection Shearing force 50 DN	2 bar	To check joint's resistance to penetration of groundwater

Test methods for resistance to positive, negative and cyclic internal pressure	**Test methods for resistance to external pressure**
	

Test methods

M = weight of pipe
W = vertical force
F = shearing force resulting from application of M and W

MANUFACTURING AND QUALITY

Works Testing

See also: *page*
- Pressures (terminology) 54
- Manufacturing 241
- Standards 98



Every PAM pipe and fitting undergoes a works internal pressure test, in accordance with European and International Standards.

Socket pipe

DN	Works hydraulic test pressure (bar)
60 to 300 *	40
350 to 600 **	30
700 to 1000 ***	32
1100 to 2000 ***	25

** Class 40 and BLUTOP*
*** Class 30*
**** Class K9*

- Every pipe is subjected to a works hydraulic pressure test at the pressure indicated in the table above.
- Standards EN 545 and ISO 2531.

Socket fitting

DN	Leaktightness test	
	Hydrostatic pressure	Air pressure
60 to 300	25 bar during 10 seconds visual inspection	1 bar during 10 seconds Checking with foaming agent
350 to 600	16 bar during 10 seconds visual inspection	
700 to 2000	–	

- Every fitting is subjected to an air test of at least 1 bar.
- Standards EN 545 and ISO 2531.

Flanged pipes and fittings

DN	Leaktightness test
40 to 2 000	Air test at 1 bar Checking with foaming agent or water immersion

- Pipes are designed and individually works tested in compliance with the above criteria.
- Every fitting is subject to an air test at 1 bar.
- Standards EN 545 and ISO 2531.

MANUFACTURING AND QUALITY

Certification

See also: *page*
- Standards 98
- Quality management 247
- Materials in contact with drinking water 99

PAM has obtained numerous certificates and approvals guaranteeing its ability to design, manufacture and commercialize ductile iron pipeline pieces, according to strict quality assurance criteria and in compliance with applicable standards and regulations.

These certifications are awarded by independent organizations which commit their liability and ensure their validity on a regular basis through system audits and product inspections.

Organization	Certification	Subject
Bureau Veritas Certification	Quality Management System	The certifications obtained demonstrate that PAM's quality assurance system complies with the requirements of standard ISO 9001 regarding the design, production and commercialization of pipelines and accessories, valves and municipal castings.
TÜV	Certification concerning ductile iron castings	This certification demonstrates: – that PAM and its sand casting foundry practices are suitable for the production of parts to be pressurized, – control of welding on ductile iron.
SINCERT	Certification of products	EN 545 – Ductile iron pipes, fittings, accessories and their joints for water pipelines EN 681.1 - Joints EN 1074 - Valves for water supply
Bureau Veritas	Compliance with the provisions of the Decree dated 29 May 1997	Materials in contact with drinking water (ACS - Sanitary Compliance Certificate)

In addition, the main type tests on PAM products are carried out in a COFRAC accredited laboratory (i.e. in compliance with standard EN 17025, accreditation number – 1984).

Extract from the COFRAC declaration: *"COFRAC is therefore at the peak of the structure required by the public authorities in the pyramid of trust. Certifying that the accredited organizations are competent and impartial, obtaining acceptance of their services at international level and recognition of the skills of laboratories, inspection and certification organizations: this is the twofold mission of the COFRAC, the French accreditation committee, conducted in application of national regulations and European directives.*
A major player in conformity assessment, COFRAC enjoys the confidence of the public authorities, its partners, the accredited organizations and their customers. All believe in accreditation, convinced of the added value it brings: legitimate skill, confidence of the financial players, international recognition opening the doors to export."

For further information concerning the COFRAC accredited laboratory which conducts the type tests, visit:
http://www.cofrac.fr/fr/recherche/ftechnique.mpi?enti=120002023

PAM

INSTALLATION

Types of laying

Assembly

Installation of special coatings

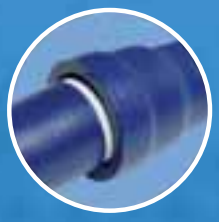
Repairs during installation

Reception on site

Packaging


NATURAL


CLASSIC

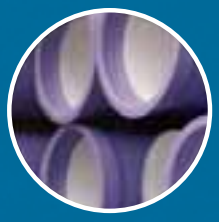

BLUTOP


KAMELEO


PMI Couplings


IRRIGAL


ALPINAL


URBITAL

SAINT-GOBAIN

PAM

SUMMARY

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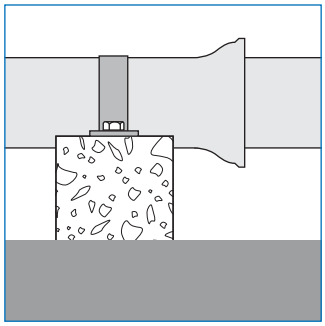
Pipe laying above ground

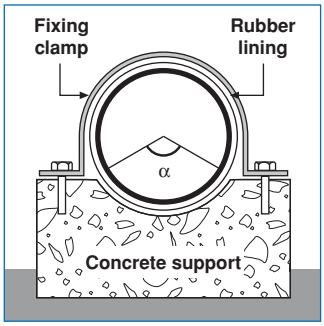
See also: *page*
- Pipe laying through tunnels 260
- Pipe laying – bridge crossing 270
- ISOPAM (preinsulated pipes) laying 352

Laying of a main above ground involves determining:
- *the support system,*
- *the accommodation of thermal expansion,*
- *the anchorage of components subjected to hydraulic thrust.*

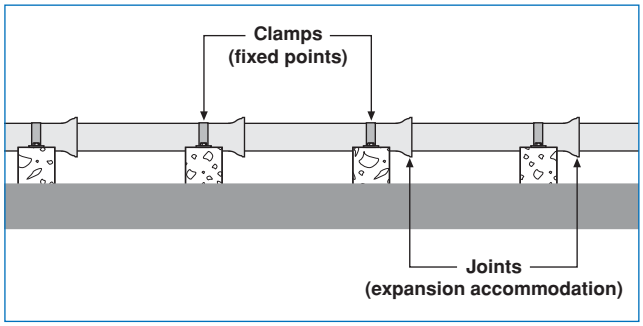
Supports

The following paragraphs give the general principles usually followed when laying STANDARD pipes above ground.
- one per pipe,
- each support behind a socket,
- a support saddle (α = 120° is a good precaution),
- a fixing clamp with rubber lining.





Thermal expansion

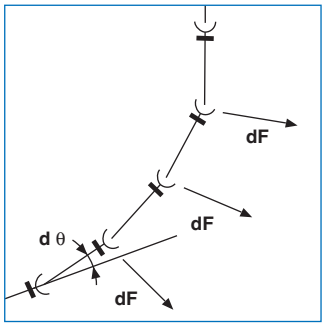


The advantage of ductile iron pipelines is that they do not require the installation of expansion absorbers.

Fixed point: every clamp must be sufficiently secured to constitute a fixed point (use a clamp of adequate width).

Expansion accommodation: the push-in joint between each support acts as an expansion absorber, taking up the expansion of the pipe length (within the permissible limits of ΔT).

Pipe laying above ground



Anchoring

Any component subjected to hydraulic thrust (bends, tees, tapers) must be stabilized with an anchor block.

Directional changes involving large radius bends can be negotiated simply by joint deflection (within the specified limits). In this case, care must be taken to reinforce the saddle anchorage of pipes involved, having assessed the hydraulic thrusts at the deflected joint positions.

Provision of an adequate safety margin on the support dimensions (saddles and clamps) is recommended, to compensate for hydraulic forces due to any misalignment of the pipes.



Pipe laying in casings

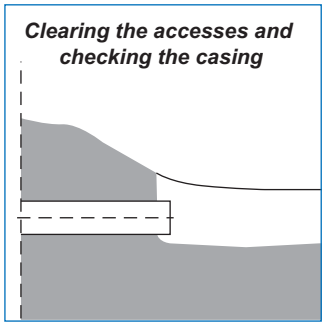
See also: *page*

- STANDARD joint 164
- STANDARD Vi joint 193
- UNIVERSAL Vi joint 203
- STANDARD V+i joint 209
- UNIVERSAL Ve joint 205
- STANDARD Ve joint 211
- Anchoring joint 63
- Pipe laying equipment 277
- Site tests 369

Laying of a carrier pipe through a casing involves:

- *the centering and guidance of each component within the casing,*
- *anchoring the components together, to allow pulling of the section through the casing.*

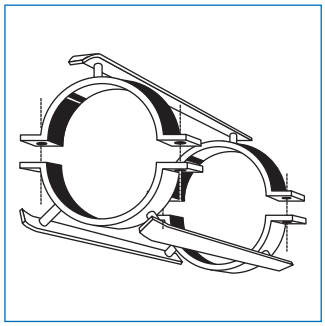
Ductile iron socket pipes may easily be installed through casings.



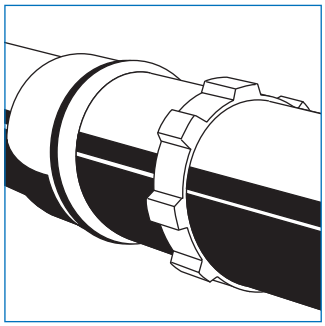
Before preparing the pipe guide sled:
- clear the accesses to the casing,
- check the condition and alignment of the casing,
- ensure that the size of the guide sled is compatible with the internal diameter of the casing.

Guide sled preparation

• Depending on the pipe diameter, the socket diameter and possibly the anchoring gland, use, or construct, the guide sled and centering collars most appropriate for pulling the pipes through the casing.



Support



Guidance collar

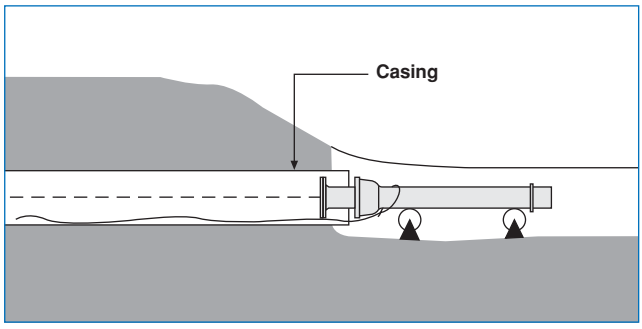
Pipe laying in casings

• Make sure that the traction load does not exceed the joint resistance.

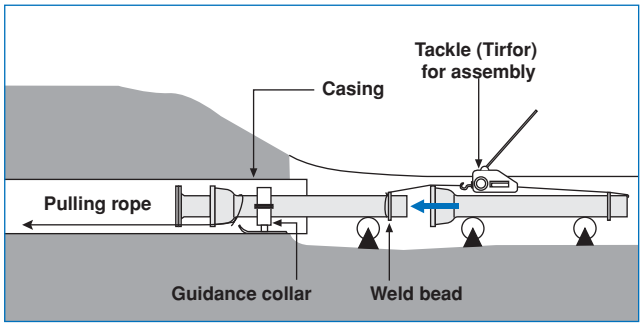
DN	De (mm)	Maximum traction load (kN)		
		STD Vi C40/C30	Univ Vi K9	Univ Ve K9
60	77	12		
80	98	17	45	
100	118	25	61	70
125	144	36	85	104
150	170	45	109	136
200	222	62	166	201
250	274	94	230	271
300	326	134	284	342
350	378	180	281	426
400	429	231	289	506
450	480	235	290	579
500	532	245	356	667
600	635	317	507	855
700	738			1155
800	842			1392
900	945			1753
1000	1048			2157
1100	1152			
1200	1255			2474

Pulling the main through the casing

Using ANCHORED STANDARD pipes



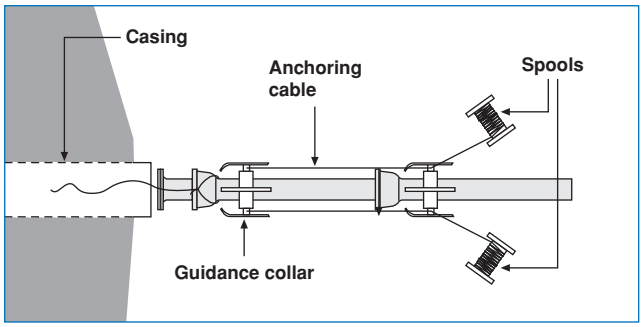
• Pass a wire rope through the casing and attach it to the first pipe.
• Attach guidance and centering collars behind each socket.
• Pull the first pipe into the casing.



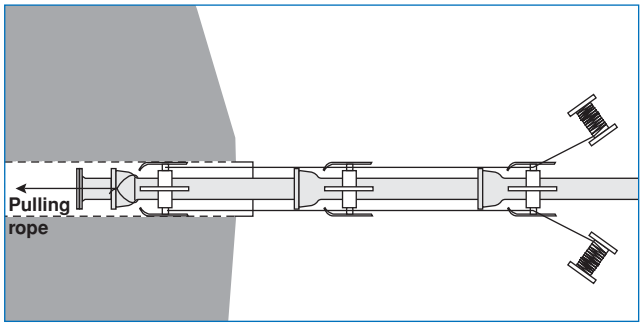
• Joint the spigot into the second pipe.
• Anchor the joint.
Having completed this operation:
– pull the second pipe into the sleeve,
– continue joining ANCHORED STANDARD pipes on until the first pipe emerges from the other end of the casing.

Pipe laying in casings

With ordinary STANDARD joint and anchoring cable



• Pass a drag rope through the casing, attached to the anchoring cable.
• Attach guidance and centering collars behind each socket, equipped with a fastening for the drag rope.
• Position the first pipe in the casing.
• Attach the anchoring cable and pull the pipe.



• Joint the spigot into the socket of the second STANDARD pipe.
• Attach the anchoring cable to the second support and continue pulling the pipes.
• Continue joining STANDARD pipes on until the first emerges from the other end of the casing.
• Uncouple the drag rope attached to the first pipe, leaving the anchoring cable in position.

Pressure testing

Before connecting the two ends of the main in the casing to the rest of the system it is advisable to subject it to a pressure test, identical to that for the remainder of the system.





Pipe laying through tunnels

See also: *page*
- Pipe laying above ground 255
- Pipe laying – bridge crossings 270
- Joint deflection 77

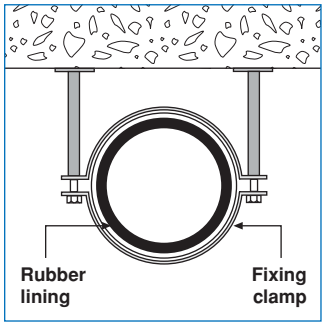
Laying a socket pipe system through a tunnel involves:

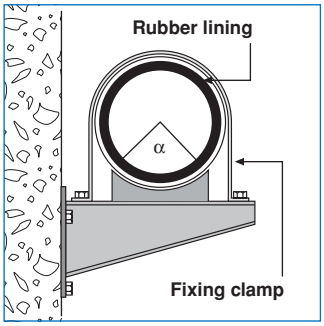
- *support,*
- *accommodation of thermal expansion,*
- *anchorage of components subjected to hydraulic thrust.*

Ductile iron socket pipes provide a simple solution, particularly if cramped conditions do not permit the use of large joint assembly equipment.

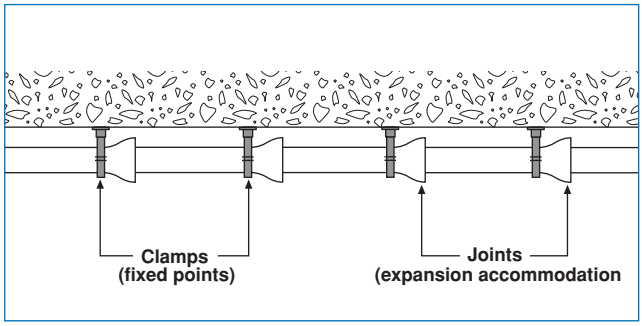
Supports

- one per pipe,
- each support behind a socket,
- a support saddle (α = 120° is a good precaution),
- a fixing clamp with rubber lining.





Thermal expansion

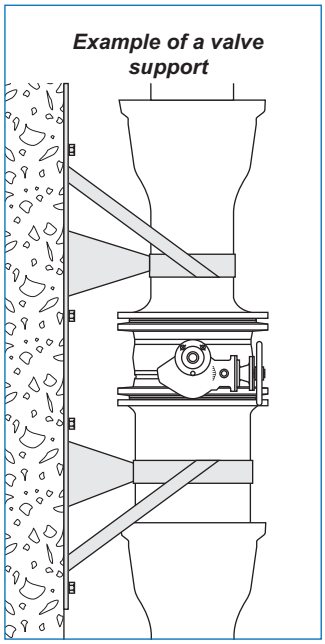


The advantage of ductile iron mains is that expansion absorbers are not necessary.

Fixed points: every clamp must be sufficiently secured to constitute a fixed point (provide a clamp of sufficient width).

Expansion accommodation: the push-in joint between each support acts as an expansion absorber, taking up the expansion of the pipe length (within the permissible limits of ΔT).

Pipe laying through tunnels



Anchoring

Every component subjected to hydraulic thrust (bends, tees, isolating valves...) must be stabilized by an anchoring system (rigid welding to fixing plates is often a good method).

Directional changes involving large radius bends can be achieved simply by joint deflection (within the specified limits).
In this case, care must be taken to reinforce the support anchorage of the pipes involved, having assessed the hydraulic thrusts at the joint positions.

It is recommended to include a safety coefficient, to compensate the hydraulic forces due to a possible misalignment of the pipeline.



Pipe laying under water

See also: *page*
- Joint deflection 77
- Unstable ground 82
- Joint – anchoring 63

Pipe laying under water requires the use of tried and tested techniques and the greatest possible care, because the difficulties involved in underwater maintenance make any servicing time-consuming, difficult and costly. Underwater laying techniques suited to the site topography and hydraulic conditions of the stream to be crossed can be used with ductile iron pipes.

Context

A drinking water supply or irrigation project can include an underwater section:
– crossing a stream on the pipe route,
– intake in a lake or impounding reservoir in altitude,
– laying along a stream bed.

Firms can, on the basis of projects designed by the contractors, carry out works based on the examples shown below.

Technique

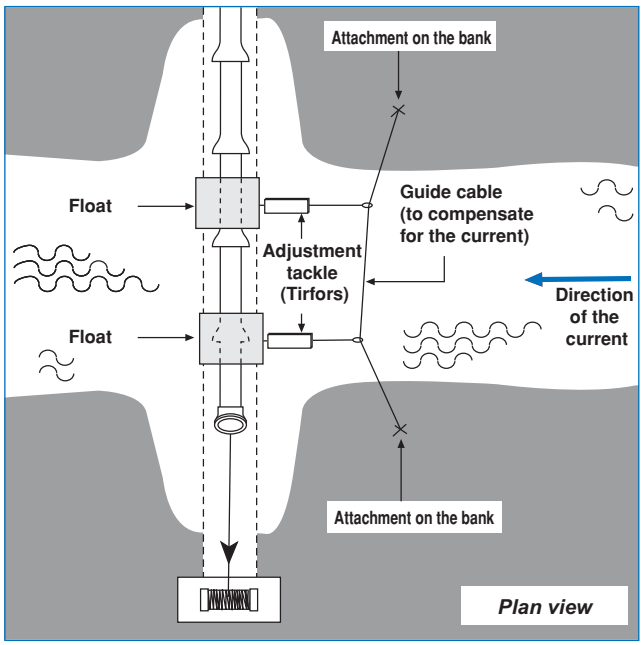
The solution chosen must comply with the following constraints:
– resistance to internal and external pressures,
– long-term guarantee of leaktightness and infiltration tightness,
– mechanical resistance of pipelines to external stresses (changes to pipeline profile, embankment erosion, floodwaters, etc.),
– ease and speed of laying given the sometimes sudden variations in water level,
– pipe, fitting and joint compatibility with the laying techniques employed.



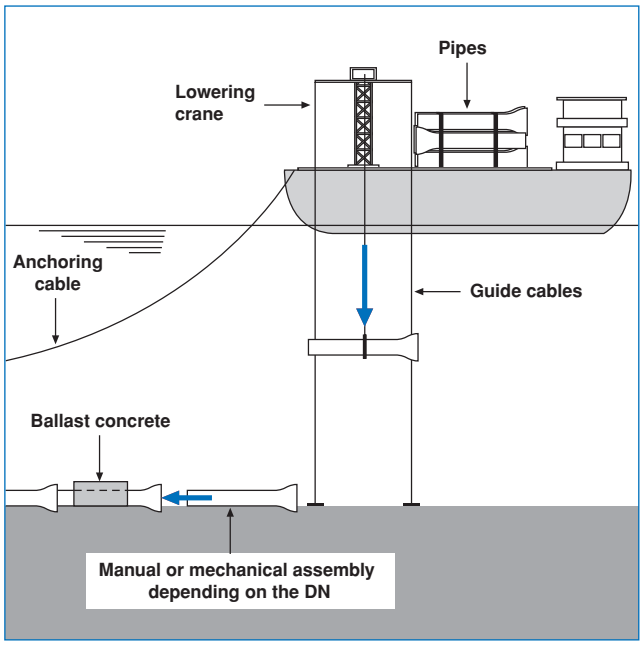
Pipe laying under water

Examples

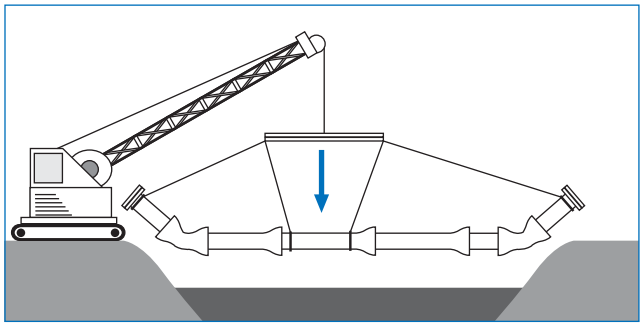
- **Example of anchored joint assembly above water as the pipeline progress**



- **Example of underwater assembly with or without anchored joints depending on prevailing technical constraints**



- **River crossing with anchored joint section assembled on the bank**

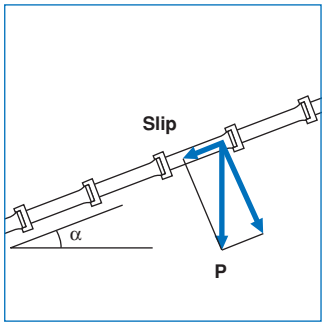


Pipe laying - steep incline

See also: *page*
- Joint - anchoring 63
- Anchor blocks 69

Laying of ductile iron mains on steep inclines can be performed in two ways:

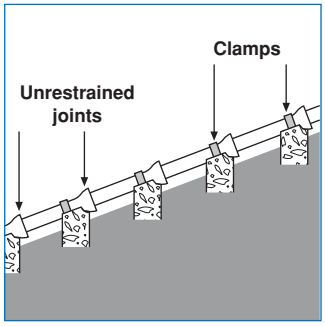
- *using concrete blocks for each pipe,*
- *using a concrete block at the head of an anchored length.*



Axial force

Beyond a certain angle, the friction between a main and the ground is insufficient to hold the main. The longitudinal gravitational movement then has to be counteracted by the use of anchor blocks or anchored joints, or a combination of both techniques. In simple terms, it is found that a main needs to be anchored when the incline exceeds:

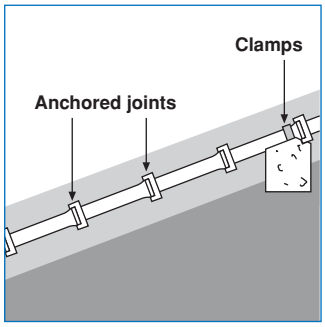
- 20 % for a surface main,
- 25 % for a buried main.



Anchoring every pipe

This technique is quite suitable for surface mains.

- An anchor block behind every pipe socket.
- Sockets point uphill to take purchase on the blocks.
- A clearance of 10 mm is left between the spigot end and the back of the socket chamber to accommodate expansion (usual EXPRESS and STANDARD joint laying conditions).



Anchoring with anchored joints

This technique is quite suitable for pipes laid below ground.

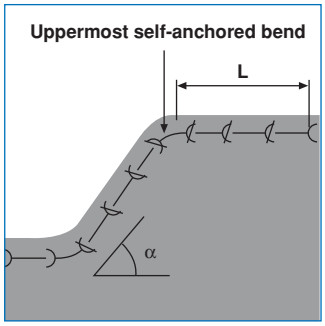
It consists of anchoring a section of anchored pipes:

- either by an anchor block situated behind the socket of the leading pipe,
- or by an additional anchored length (L) installed in the flat section behind the uppermost bend.

The maximum axial force is supported by the first anchored joint below the block. This force is a function of the gradient, and also of the length of the anchored section. The maximum permissible length therefore is defined by the strength limit of the anchored joint.

Note: If the length of the incline exceeds the permissible anchored length, the descent can be made in several independent sections, each being anchored at its head with a concrete block. The end joints of the sections are not anchored in this case.

Note: The main must be laid downhill starting from the highest point, so that the self-anchoring system is fully engaged and tensioned.

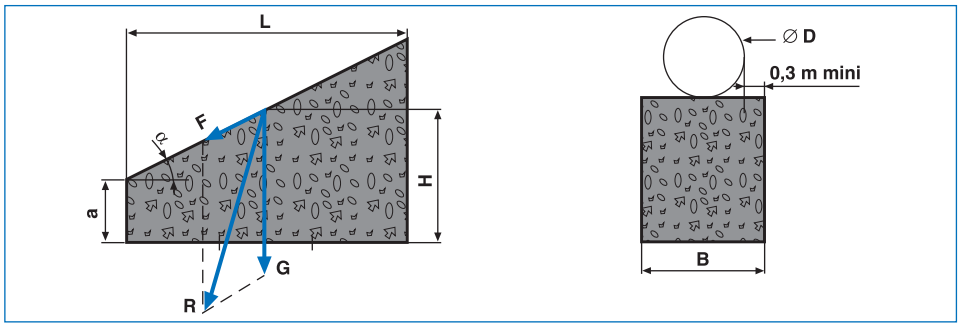


Pipe laying - steep incline

Anchoring block dimensions for a buried section







a: height of the block heel
α: gradient
F: slip force
L: seating length
B: seating width
H: block height
W: weight of pipe or section filled with water
S: cross section
P_{max} : maximum service pressure for anchored joint
f: soil/pipe friction coefficient
Φ: angle of internal friction. See SOIL (MECHANICAL PROPERTIES)
G: block weight
γ: bulk density of concrete (22 000 N/m^3)
D: pipe diameter

Hypotheses

- R passes through the central third of the block base.
- The hydraulic thrust on the top bend is not taken into account.

Block dimensions

$$L = \left[\frac{6F\cos\alpha}{\gamma B}\right]^{1/2}$$

$H = 0.5\ L\ \text{tg}\ \alpha + a$ (a = 0.10 m mini)

$G = \gamma LBH$

Where:

$F = W(\sin\alpha - f\cos\alpha)$

$f = \alpha_2\ tg\ (0.8 \cdot \Phi)$ with $\alpha_2 = 1$ pipe coated with zinc + varnish

$\alpha_2 = \frac{2}{3}$ pipe in PE sleeve, PE or PU

Other conditions to be checked:

– anchored joint resistance: $W < P_{max} \cdot S$

– block non-slippage: $\frac{F\cos\alpha}{G} \leq 0.9\ tg\ \Phi$ (otherwise increase H)

Pipe laying – trenchless

See also: *page*
- Joint - Anchoring 63
- STANDARD TT (special coating) 123
- Joint – Anchored UNIVERSAL STANDARD Ve 205

Ductile iron pipes DN 60 to 1000 can be laid without a trench using one of two techniques:

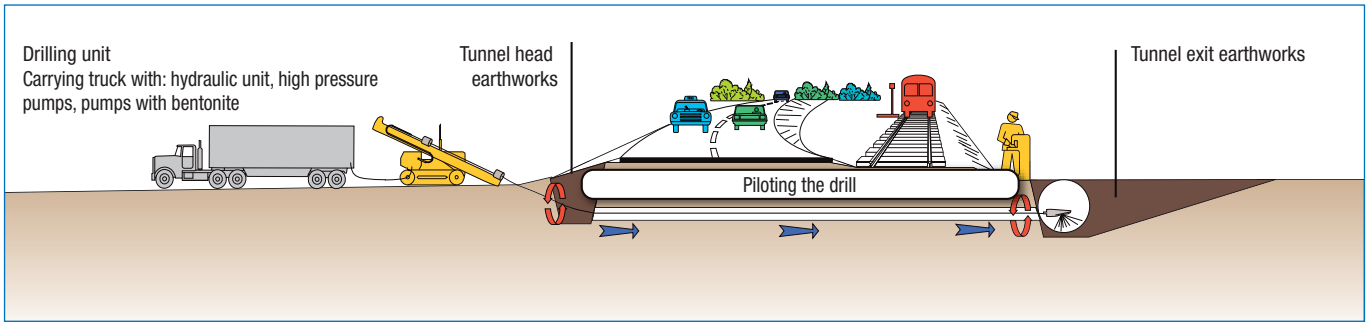
- *new pipe laying by horizontal directional drilling (HDD),*
- *trenchless replacement of existing pipes.*



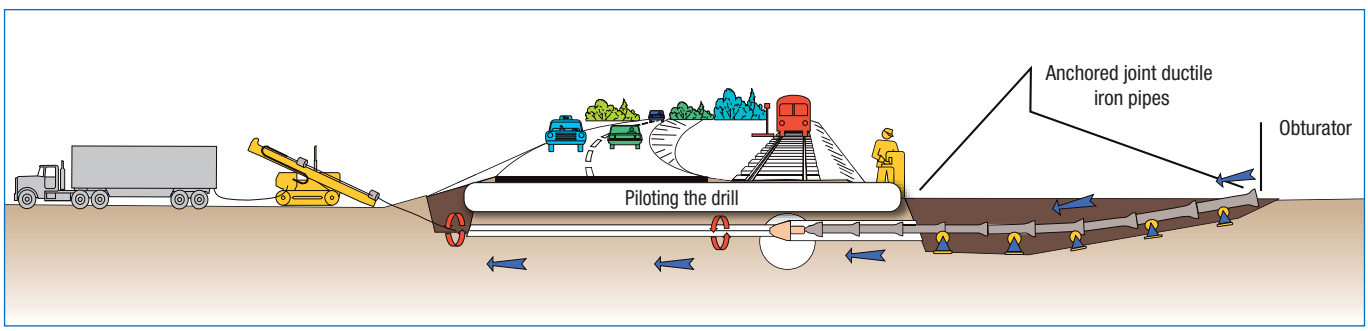
Horizontal directional drilling: the principle

This type of pipe laying is suitable for crossing under obstacles, rivers, motorways, railways, without recourse to an open trench and without disrupting the activity on the surface.
Ductile iron pipe laying by HDD involves several stages:
a) sub-soil survey, notably with the use of a georadar;
b) drilling a pilot hole using a piloted rotatable drill that bores through the soil. It draws behind a train of rotating rods;
c) calibre boring the pilot hole and drawing through the iron pipe. The train of rods installed during stage b) is used to draw back a bore tool followed by the ductile iron pipes assembled and anchored to each other as works progress. This operation, as well as the previous one, is accompanied by the injection and constant circulation of bentonite.

Drilling the pilot hole



Boring the pilot hole and drawing through the pipes

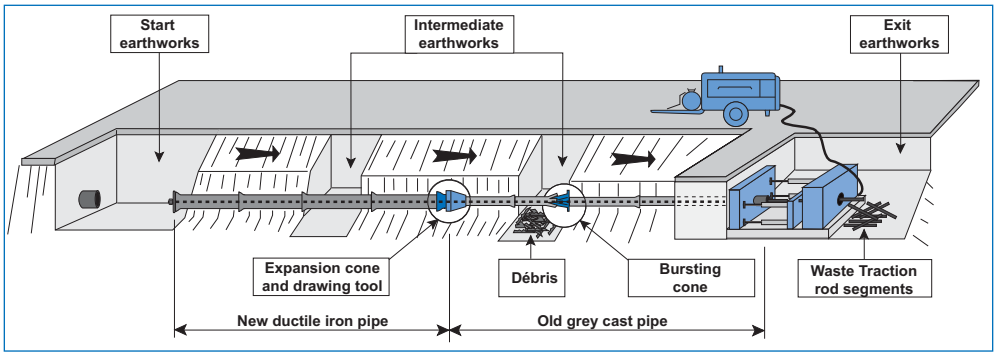


Pipe laying – trenchless

Trenchless pipe replacement: principle

Trenchless pipe replacement is used to extract an old grey cast iron pipe and replace it with a new ductile iron pipe.
An extraction machine is installed in the exit earthworks of the section to be replaced. A traction rod, made up of small segments assembled as work progresses, is installed inside the pipe to be replaced, and a drawing tool is attached to it at the start earthworks end. The tool pushes the old pipe and draws in its wake the new anchored joint pipes.
The old pipe is destroyed and removed as it passes through small intermediate earthworks spread out along the route.

Trenchless pipe replacement



Products

The range of pipes and anchored joints that can be used for trenchless pipe laying is as follows:

– **UNIVERSAL TT pipes** with a thick external polyethylene coating TT PE, DN 100 to 700 and with external polyurethane coating TT PUX, DN 800 to DN 1000.

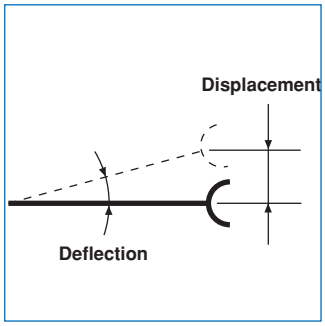
– **Anchored joints:**

• UNIVERSAL Ve : DN 100 to 1000 (see JOINT - ANCHORED UNIVERSAL STANDARD Ve)

– **Pulling head:**
drawing tool specifically designed for this purpose is used to attach the first pipe to the bore head or the drawing tool. (Please consult us.)

Pipe laying – trenchless

Ductile iron pipe anchored joints allow for joint deflection and traction stress (see table). They are more than compatible with the route requirements and lengths involved in microtunnelling or trenchless pipe replacement.



DN	Type of joint	Useful length L	Maximum joint deflection	Displacement	External coating
		m	*degree*	*cm*	
100	UNI Ve	5.97	3°	31	TT PE
150	UNI Ve	5.97	3°	31	TT PE
200	UNI Ve	5.97	3°	31	TT PE
250	UNI Ve	5.97	3°	31	TT PE
300	UNI Ve	5.97	3°	31	TT PE
350	UNI Ve	5.97	3°	31	TT PE
400	UNI Ve	5.97	3°	31	TT PE
450	UNI Ve	5.97	3°	31	TT PE
500	UNI Ve	5.97	2°	21	TT PE
600	UNI Ve	5.97	2°	21	TT PE
700	UNI Ve	5.97	2°	21	TT PE
800	UNI Ve	6.89	2°	24	TT PUX
900	UNI Ve	6.87	1.5°	18	TT PUX
1000	UNI Ve	6.88	1.2°	14	TT PUX



Innovative techniques to reduce disturbances caused by work sites

The number of buried networks and their different types have increased dramatically with the development and demographic growth.
Trenchless pipe laying techniques - horizontal directional drilling or in situ laying - provide efficient targeted solutions to protect inhabitants and the environment from the impacts of work sites.



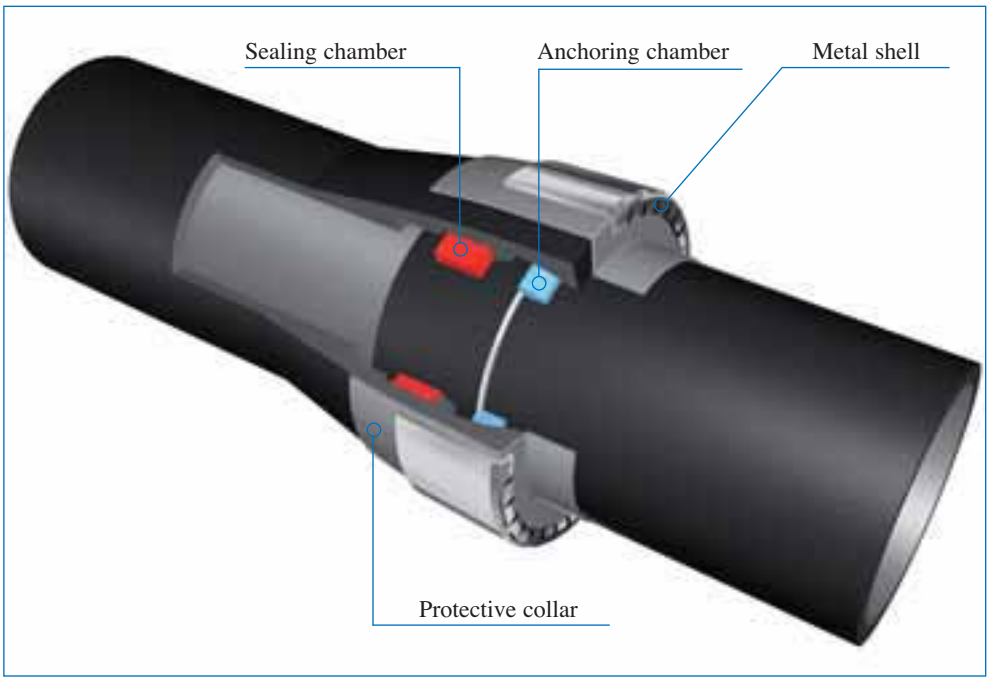


Pipe laying – trenchless

The pipes fitted with UNIVERSAL Ve joints and coated with special external coating of type TT (PE and PUX) are ideally suited for horizontal directional drilling and in situ laying.
The exceptionnal mechanical strength of UNIVERSAL Ve type anchored joints combined with their ability to high angular deflection enable to draw lengths of several hundred meters without any risk of joint dislocation when pulling loads are applied.

Permissible pulling forces (kN) for various pipe diameters and pulling lengths									
DN	Pipe pulling lengths in horizontal directional bores - km								
	0 to 0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2
100	87	84	80	77	73	70	66	63	59
125	114	109	105	100	96	91	87	82	78
150	136	131	125	120	114	109	104	98	93
200	201	193	185	177	169	161	153	145	137
250	271	260	250	239	228	217	206	195	184
300	342	329	315	301	287	274	260	246	233
350	426	409	392	375	358	341	324	307	290
400	506	486	465	445	425	405	384	364	344
450	579	556	533	510	486	463	440	417	394
500	667	640	614	587	560	533	507	480	453
600	855	821	787	752	718	684	650	616	581
700	1000	961	921	881	841	801	761	721	681
800 to 1000	Please consult us								

For nominal diameters exceeding DN 300, ballasting of pipes is a solution which allows the contractor to reduce the pulling forces.
"These recommandations are based on the experience of PAM. However, the contractor in charge of the project has full responsibility for carrying out the installation in accordance with applicable good working practises." Please refer to the brochure "There are places where discretion is a paramount" to have more information on PAM ranges for horizontal directional drilling products.



Pipe laying - bridge crossing

See also: *page*

- Pipe laying above ground 255
- Pipe laying through tunnels 260
- ISOPAM (preinsulated pipes) laying 352
- STANDARD Vi joint 193
- EXPRESS Vi joint 195
- STANDARD Ve joint 211
- UNIVERSAL Ve joint 205
- UNIVERSAL Vi joint 203

Bridge crossing with a push-in joint main involves determining:

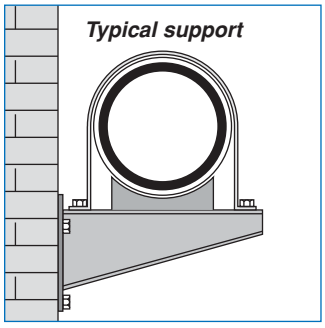
- *the support system,*
- *the accommodation of both bridge and main thermal expansions,*
- *the anchoring of components subjected to hydraulic thrust,*
- *the protection against freezing, if necessary.*

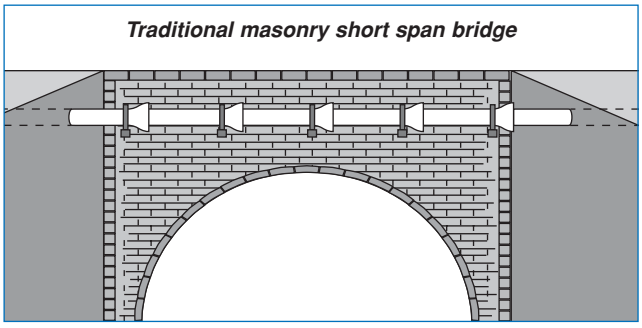
There are two principal installation systems, the choice depending on the type of structure:

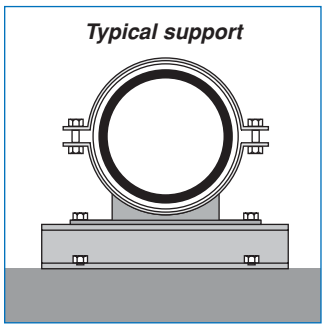
- *pipeline secured to the structure,*
- *pipeline independent of the structure.*

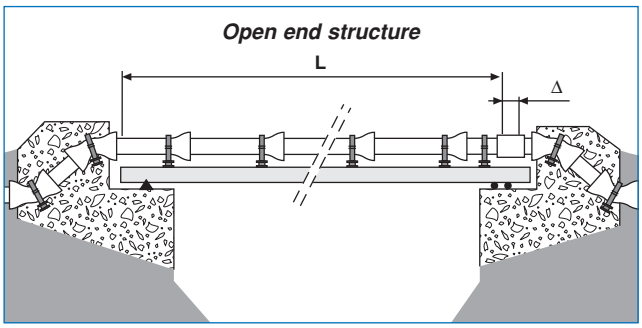
The systems shown below correspond with the usual types of bridge crossings; they are merely given as examples and do not represent the variety of situations that may be encountered.
Every bridge is a special case and must be specifically studied. The initial concern is to ensure that the structure can support the weight of the main and that provision of anchorages is possible.

Pipelines fixed solidly to the structure









Pipe laying - bridge crossing

Supports

– one per pipe,
– every support behind a socket,
– supporting saddles (α = 120° s a good precaution),
– securing collars,
– rubber protection.

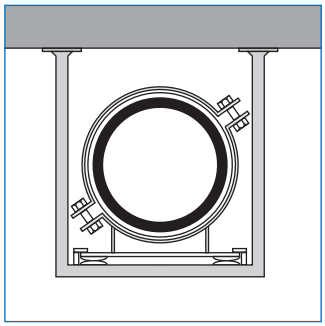
Thermal expansion

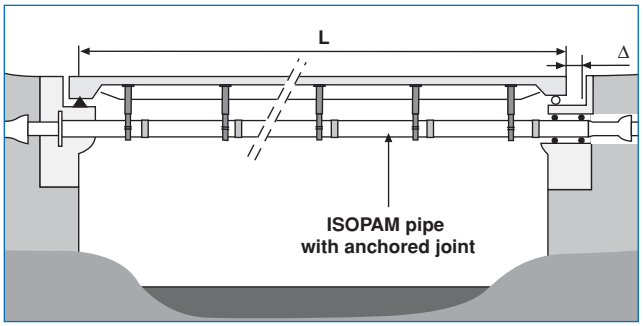
Relative expansion: every clamp must be adequately secured and act as a fixture to the bridge. Between each of these supports, which are solid with the pipe and bridge, the push-in joints act as expansion compensators, absorbing the expansion of a length of pipe.
Overall expansion (ΔL): depending on its amplitude, the overall expansion at the bridge ends is accommodated by either a simple socket joint (in the case of a traditional short span masonry bridge), or by an adequate size expansion accommodator (in the case of an open end bridge).

Anchorage

Every component subjected to hydraulic thrust (bends, tees, valves...) must be held by an anchoring system.
The supports must be of sufficient dimensions to secure the correct alignment of the pipes and to withstand the hydraulic thrust. Provision of an adequate safety margin on the support dimensions is recommended, to compensate for hydraulic forces due to any misalignment of the pipes.

Pipeline independent of the structure





Supports

Each support is solid with the pipeline and independent of the bridge movements. Several techniques may be used, using sliding or rolling on rails or rollers, depending on the magnitude of the expansions.
The support sliding forces must be compatible with the anchoring system:
– one support per pipe,
– every support behind a socket,
– a saddle support,
– a securing collar,
– a rubber protection.

Pipe laying - bridge crossing



Thermal expansion

The pipeline expands and contracts independently of the bridge. The joints are anchored: they facilitate assembly and play a part in distributing the overall pipeline expansion. This expansion, ΔL, is taken up by an adequately sized expansion absorber at the free end of the main.

Anchorage

Every component subjected to hydraulic thrust (bends, tees, valves...) must be stabilized by an anchoring system.
Sliding supports must be of adequate size to maintain the pipeline correctly aligned and to withstand the effects of hydraulic thrust.
Provision of an adequate safety margin on the support dimensions is recommended, to compensate for hydraulic forces due to any misalignment of the pipes.



Recommended anchoring systems according to specific situations and types of laying

Synthesis

Recommanded self-anchoring solutions for different locations and pipe-laying techniques			
Pipeline location	Laying technique	Insert type anchoring	Bead type anchoring
Buried	Open trench	STANDARD Vi, UNIVERSAL Vi, EXPRESS Vi and STANDARD V+i	UNIVERSAL Ve, PAMLOCK and STANDARD Ve
	Directional drilling	Cannot be used	UNIVERSAL Ve
	Underwater laying	Cannot be used	UNIVERSAL Ve, PAMLOCK, STANDARD Ve
	Casing	STANDARD Vi and UNIVERSAL Vi Usable for short, straight sleeves	UNIVERSAL Ve, PAMLOCK, STANDARD Ve
Above ground	Bridge	STANDARD Vi, EXPRESS Vi and UNIVERSAL Vi For short-span bridges only	UNIVERSAL Ve, STANDARD Ve All types of bridges, including long-span
	Tunnels and technical areas	STANDARD Vi, EXPRESS Vi, UNIVERSAL Vi and STANDARD V+i Hydraulic thrust forces compensated by suitable support devices	UNIVERSAL Ve, STANDARD Ve Hydraulic thrust forces compensated by suitable support devices
Buried or above ground	Steep incline	STANDARD Vi, EXPRESS Vi UNIVERSAL Vi, and STANDARD V+i Compensate sliding loads at top of slope and, if slope is long, at several points along the slope	UNIVERSAL Ve, STANDARD Ve and PAMLOCK Compensate sliding loads at top of slope and, if slope is long, at several points along the slope


PAM
PAM
Innovation et
Tradition ?

Lubricating paste

See also:

page

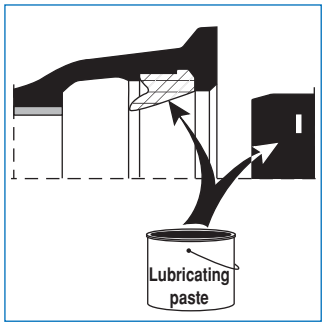
- Materials in contact with drinking water 99

The seal of the push-in joints is achieved by compression of the joint gasket during assembly. Lubricating paste is required for this operation, to reduce the jointing force.

Packaging

The lubricating paste is packed in 0.850 kg cans which indicate the recommendations for use.

Procedure



First check that the pipe spigot is chamfered.
Otherwise, do it.
See CUTTING PIPES.
A thin layer of the lubricating paste is brushed on.
The paste is applied on the visible face of the joint gasket in position in its housing and on the spigot.

Lubricating paste characteristics

The lubricating paste:
- reduces the jointing force,
- is applied easily on site,
- has good water resistance,
- can be used across a wide range of temperatures (-20 °C to +60 °C),
- translucent and odourless, it:
  - preserves the quality of the potable water,
  - prevents bacterial growth..

Contact with potable water

See the chapter MATERIALS IN CONTACT WITH DRINKING WATER

Lubricating paste



Quantity

The following table indicates the number of cans of lubricating paste generally required to make 100 joints.

DN	Number of cans	DN	Number of cans
60	2	600	9
80	2	700	13
100	2	800	15
125	2	900	17
150	3	1 000	19
200	3	1 100	21
250	4	1 200	24
300	5	1 400	40
350	5	1 500	45
400	6	1 600	50
450	6	1 800	60
500	7	2 000	71

For BLUTOP pipes and fittings, use BLUTOP lubricating paste (ref. 214 611) and refer to the BLUTOP chapter, lubrication instructions.

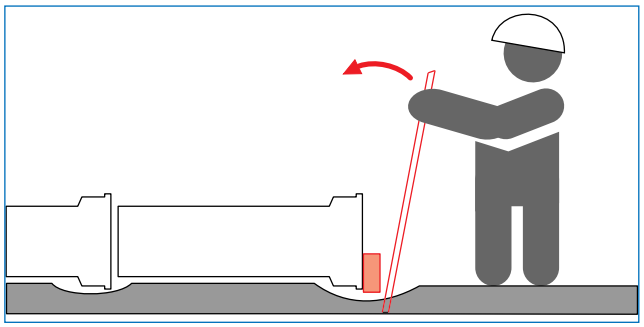
Equipment for assembly



Crowbar

- **DN 60 to 125**

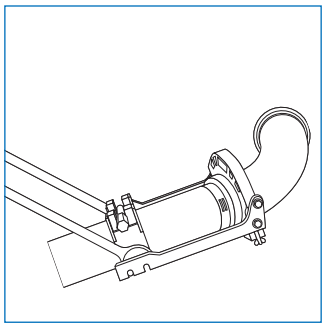
Protect the socket with a piece of hard wood.



Sockets

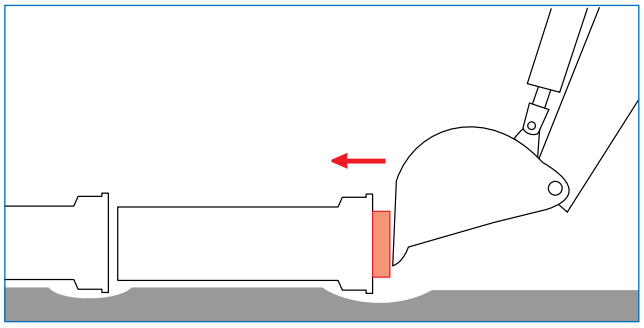
- **DN 80 to 300 - Insertion machine**

Solution recommended for assembling fittings.



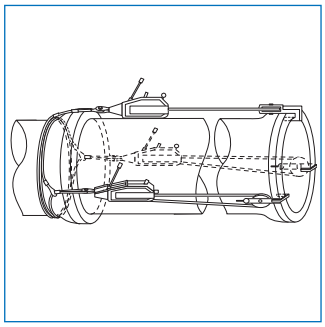
- **DN 125 and over - Mechanical shovel**

Insert a wooden plank between the bucket and the pipe



Equipment for assembly

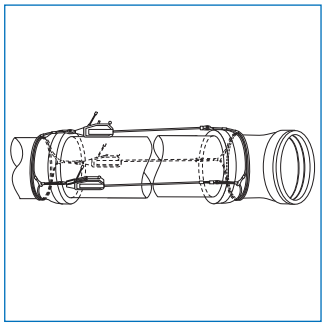
Mechanical winches



● DN 150 and over

Practical solution when access is difficult.
Use one or more winches depending on the DN:

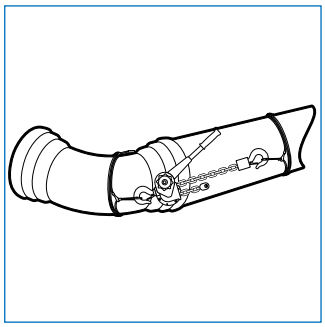
DN	Nbr of winches
150 to 300	1 T516 (2.5 tonnes)
350 to 600	1 T532 (5 tonnes)
700 to 1200	2 T532 (2 x 5 tonnes)
1400 to 2000	3 T532 (3 x 5 tonnes) **+ 3 pulleys**



● DN 500 to 2000

DN 500 to 1200: 3 TIRFOR 532 winches at 120°, 3 shackles and 6 wire ropes.
DN 1400 to 1800: 3 TIRFOR 532 winches at 120°, 6 wire ropes, 6 shackles, 3 pulley blocks.

Ratchet winch

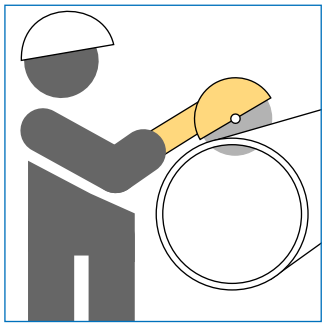


● DN 80 and over

REMA, PUL-LIFT YALE type ratchet winch with textile straps with looped ends.

DN	Nbr of ratchet winches
80 to 300	1 (1.5 tonnes)
300 to 800	3 (3 tonnes)
900 to 1200	2 (6 tonnes) ou 3 (3 tonnes)
1400 to 2000	3 (6 tonnes)

Cutting pipes

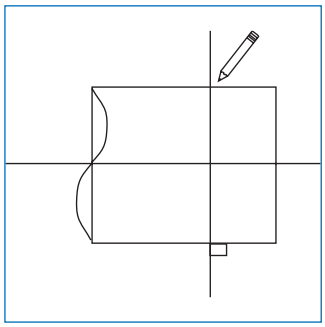


Check the outer diameter

Before cutting, use a circumference tape to check that the OD measured is less than OD **+ 1 mm** (see table below).

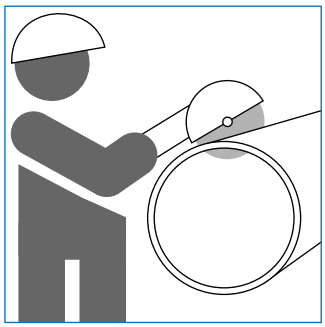
DN	OD mm	DN	OD mm	DN	OD mm	DN	OD mm
60	77	250	274	600	635	1200	1255
80	98	300	326	700	738	1400	1462
100	118	350	378	800	842	1500	1565
125	144	400	429	900	945	1600	1668
150	17	450	480	1000	1048	1800	1857
200	222	500	532	1100	1151	2000	2082

DN ≤ 300: preferably, cut at a distance of **less than 4 m from the pipe spigot**.
DN > 300: preferably, cut the **calibrated** pipes specified in the order and identified by metal grey painted rings on the socket edges.



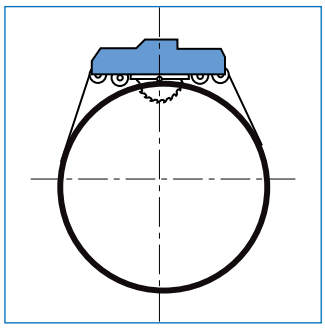
Mark

Mark the cutting plane **perpendicular** to the pipe axis.



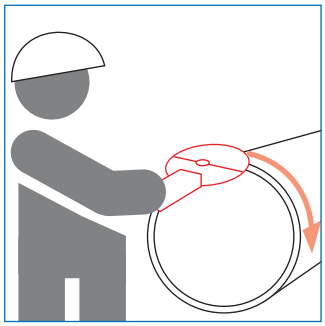
Cut

• For DN 60 to 700
Use a cut off machine, for example.
• For DN 800 to 2000
Use a pneumatic cross cut saw (e.g. FEIN) which, with an adaptation, can produce the chamfer at the same time.



ASSEMBLY

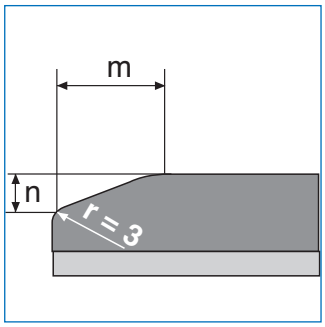
Cutting pipes



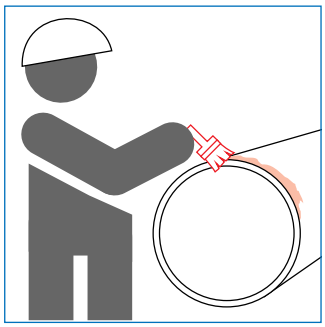
Fettle or chamfer

• For EXPRESS mechanical joints, collar, fettle the cut edges with an angle grinder.
• For STANDARD, STANDARD Vi, UNIVERSAL, etc. automatic joints redo the chamfer with an angle grinder to avoid damaging the joint.

DN	m (mm)	n (mm)
60 to 600	9	3
700 to 1200	15	5
1400 to 1600	20	7
1800 to 2000	23	8



Cross section of the chamfer



Redo the coating

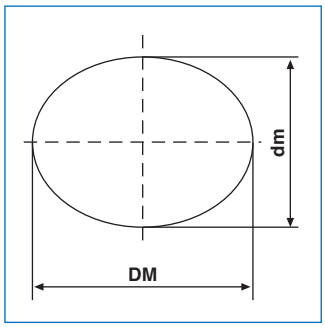
Recoat the edge exposed by the cut and the chamfer.
For the traditional black coating:
• ENDOLAC 245-30 (1 kg: Ref. 518134; 5 kg: Ref 158131)
For NATURAL coating:
• EUROKOTE 438 (1 kg: Ref. 158255)

Respect the recommendations for use on the safety data sheets available on www.pamline.com

Desovalisation

See also: *page*
• Cutting pipes 279

Transporting, handling and cutting large diameter pipes may result in ovalisation, preventing correct assembly of the pipeline elements. The methods described below concern pipes of DN ≥ 400.



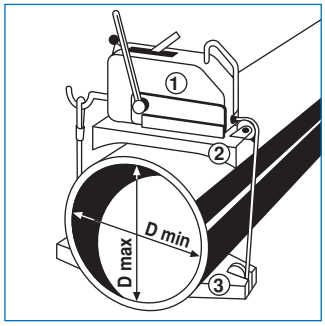
Definitions and criteria

$$\text{ovality in \%} = \frac{DM - dm}{DM + dm} x\ 100$$

where:
DM : maximum diameter measured
dm : minimum diameter measured

Experience has shown that ovalisation making it difficult to assemble the pipes is extremely rare for small and medium diameters (DN < 400).
In case of ovalisation, re-rounding (or de-ovalisation) can be carried out according to one of the following procedures, ensuring that this operation does not damage the internal cement coating.

DN 400 to 700



Equipment

• TIRFOR 516 winch (1)
• Winch support with cable guide roller (2)
• Base plate with 2 cable guide rollers (3)

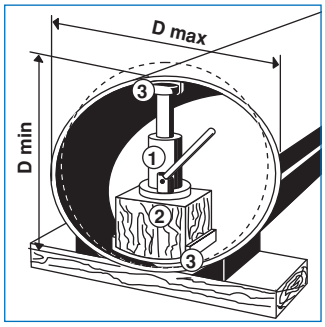
Procedure

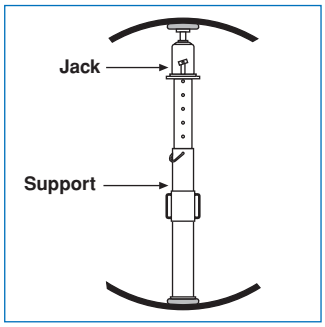
• Fit the equipment according to the diagram opposite. Tighten up the cable.
• Check the re-rounding of the spigot to avoid exceeding the circular shape.
• Check that this operation has not damaged the internal cement coating.
• Assemble while the equipment is in position. The cable tension must be maintained while assembling the joint, to compensate for the elastic deformation of the pipe.

ASSEMBLY

Desovalisation

DN ≥ 800





Equipment

- Hydraulic jack (1)
- Block (or adjustable support) (2)
- Two sufficiently large rubber-coated protective pads (3).

Procedure

- Position the parts according to the diagram, respecting the ovalisation position.
- Adjust the support according to the diameter.
- Operate the hydraulic jack and check the re-rounding of the spigot to avoid exceeding the circular shape.
- Check that this operation has not damaged the internal cement coating.
- Assemble while the equipment is in position. The equipment must remain under tension to compensate for the elastic deformation of the pipe. The tension must be maintained while assembling the joint.

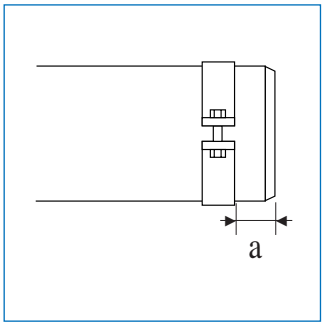


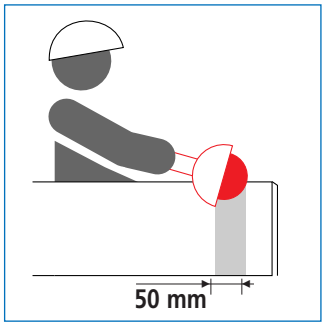
Weld bead

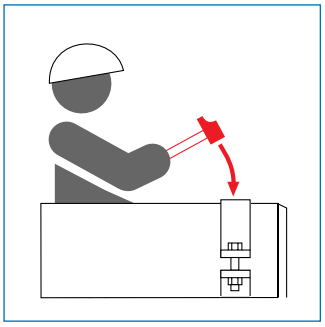
Equipment required

- Arc welding set, minimum 150 A
- Angle grinder
- Copper guide, according to drawing below
- Recommended electrodes: ferro-nickel electrodes - Ø 3.2 mm

Surface preparation

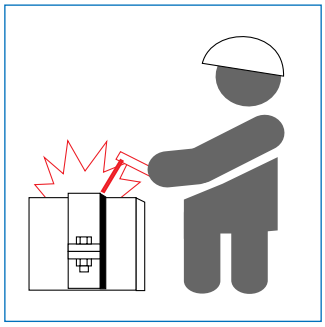


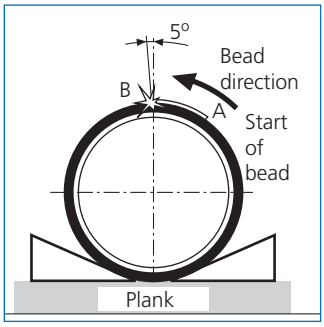




Using the copper guide, mark the position of the weld bead, respecting distance a.
Prepare the surface to be welded by gently grinding a width of about 50 mm.
Position the copper guide upstream from the weld bead, respecting distance a.
It must be pressed against the entire periphery of the pipe. Hammer if necessary.

Producing the weld bead

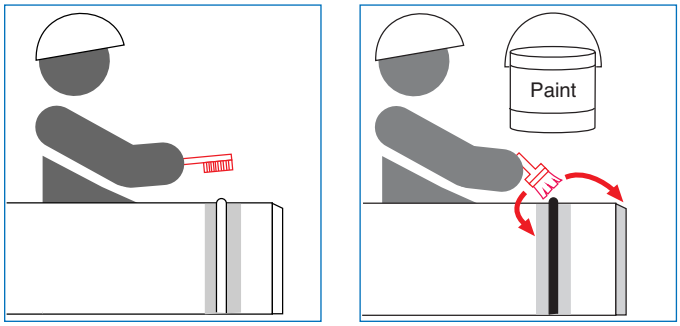




Make the weld bead against the guide to obtain a straight face at right angles to the surface of the pipe.
If possible, work between marks A and B, by rotating the pipe.

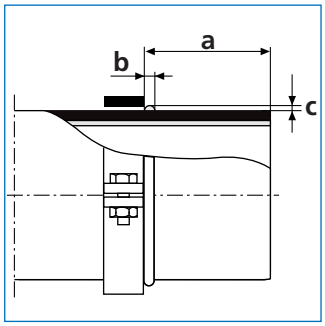
Weld bead

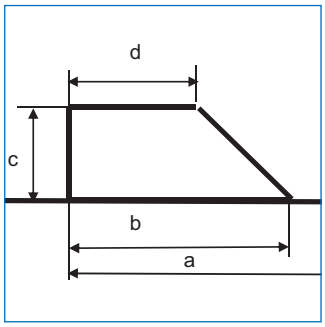
Repairing the external coating



Brush the welded area.
Apply the epoxy paint with a brush, respecting the proportions of the components.
Paint ref.: ENDOKOTE 4820 (colour depending on the pipe type)
Respect the recommendations for use on the safety data sheets available on www.pamline.com

Weld bead dimensions and position



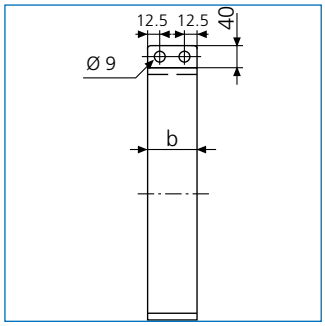


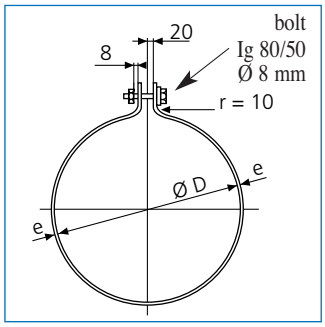
Weld bead dimensions depending on joint type

DN	a	Tolerence a	b	Tolerence b	c	Tolerence c	d	Tolerence d
	mm							
80	85	+/-3	7	+/-1	3	+/-1	-	-
100	90	+/-3	6.5	+/-1.5	3.5	+/-0.5		
125	95							
150	95							
200	100							
250	110							
300	115							
350	115	+/-3	7.5	+/-1.5	4	+/-0.5		
400	113							
450	120							
500	125				4.5			
600	135							
700	158							
800	150	+/-2	9	+/-1	5	-0.8/+0.5		
900	155							
1000	165							
1100	165							
1200	170	+/-2	12	+/-1	5.5	+/-1		
1400	170	-2/+3	15	0/+3	8	-1/+3	7	0/+3
1500	180							
1600	195							
1800	222	-2/+3	28	0/+3	11	-1/+2	15	0/+3
2000	243							

Weld bead

Details of the copper guide





Copper guide

DN	D (mm)	e (mm)	b (mm)
80	96	5	25
100	116	5	25
125	142	5	25
150	168	5	25
200	220	5	25
250	271	5	35
300	323	5	35
350	375	5	35
400	427	5	35
450	477	5	35
500	528	5	35
600	631	5	50
700	734	5	50
800	837	5	50
900	940	5	50
1000	1043	5	50
1100	1140	5	50
1200	1249	5	50
1400	please contact us		
1500			
1600			
1800			
2000			







Handling



Basic instructions

To preserve the integrity of the products:

- Use lifting gear suitable in particular for the weights indicated in the following tables.
- Do not allow the pipes to hit or rub against the lorry walls or stanchions.
- Operate carefully and without swinging.
- Avoid dragging the pipes over the ground or dropping them.

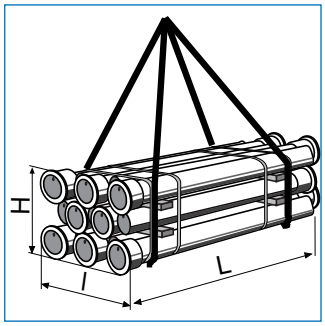
Bundle weights and dimensions

DN	Nbr beds x Nbr pipes	L (m)	l (m)	H (m)	Bundle weight (kg)
60	4 x 6	6.3	0.54	0.49	1411
80	3 x 5	6.3	0.57	0.42	1148
100	3 x 5	6.3	0.67	0.50	1398
125	3 x 4	6.3	0.65	0.58	1380
150	3 x 3	6.3	0.59	0.66	1272
200	2 x 3	6.3	0.75	0.56	1190
250	2 x 2	6.3	0.63	0.67	1044
300	2 x 2	6.3	0.74	0.77	1319

Unit weights of NATURAL and STANDARD K9 pipes

DN	M kg	DN	M kg	DN	M kg	DN	M kg
60	60	250	267	600	895	1200	4112
80	78	300	33	700	1520	1400	5543
100	95	350	407	800	1863	1500	6235
125	118	400	476	900	2230	1600	6941
150	145	450	562	1000	2635	1800	8430
200	203	500	659	1100	3576	2000	10093

NATURAL C40 *NATURAL C30* *STANDARD K9 - CLASSIC*

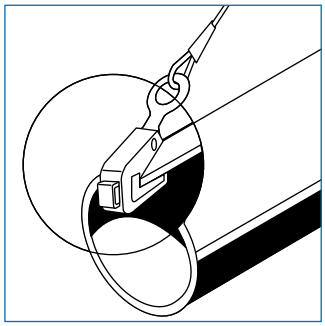


DN 60 to 300: lifting bundles

- Always use textile straps suitable for the load.
- Pass the straps underneath the bundle.

Caution! Never lift a bundle with hooks or suckers. The pipe banding straps are not designed to support the load.

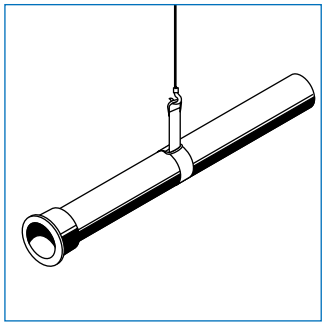
Handling



DN 350 to 2000: lifting by the ends

Always use hooks suitable for the load, offering good grip and coated with a polyamide type protection*.

** Hooks can be ordered from* PAM



DN 350 to 2000: lifting by the barrel

- Always use a textile strap suitable for the load.
- Pass the strap under the centre of gravity of the pipe, making sure that it does not slip.

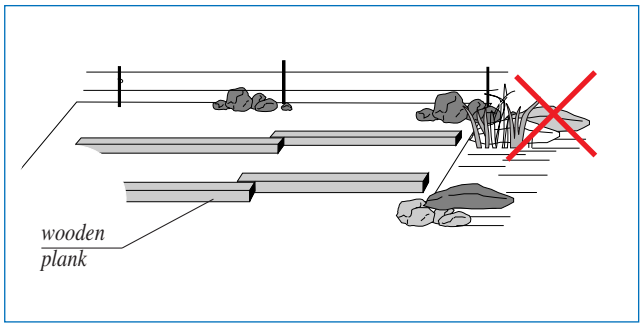


Storing pipes

Prepare the storage area

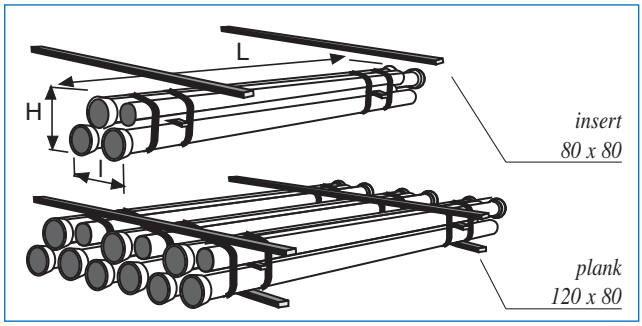
Pipes, fittings and accessories must be stored by part, type and diameter.
Do not store on unstable or sloping ground.
Avoid:

- marshy ground,
- polluted soils,
- placing the pipes directly on the ground.



Planks, inserts and wedges must be made from "timber framework" without knot free wood quality, and respect the minimum dimensions given in the following tables.

DN 60 to 300: Pipes delivered in bundles



Stack the bundles perfectly square, not exceeding the maximum heights indicated in the following table.

Always make sure that the banding straps around the bundles are tight. Never lift a bundle with hooks or suckers. Lift using straps passed underneath the bundle. (The pipe banding straps are not designed to support the load.)

Stacking heights for DN 60 to 300 pipe bundles

Maximum number of bundles that can be stacked on top of each other

DN	Number of bundle heights	Creation and dimensions of a bundle				
		Nbr beds x Nbr pipes	L m	I m	H m	W (kg) bundle
60	6	4 x 6	6.3	0.54	0.49	1411
80	6	3 x 5	6.3	0.57	0.42	1148
100	6	3 x 5	6.3	0.67	0.50	1398
125	5	3 x 4	6.3	0.65	0.58	1380
150	5	3 x 3	6.3	0.59	0.66	1272
200	5	2 x 3	6.3	0.75	0.56	1190
250	4	2 x 2	6.3	0.63	0.67	1044
300	4	2 x 2	6.3	0.74	0.77	1319

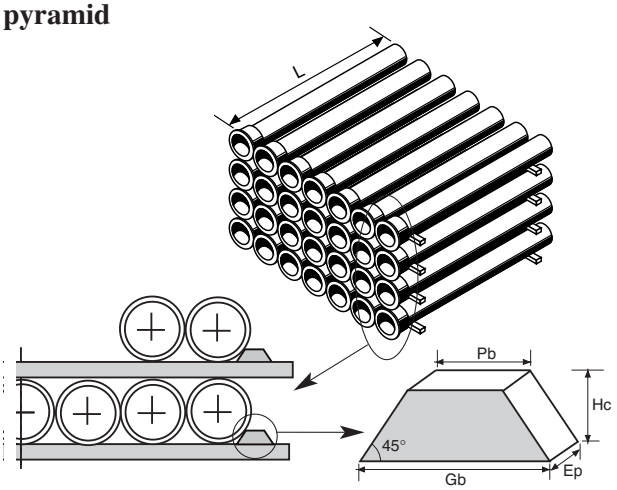
Storing pipes



DN 350 to 2000: Pipes delivered loose

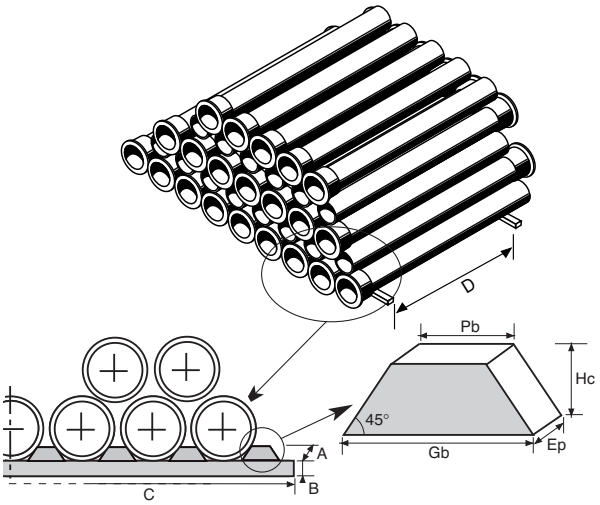
Stack the pipes in a pyramid or with inserts without exceeding the maximum heights indicated in the following tables in order to preserve the integrity of the products.

Stacking in pyramid



Nail wedges on the planks on the ground (at the ends and between the pipes).

Stacking with inserts



Nail wedges on all the ends of the bed inserts.

Storing pipes

Stack heights DN 350 to 2000

Maximum number of beds on top of each other for C30 and K9 pipes

DN	Pyramid storage		Insert storage	
	C30	K9	C30	K9
350	18	18	12	12
400	11	16	11	11
450	9	14	9	10
500	8	12	8	8
600	6	10	6	7
700		7		5
800		6		4
900		5		4
1000		3		3
1100		3		3
1200		2		2
1400		2		2
1500		2		2
1600		2		1
1800		2		1
2000		2		1

STANDARD C30 and K9 pipe

Unit length (m)	Unit weight kg	
	C30	K9
6.00	407	475
6.00	476	564
6.00	562	667
6.00	659	767
6.00	895	1001
6.95		1515
6.95		1856
6.95		2222
6.95		2621
8.19		3604
8.18		4153
8.17		5543
8.16		6236
8.16		6942
8.15		8430
8.13		10094

Wedging the stacks

DN	Trapezoidal wedges				Bottom planks			
	Gb (mm)	Pb (mm)	Hc (mm)	Ep (mm)	A (m)	B (m)	C (m)	D (m)
350	330	170	80	80	100	100	5	4.5
400	360	200	80	80	100	100	5	4.5
450	400	200	100	80	100	100	5	4.5
500	430	230	100	80	100	100	5	4.5
600	490	250	120	80	100	100	5	4.5
700	570	330	120	100	120	100	5	5.5
800	640	340	150	100	120	100	5	5.5
900	710	410	150	100	130	120	5	5.5
1000	780	380	200	100	130	120	5	5.5
1100	850	450	200	100	130	120	5	6.5
1200	910	510	200	120	150	120	5	6.5
1400	1010	610	200	120	150	120	5	6.5
1500	1080	580	250	120	150	120	5	6.5
1600	1140	540	300	120	150	120	5	6.5
1800	1300	700	300	150	180	120	5	6.5
2000	1350	750	300	150	180	120	5	6.5

Storing the joint gaskets

See also: *page*
• Elastomers 161

Due to the characteristics of elastomers, certain precautions must be taken when storing the joint gaskets. They concern in particular:

- *the storage temperature,*
- *the humidity or dryness of the environment,*
- *exposure to light,*
- *the storage duration.*

Standards EN 681-1, ISO 4633 and ISO 2230 specify the recommendations concerning the storage of joint gaskets, to ensure that they retain their qualities and efficiency.

Storage

The storage temperature must be less than 25°C.
Avoid deforming the joint gaskets at low temperature. Before use, they must be brought up to a temperature of about 20 °C for several hours so that they recover their original flexibility (immerse in warm water, for example).
PAM vulcanised elastomer-based joint gaskets must be stored in a clean environment of average humidity.

Exposure to light

Elastomers are sensitive to ultraviolet radiation and the action of ozone.
Consequently, the joint gaskets must be stored away from light (out of direct sunlight or artificial light).

Storage period

PAM considers it reasonable to use within a period of six years after manufacture the joint gaskets and washers stored under the conditions specified by the standards indicated previously.

ASSEMBLY

Transport

See also: *page*
- Handling 286
- Storage / Pipes storage 288
- Packing 374





It is important to apply a few simple chocking and lashing rules to minimize the risks of incident during transport.

Vehicles must be suitable for the transport, loading and unloading of cast iron pipes and fittings. Apply the following basic rules:

- Prevent any contact between the pipeline elements and metal surfaces (to avoid damaging the coatings).
- Make sure the pipes do not come into direct contact with the trailer floor (store the pipes horizontally by placing two parallel rows of good quality wooden planks fastened to the floor).
- Make sure that the pipes can be loaded and unloaded in complete safety (use suitable textile straps or hooks; never use metal slings).
- Make sure that the load is secure during transport.
- Always use vehicles or trailers with sufficiently large stanchions fitted on each side of the floor to stabilize the load.
- Lash the load with textile straps and lever tensioners.

To find out whether the means of transport chosen comply with our loading requirements: please contact us.
Special care is required for pipes with special coating: please contact us.



ASSEMBLY

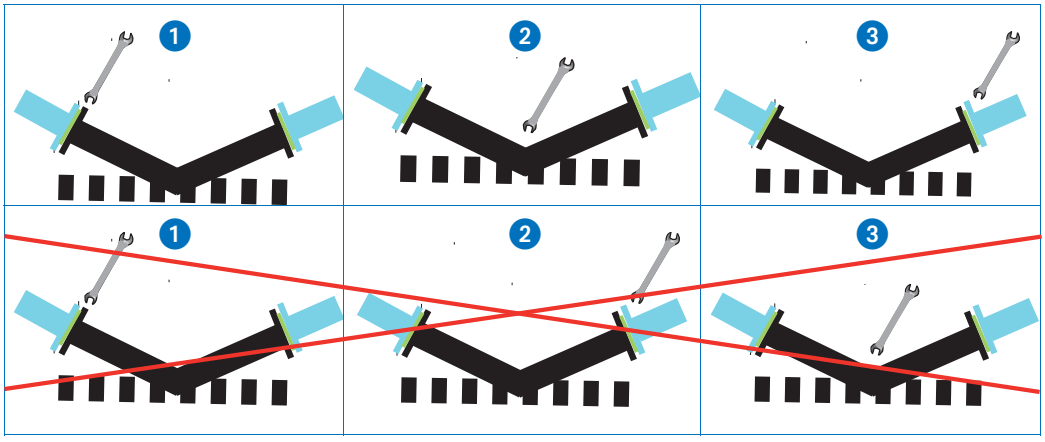
KAMELEO flanged kit DN 80-100-150

KAMELEO flanged junction assembly









These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

ASSEMBLY

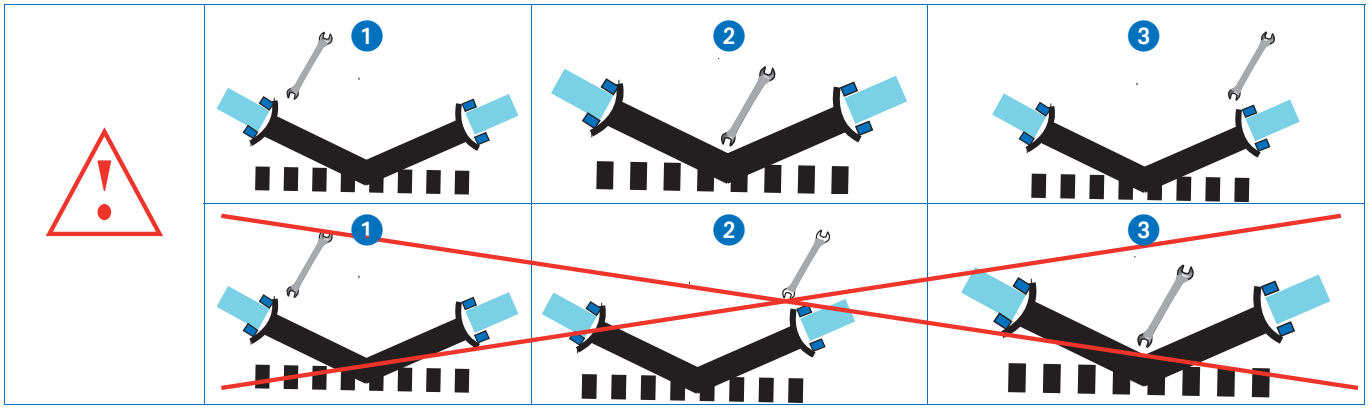
KAMELEO EXPRESS kit DN 80-100-150

KAMELEO mechanical junction assembly









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ASSEMBLY

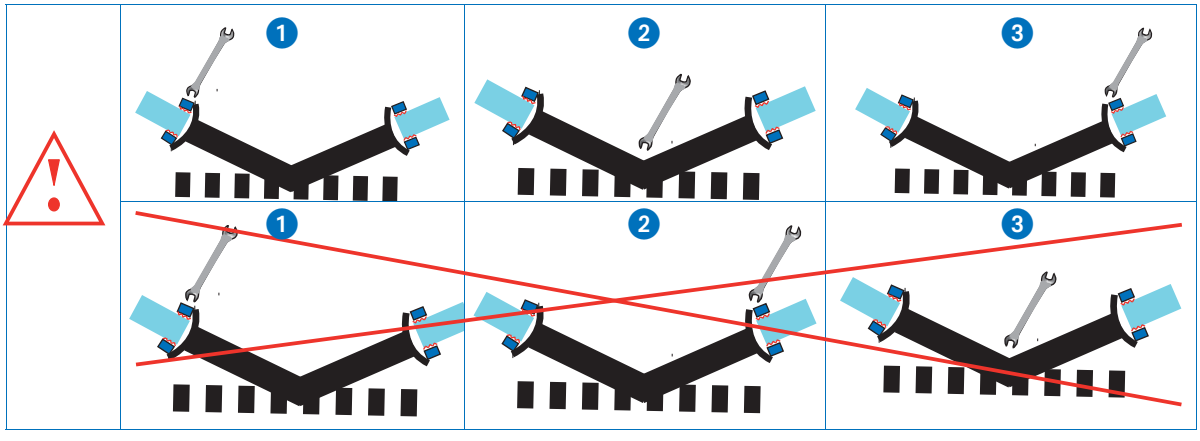
KAMELEO EXPRESS Vi kit DN 80-100-150

KAMELEO anchored mechanical junction assembly









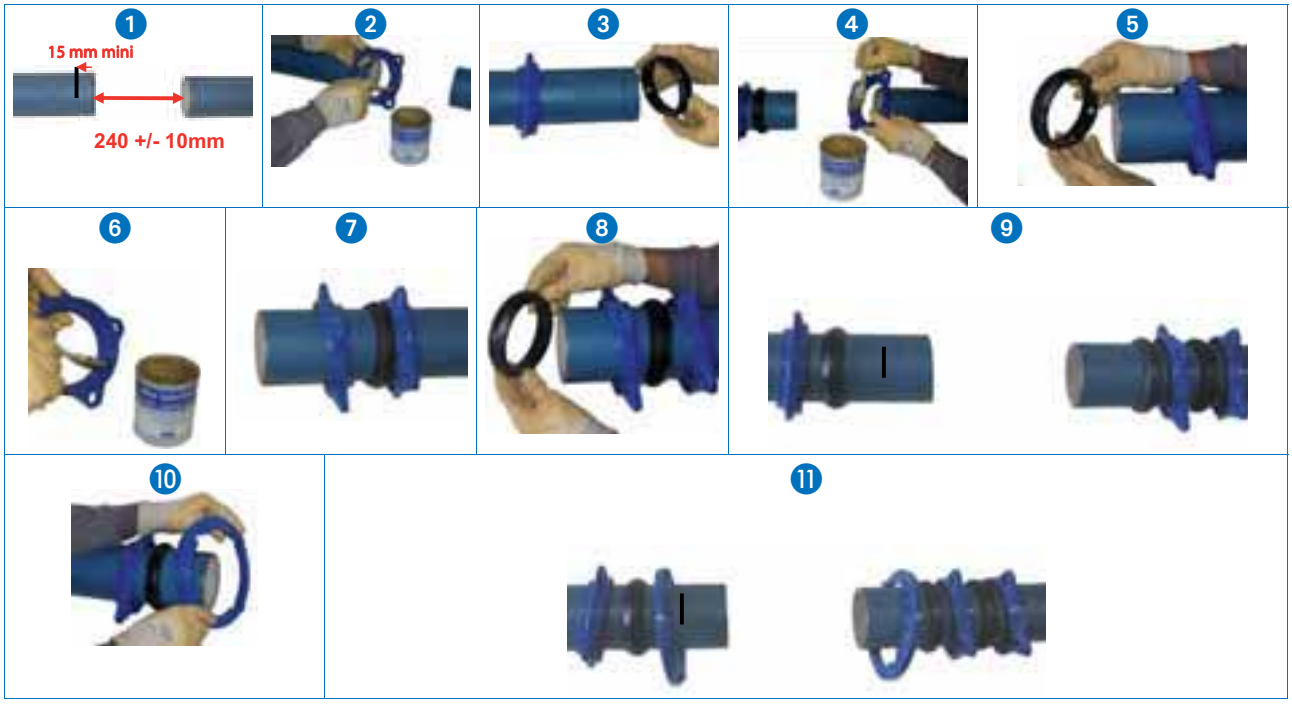
These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

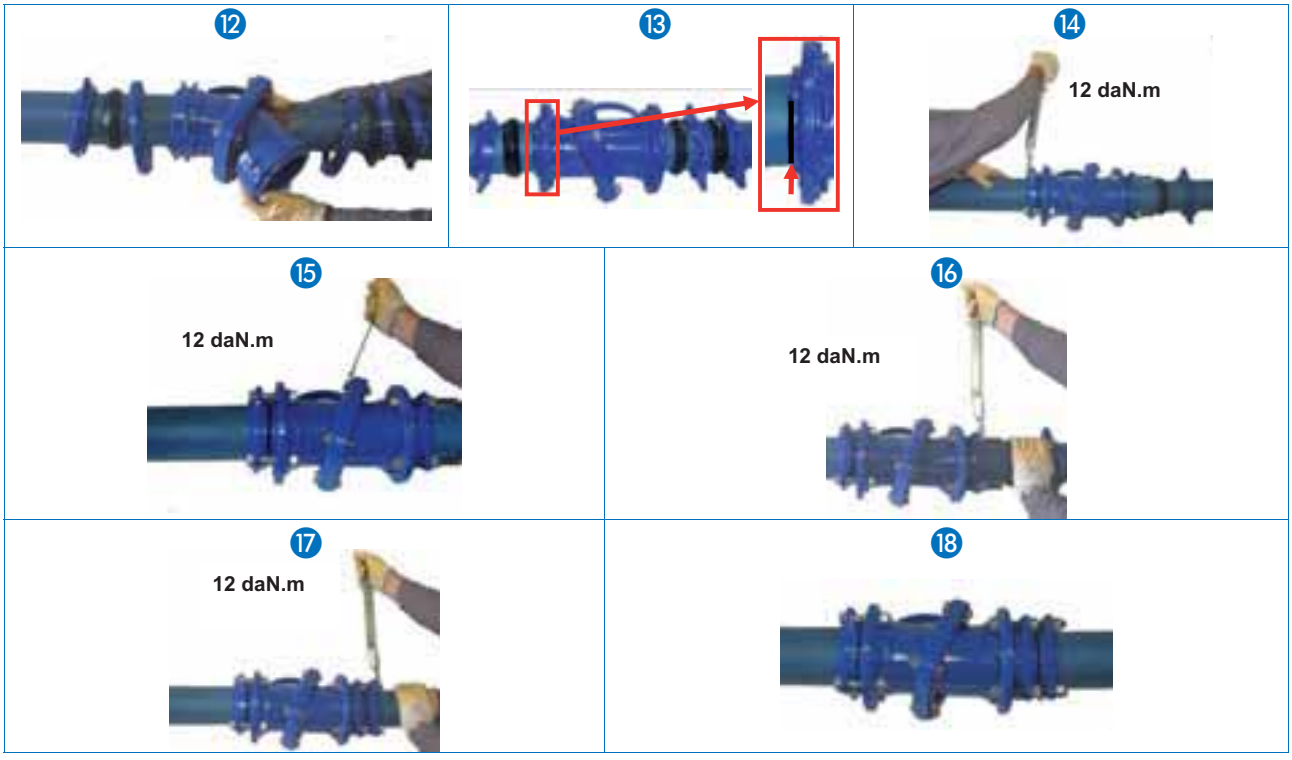
ASSEMBLY

KAMELEO EXPRESS Vi "special insertion" kit DN 80

KAMELEO anchored mechanical junction "special insertion" assembly







These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

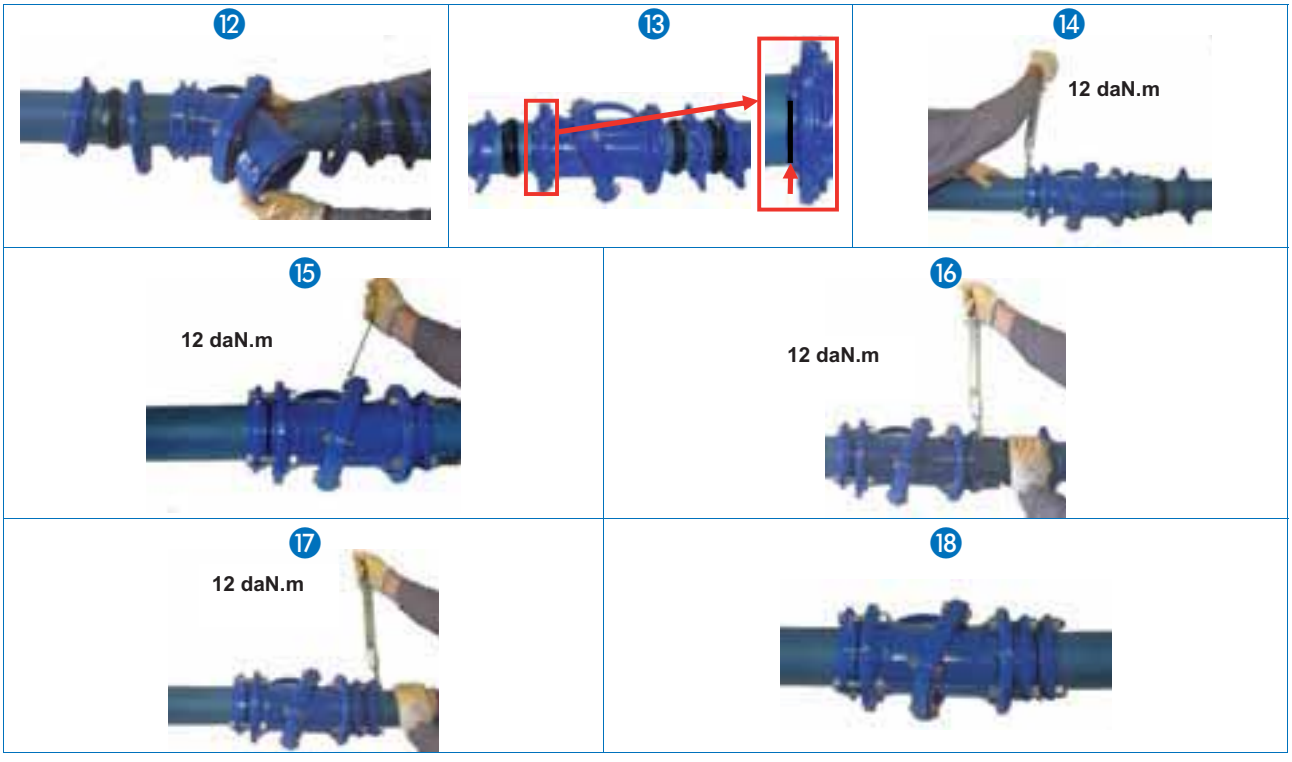
ASSEMBLY

KAMELEO EXPRESS Vi "special insertion" kit DN 100

KAMELEO anchored mechanical junction "special insertion" assembly







These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

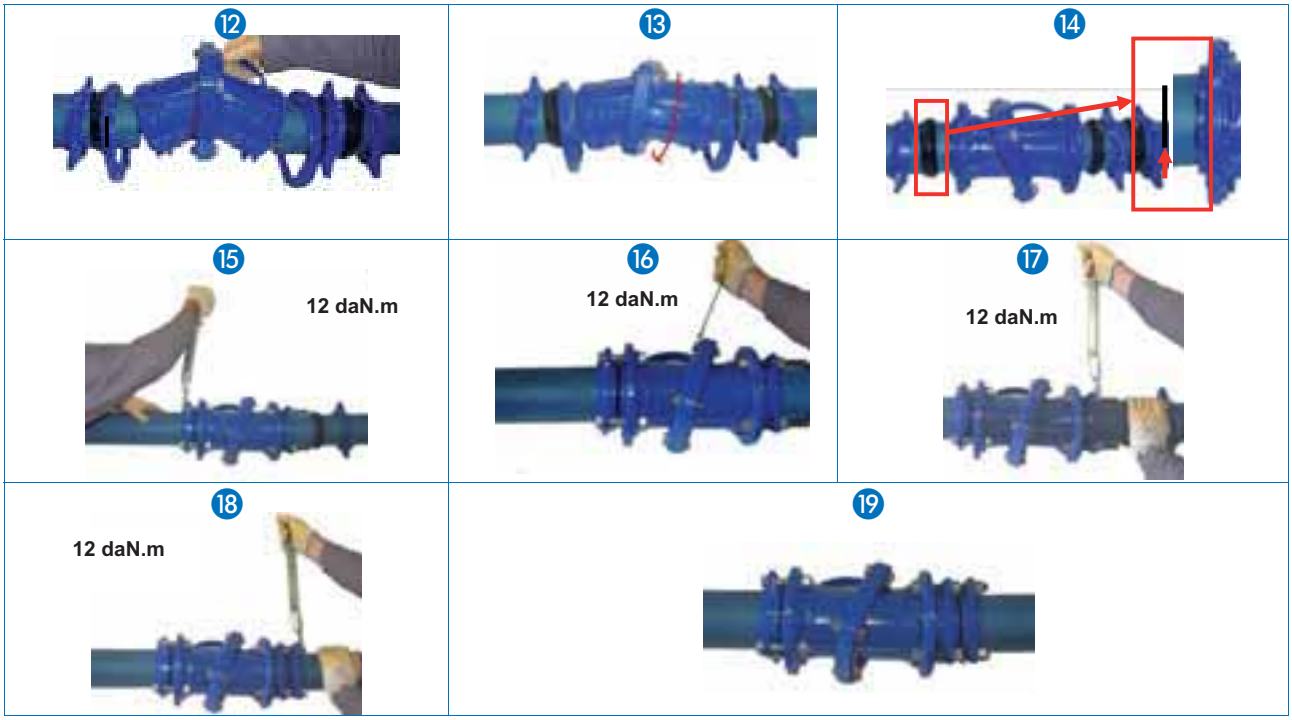
ASSEMBLY

KAMELEO EXPRESS Vi "special insertion" kit DN 150

KAMELEO anchored mechanical junction "special insertion" assembly

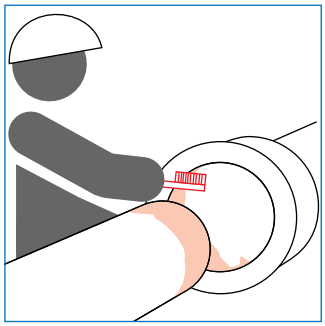






These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

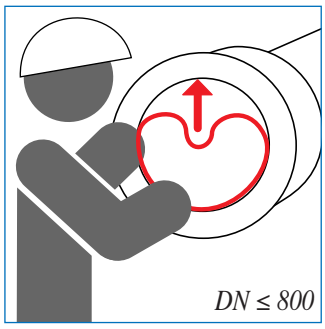
Non-anchored / STANDARD joint assembly

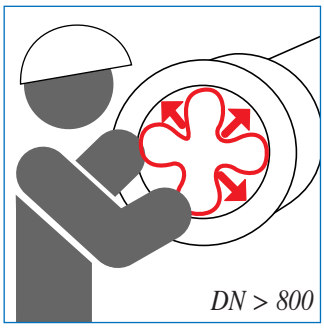


Clean

Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.

Install the joint gasket

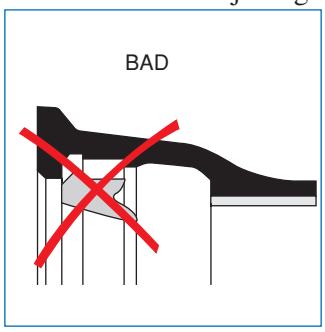


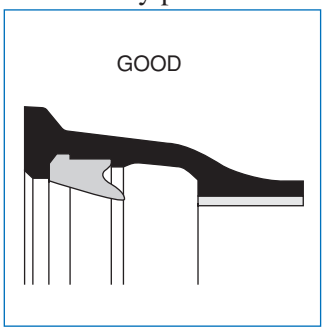


Position the joint gasket before laying the pipe in the trench.

Check the positioning

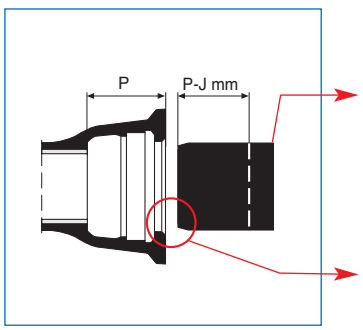
Make sure that the joint gasket is correctly positioned in its housing.



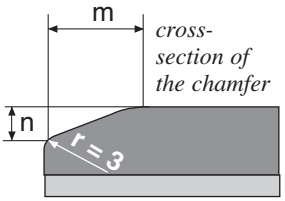


Mark the jointing depth

(when not marked during manufacture: on a cut or if a UNIVERSAL pipe spigot is used)
Mark the spigot at a distance P-J mm.
J=15 mm (DN 60 to 300)
J=20 mm (DN 350 to 600) J=25 mm (DN 700 to 900)
J=30 mm (DN 1000 to 1200) J=40 mm (DN 1400 to 2000)
On a cut, restore the chamfer according to the following dimensions.



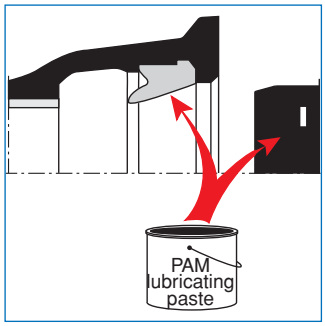
DN	P mm	DN	P mm	DN	P mm	DN	P mm
60	89.5	250	105.5	600	132.5	1200	235
80	92.5	300	107.5	700	192	1400	245
100	94.5	350	110.5	800	197	1500	265
125	97.5	400	112.5	900	200	1600	265
150	100.5	450	115.5	1000	203	1800	275
200	106.5	500	117.5	1100	225	2000	290



DN	m (mm)	n (mm)
60 to 600	9	3
700 to 1200	15	5
1400 to 1600	20	7
1800 to 2000	23	8

ASSEMBLY

Non-anchored / STANDARD joint assembly



Lubricate

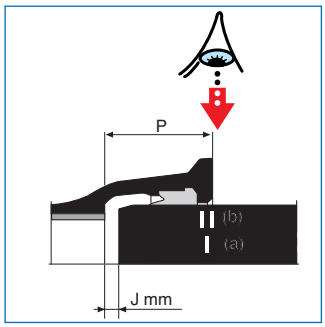
Coat:

- the visible surface of the joint gasket,
- the chamfer and the pipe spigot.

Brush on a reasonable quantity of lubricating paste (see table of quantities below). Respect the recommendations for use on the safety data sheets available on www.pamline.com

Number of cans for 100 joints:

DN	Nbr	DN	Nb	DN	Nb	DN	Nb
60	2	250	4	600	9	1200	24
80	2	300	5	700	13	1400	40
100	2	350	5	800	15	1500	45
125	2	400	6	900	17	1600	50
150	3	450	6	1000	19	1800	60
200	3	500	7	1100	21	2000	71

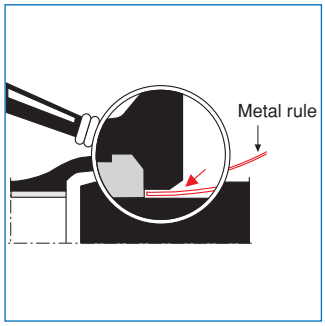


Assemble

Centre and fit the spigot in the perfectly aligned socket:
(a) up to the line drawn at a distance of P-J mm,
(b) up to between the 2 lines when they are marked during manufacture.

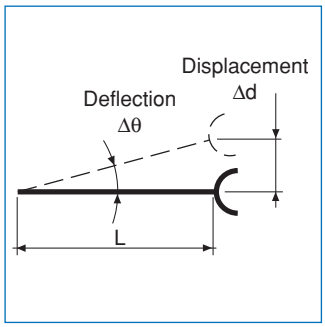
Note: For diameters 700 to 1200, the marking of the jointing lines is made of 2 large lines and a small one.

- For the pipes : use the two large lines (the first two ones must be completely covered after the jointing)
- For the fittings : use the large median line and the small one (the first marking must be completely covered after the jointing).



Check the assembly

The rule must enter the same depth all the way around the outside.



Angular deflection

The pipe axes must be perfectly aligned during the jointing operation.
The deflection must only be carried out once the joint has been fully assembled and before pressurization.

Maximum allowable deflection

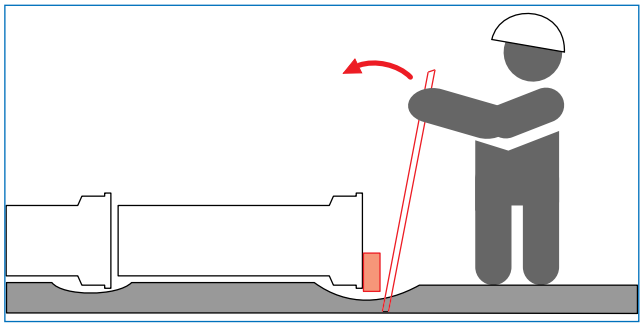
DN	Δθ	L m	Δ d cm
60 to 300	5°	6	52
350 to 600	4°	6	42
700 to 1000	4°	7	49
1100 to 1200	4°	8	56
1400 to 1600	3°	8	42
1800	2.5°	8	35
2000	2°	8	28

Non-anchored / STANDARD joint assembly

Equipment for assembly

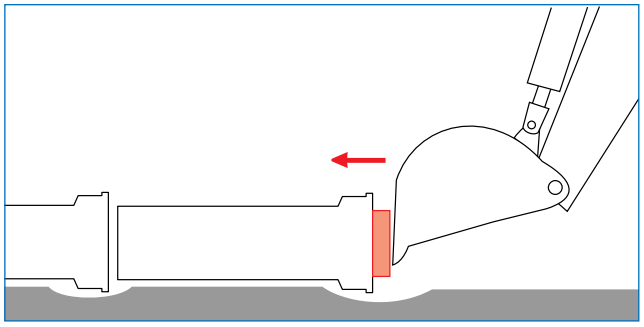
● DN 60 to 125

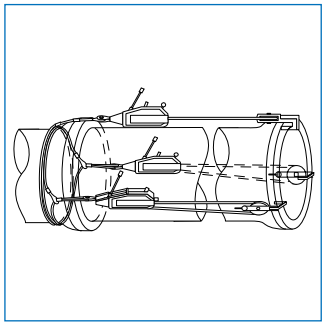
Protect the socket with a piece of hard wood.



● DN 125 and over

Insert a wooden plank between the bucket and the pipe.





● DN 150 and over

Practical solution when access is difficult.

Use one or more winches* depending on the DN.

DN	Nbr of winches
150 to 300	T516 (2.5 tonnes)
1350 to 600	1 T532 (5 tonnes)
700 to 1200	2 T532 (2 x 5 tonnes)
1400 to 2000	3 T532 (3 x 5 tonnes)

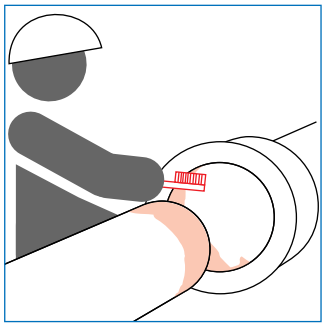
** Available on order. See installation recommendations "EQUIPMENT FOR ASSEMBLY".*

ASSEMBLY

Non-anchored / EXPRESS joint assembly

Respect the jointing depths and the tightening torques (use a torque wrench).

Applicable to DN 60, 125, 200, 250 et 300

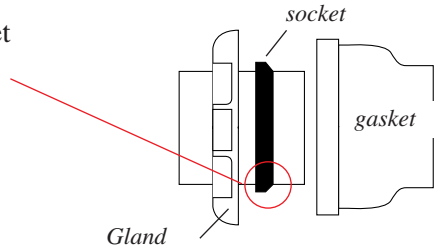


Clean

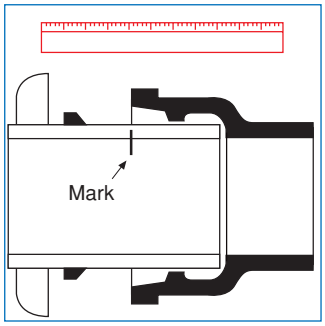
Clean thoroughly inside the socket, the pipe spigot and the joint gasket. Keep them clean until the end of the assembly operation.

Slide on the gland then the joint gasket

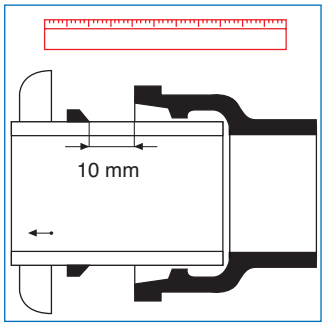
Direct the slope of the joint gasket towards the fitting socket.



Insertion



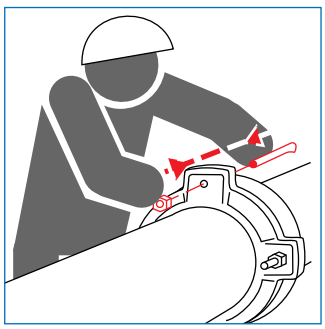
1. Push the spigot fully into the socket, making sure that the parts to be assembled are perfectly aligned. Make a mark opposite the end of the socket.
2. Pull out about 10 mm



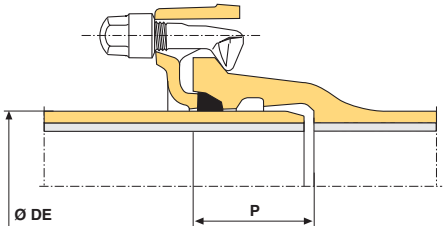
To fit the joint gasket more easily, apply a little lubricating paste on the socket.

Respect the recommendations for use on the safety data sheets available on www.pamline.fr

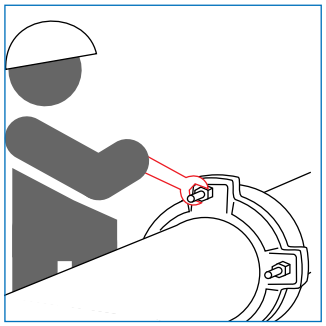
Assemble



• Slide the gasket over the barrel, insert it into its housing and bring the gland up against it.
• Make sure that the gland and the joint are perpendicular to the pipe axis.
• Insert the bolts and pre-tighten the nuts, with the joint aligned.

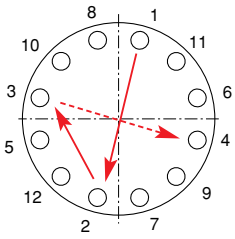


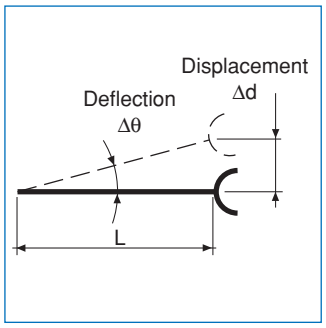
Non-anchored / EXPRESS joint assembly



Tighten the bolts

Check the position of the gland.
Tighten the nuts with a torque wrench in successive passes in the order shown on the diagram.
Bolt tightening torques:
• Ø 22 bolts: 12 m.daN,
• Ø 27 bolts: 30 m.daN.
Check the torques after the pressure test.
Retighten if necessary.





Angular deflection

The pipe axes must be perfectly aligned during the jointing operation. The deflection must be made between pre-tightening and final tightening.

Maximum allowable deflection

DN	Δθ°	L m	Δ d cm
60 and 125	5°	6	52
200 to 300	4°	6	42
350 to 600	3°	6	31
700 to 800	2°	7	24
900 to 1000	1.5°	7	18
1000 to 1200	1.5°	8	21

ASSEMBLY

Non-anchored / EXPRESS New joint assembly

Respect the jointing depths and the tightening torques (use a torque wrench).

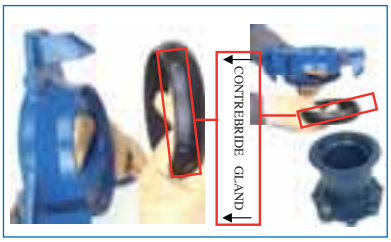
Applicable to DN 80, 100 and 150

Clean

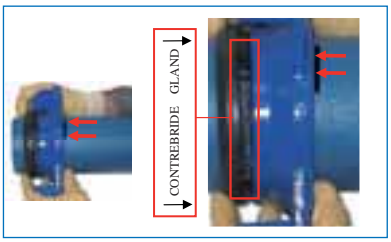
Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.
Lubricate the spigot and inside the gland. See steps 2 and 6 in the installation instructions page 305 and steps 3 and 6 page 306.

Slide on the joint and the gland

Position the side of the joint marked "gland" towards the gland.



See step 3 page 305



See step 5 page 306

Insertion

Position the gland exactly against the line marked 11 cm from the spigot.
Respect the jointing depth

Respect the recommendations for use on the safety data sheets available on www.pamline.com

Assembly and tightening the bolts

After tightening the bolts (14 m.daN), the line must be visible right next to the gland.
See step 12 page 305 and step 12 page 306.

Angular deflection

DN	AOP on pipe C40 in bar	Angular deflection
80	40	5°
100		
150		

DN	End play	
	Aligned mm	Deflected mm
80	42	34
100	43	33
150	47	33

ASSEMBLY

Non-anchored / EXPRESS New DN 80 - DN 100 - DN 150

Accessories installation with pre-assembly

KiT EXPRESS New









1



2



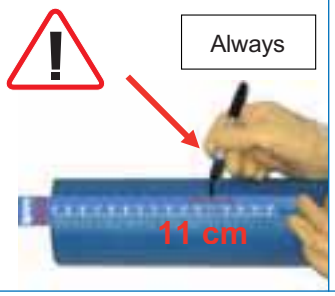
3



4



5



6

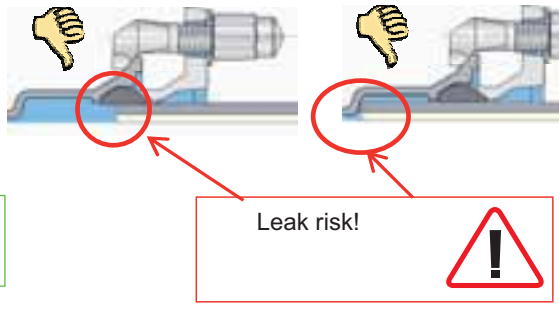


7



8

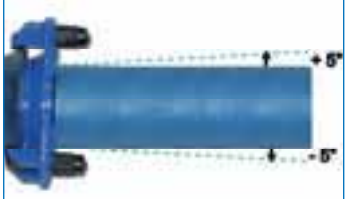




9



10



11



12



These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

ASSEMBLY

Non-anchored / EXPRESS New DN 80 - DN 100 - DN 150

Accessories installation without pre-assembly

KIT EXPRESS New



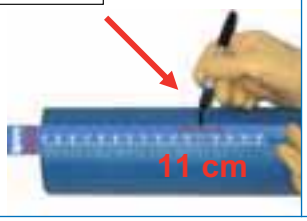






1

Always



2



3



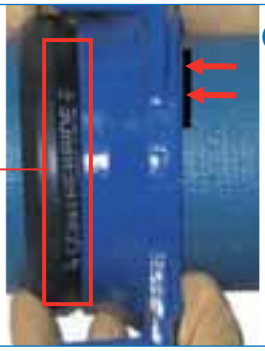
4



5



CONTREBRIDE GLAND



6



7



8





11 cm leaktightness guaranteed





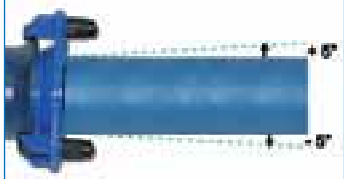
Leak risk!

9

2 m.daN



10



11

14 m.daN



Always

12



These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

Non-anchored / flanged joint assembly

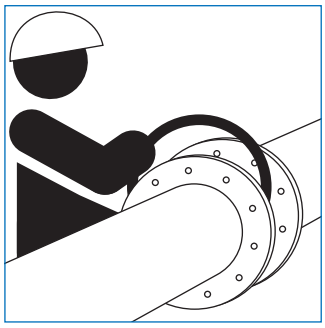
See also: *page*
- Flanged joint 173
- Flanges (dimensions/drilling) 150

Flanged joints allow easy assembly and disassembly in line (repair, inspection, maintenance). Important:

- *respect the bolt tightening order and torque,*
- *do not stretch the pipeline when tightening the bolts,*
- PAM *recommends the use of metal reinforced gaskets for their easy installation and reliability.*

Assembling the flanged joint with metal reinforced gasket

Procedure



Clean and align the flanges

- Check the appearance and cleanliness of the flange and joint gasket faces.
- Align the parts to be assembled.
- Leave a gap for the joint gasket between the two flanges to be assembled.

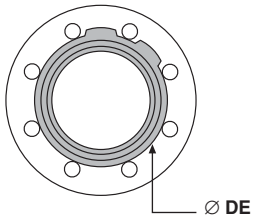
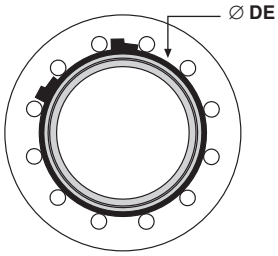
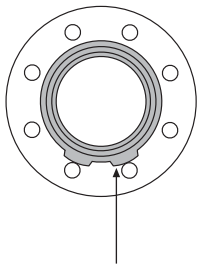
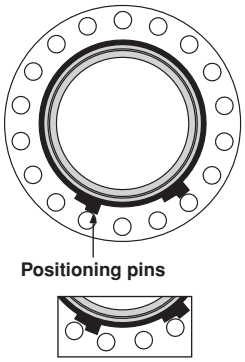
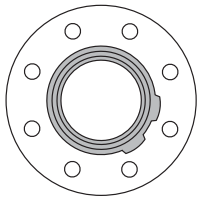
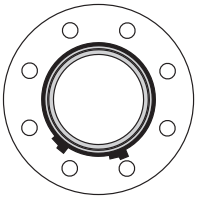
The metal reinforced gaskets sold by PAM are available in the following thicknesses:
DN 40 to 300 = 10 mm
DN 350 to 2 000 = 16 mm

Positioning the washer

- Centre the gasket between the bosses of the two flanges using positioning pins, as shown on the following table.

ASSEMBLY

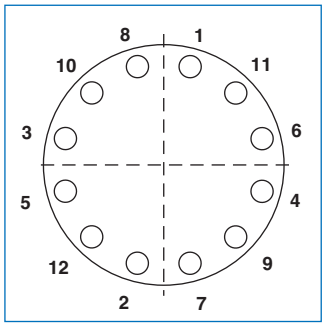
Non-anchored / flanged joint assembly

Method for positioning metal reinforced joint gaskets according to flange DN and PN*		Centring type	Assembly detail
Overmoulded gaskets	Clipped gaskets		
DN 40 to 80 – PN 10 to 40 **DN 100 to 300 – PN 10 to 16** 	**DN 350 to 2000 – PN 10** **DN 700 to 2000 – PN 16** 	Centring with outer diameter of the joint in contact with the bolts	First insert the bolts of the bottom half circle so that the joint gasket sits on the bolt
DN 100 to 300 – PN 25 **DN 100 to 150 – PN 40** 	**DN 600 – PN 16** **DN 350 to 2000 – PN 25**  **Detail: DN 300 to 550 for PN 16**	Centring with the two positioning pins resting on the bolts	Check that the reinforced gasket is correctly centred before tightening the bolts crosswise
DN 200 to 300 – PN 40 **DN 40 to 200 – PN 63** 	**DN 350 to 400 – PN 40** 	Visual centring during assembly of the metal reinforced gasket	Check that the reinforced gasket is correctly centred before tightening the bolts crosswise

** Joint gaskets PN 63 for DN 250 and 300, PN 100 for DN 40 to 300: please contact us*



Non-anchored / flanged joint assembly



Tightening the bolts

• Insert the bolts.

• Tighten the bolts in the order indicated on the diagram opposite, respecting the recommended tightening torques below.

Bolt tightening torques (metal reinforced gasket)

The torques recommended below are for greased threads.

The bolts are only tightened to compress the gasket, not to exert any tractive force on the pipeline elements.

Bolt tightening torques (metal reinforced gasket)

The torques recommended below are for greased threads.

The bolts are only tightened to compress the gasket, not to exert any tractive force on the pipeline elements.

Metal reinforced gasket						
DN	Bolt tightening torques for flanges					
	PN 10	PN 16	PN 25	PN 40	PN 63	
	m.daN	*m.daN*	*m.daN*	*m.daN*	*m.daN*	
40	4	4	4	4	4	
50	4	4	4	4	4	
60	4	4	4	4	6	
65	4	4	4	4	6	
80	4	4	4	4	6	
100	4	4	6	6	8	
125	4	4	8	8	12	
150	6	6	8	8	15	
200	6	6	8	12	18	
250	6	8	12	15		
300	6	8	12	15		
350	6	8	15	18		
400	8	12	18	30		
450	8	12	18			
500	8	15	18			
600	12	18	30			
700	12	18	40			
800	15	30	50			
900	15	30	50			
1 000	18	40	60			
1 100	18	40	60			
1 200	30	50	60			
1 400	40	50	70			
1 500	40	60	70			
1 600	50	60	70			
1 800	50	60	80			
2 000	50	70	80			

ASSEMBLY

Non-anchored / BLUTOP joint assembly











Installing the joint

Clean ends

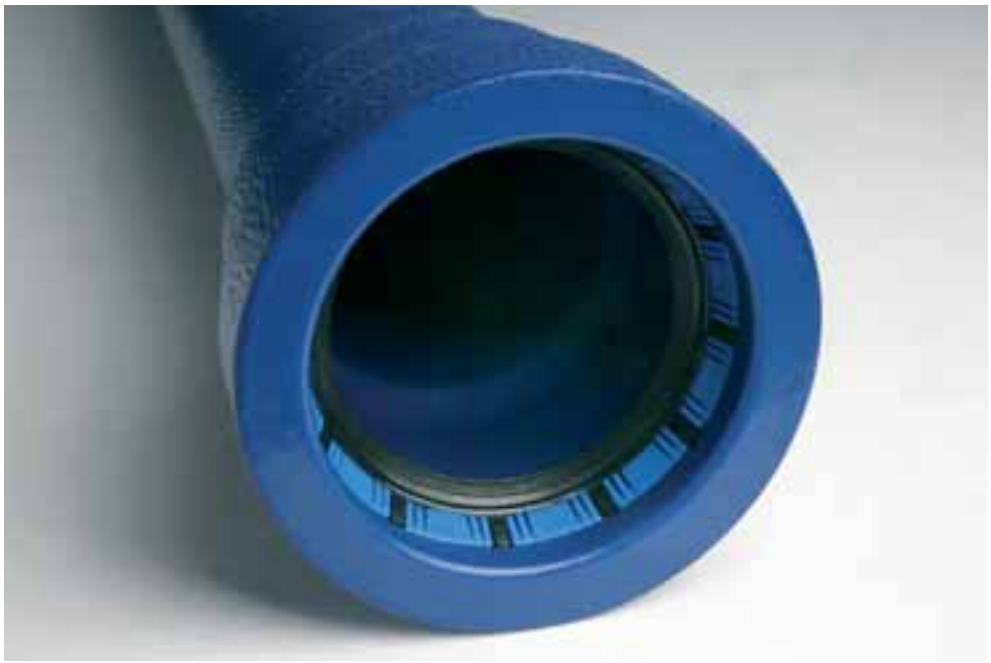
• Position the joint gasket before laying the pipe in the trench

Assembling the joint gasket

• Lubricate inside the socket [1]
• Offer up the joint without prior deformation, with the blue segments pointing towards the outside [2]
• Press gently to insert the joint fully into its housing in the socket [3]
• Make sure that the joint is correctly positioned in its housing [4]
• Lubricate inside the joint gasket [5]

Tip

• Keep the spigot and socket plugged until jointing
• The Blutop sleeve allows the tube spigot to be laid in the trench without getting it dirty
• Use the can of special lubricating paste for the BLUTOP range.



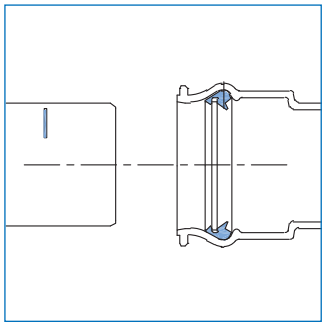
Non-anchored / KLIKSO joint assembly

See also: *page*
• KLIKSO 179

KLIKSO fittings are assembled by insertion on the spigot of a PVC or PE tube.*

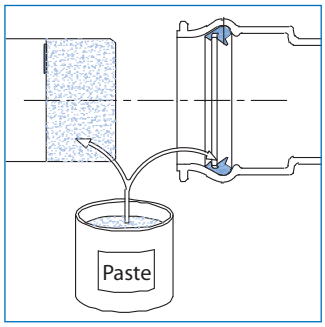
The KLIKSO fitting is anchored by simply adding a locking gland, to be screwed a quarter turn on its socket.

Before insertion, check that the chamfer on the end of the pipe to be assembled is conform.
Clean inside the socket and the tube spigot.



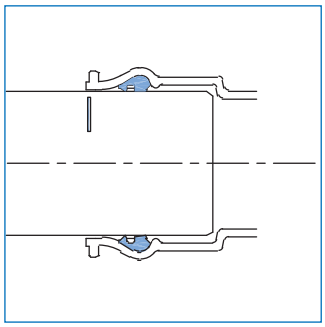
Marking the jointing depth

• Using a soft pencil or a felt tip pen, mark the KLIKSO fitting jointing depth on the tube spigot.



Lubrification

• Coat the end of the tube with lubricating paste, over a length of about 30 mm, as well as the visible face of the joint gasket, preassembled in the fitting.



Jointing

• Align and centre the parts to be assembled.
Push one pipe inside the other until the edge of the socket reaches the line.
If necessary, make the angular deflection within the permissible limit, after assembly only.

* PE pipelines are generally welded together: they are manufactured to be self-restrained.
Due to the expansion coefficients of the material, anchored fittings are recommended for connections on polyethylene.
Note: If self-anchoring is used, constructive measures must be taken to absorb, if necessary, the expansions of PE tubes.

Anchored / Simplified installation by professional teams

Fewer long and tedious operations

To promote the development and use of self-anchoring technologies, PAM has designed solutions to simplify their implementation, aiming to reduce the tedious and time-consuming operations. Insert type self-anchoring systems (STANDARD Vi, EXPRESS Vi and UNIVERSAL Vi) and double chamber self-anchoring systems (UNIVERSAL Vi and Ve, PAMLOCK) were produced with this in mind.

Insert-type self-anchoring systems

- Locking is obtained by fitting gaskets with inserts in the sockets provided
- No need for weld beads in case of cutting
- Due to the outstanding performance of Vi anchoring systems, Ve anchoring with bead will only be required under exceptional cases in the NATURAL range DN 60 to 600

UNIVERSAL self-anchoring systems

- No need to fit a gland or tighten bolts
- UNIVERSAL pipes and fittings are compatible for Vi and Ve versions (provided that there is a bead on the spigot).

Operations performed by professionals

In view of the extreme hydraulic thrusts they need to withstand, anchored junctions are a true guarantee of safety in supply and distribution pipes. Special attention must be paid to the implementation of anchored junctions which must be installed by well-trained teams. PAM therefore proposes:

On-site technical-sales assistance

Teams of engineers and technicians, experts in ductile cast iron pipelines, are at your disposal to start the work sites. They can also help you to determine the most suitable self-anchoring techniques as well as the lengths of the pipelines to be locked (computation software).



Installation recommendations

An installation sheet is included in the pieces packaging for each self-anchoring device. PAM also offers a set of Installation Recommendation sheets giving practical advice on the operations to be carried out.

Customer school

PAM organizes training sessions on the implementation of anchored junctions in courses delivered at its Customer School.

Anchored / Simplified installation by professional teams

Understanding the fields of use

For **buried water distribution and supply networks**, the use of different self-anchoring systems depends mainly on the network operating pressure and the test pressure during site acceptance.

For **other applications**, apart from the pressure levels the mechanical operating principles of the junctions must also be taken into account. Apply the following rules:

- Insert-type self-anchoring systems are not suitable for implementation by pulling. If pulling a string of pipes, bead-type self-anchoring techniques must be used
- A specific study is required for pipeline supports, taking into account in particular the network operating conditions (pressure, hydraulic regimes, etc.), the supporting techniques, the support points, the axial force thrust points, as well as any other features which could have an impact
- With the special case of bridges, if the pipeline is anchored it must be uncoupled from the structure (the bridge and the pipeline must expand independently to avoid generating additional forces)

PAM teams are at your disposal to provide any information you may need to define the most appropriate technical solutions. Do not hesitate to ask them for advice or visit the site **www.pamline.com**

Good practices

When implementing self-anchoring systems, some basic professional rules must be respected:

● Work professionally

Before assembling the self-anchoring systems, make sure that the joint rings, gaskets and locking rings, sockets and spigots of the components are clean and free from foreign bodies. The spigot chamfer must comply with the general specifications to allow jointing under good conditions. Weld beads must be checked visually to ensure that they were not damaged during handling and transport.

● Assemble in line, then make the angular deflection

It is absolutely essential to coat the rubbing surfaces (spigot and internal face of the joint in particular) with PAM lubricating paste. The joint must be assembled aligned with the socket axis, before making the angular deflection. Irrespective of the angular deflection required, the spigot must never be pushed fully into the socket. Always respect the jointing depth marks painted on the spigot.

ASSEMBLY

Anchored / Simplified installation by professional teams





Never reuse gaskets and locking rings

After dismantling a anchored junction, pressurized or not, never reuse the gasket or locking ring to make a junction.

Use PAM assembly accessories

For the UNIVERSAL Ve, PAMLOCK and STANDARD Ve self-anchoring systems, use of assembly accessories supplied by PAM is essential.

Tightening the UNIVERSAL Ve and STANDARD Ve self-anchoring systems

After assembly, the UNIVERSAL Ve and STANDARD Ve anchored junctions must be tightened using suitable devices.

Respect the bolt tightening instructions

For systems with gland and bolts, always respect the bolt tightening instructions indicated in the Installation Recommendation sheets and manuals.

Use PAM pipes and fittings

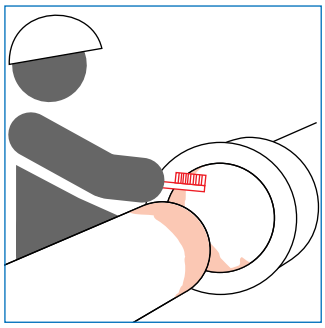
PAM self-anchoring systems have been carefully developed to guarantee safe and optimum operation with its pipes and fittings. The self-anchoring systems use functional dimensions (drawing of the tightness chambers, drawing of the locking chambers, etc.) not covered by European standards. PAM declines any responsibility if parts from different origins are mixed.

Anchored / STANDARD Vi joint assembly

The Vi self-anchoring system must not be used to lock a string of pipes which is to be pulled (e.g. directional drilling). For these types of situation, use the Ve self-anchoring system (with a weld bead).

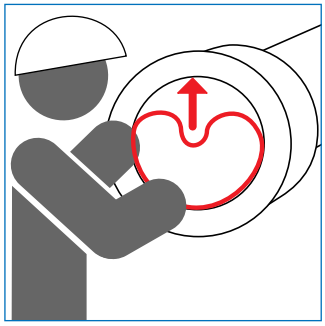
Prior remark

• The STANDARD Vi assembly is locked by teeth on the **metal inserts** of the joint gasket which grip the spigot end of the pipe during jointing.
• The STANDARD Vi joint gasket is suitable for all STANDARD sockets and all spigots without weld bead.



Clean

Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.

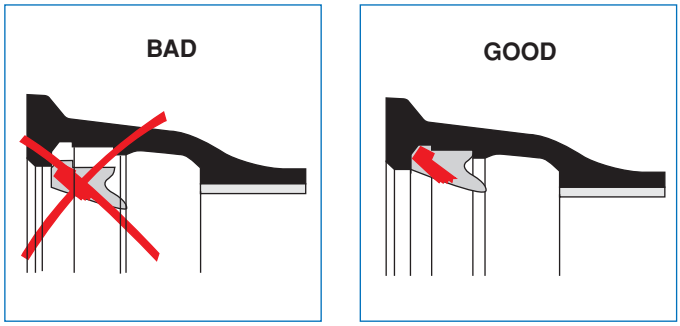


Install the joint gasket

Position the joint gasket before laying the pipe in the trench.

Check the positioning

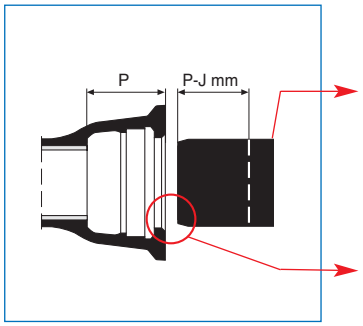
Make sure that the joint gasket is correctly positioned in its housing.



Anchored / STANDARD Vi joint assembly

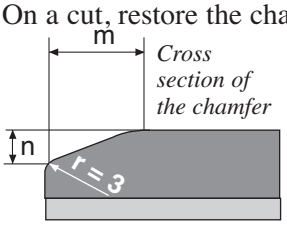
Mark the jointing depth

(when not marked during manufacture: on a cut or if a UNIVERSAL pipe spigot is used)
Mark the spigot at a distance P-J mm.
J=15 mm (DN 60 to 300)
J=20 mm (DN 350 to 600)



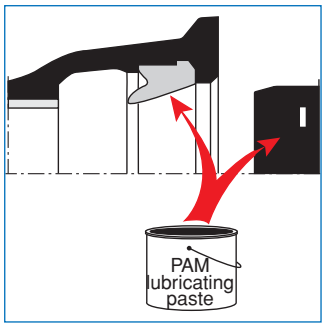
DN	P mm	DN	P mm	DN	P mm
60	89.5	200	106.5	400	112.5
80	92.5	250	105.5	450	115.5
100	94.5	300	107.5	500	117.5
125	97.5	350	110.5	600	132.5
150	100.5				

On a cut, restore the chamfer according to the following dimensions.



DN	m (mm)	n (mm)
60 to 600	9	3

Lubricate



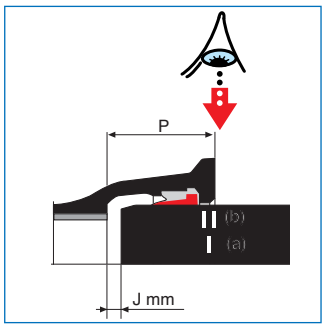
Coat:
- the visible surface of the joint gasket,
- the chamfer and the pipe spigot.

Brush on a reasonable quantity of lubricating paste (see table of quantities below).
Respect the recommendations for use on the safety data sheets available on www.pamline.fr

Number of cans for 100 joints:

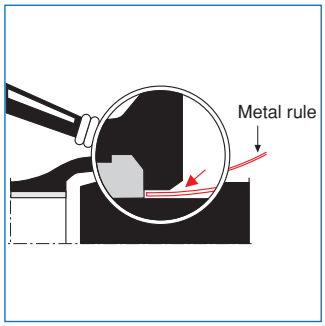
DN	Nbr	DN	Nbr	DN	Nbr
60	2	200	3	400	6
80	2	250	4	450	6
100	2	300	5	500	7
125	2	350	5	600	9
150	3				

Assemble



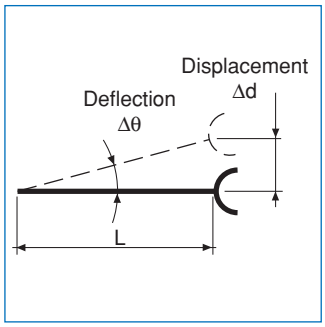
Centre and fit the spigot in the perfectly aligned socket:
(a) up to the line drawn at a distance of P-J mm,
(b) up to between the 2 lines when they are marked during manufacture.

Anchored / STANDARD Vi joint assembly



Check the assembly

The rule must enter the same depth all the way around the outside.



Angular deflection

The pipe axes must be perfectly aligned during the jointing operation.
The deflection must only be carried out once the joint has been fully assembled and before pressurization.

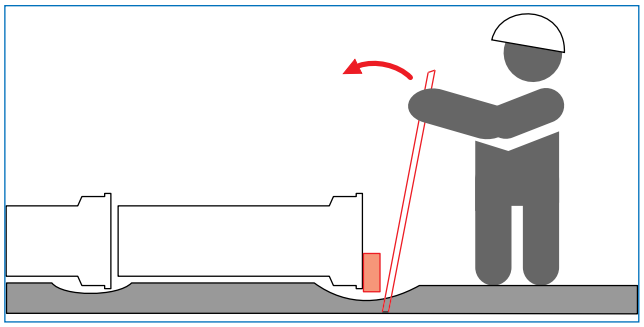
Maximum allowable deflection

DN	Δθ	L m	Δ d cm
60 to 150	5°	6	52
200 to 250	4°	6	42
300 to 350	3°	6	31
400 to 600	2°	6	21

Equipment for assembly

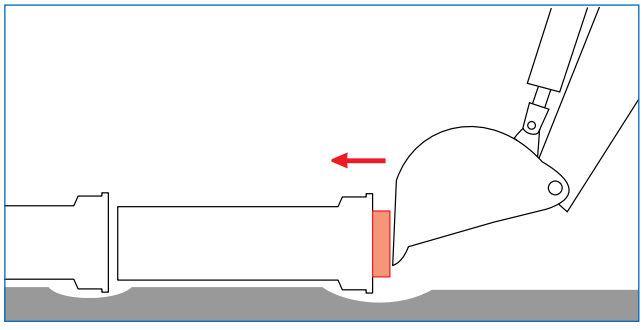
DN 60 to 125

Protect the socket with a piece of hard wood.



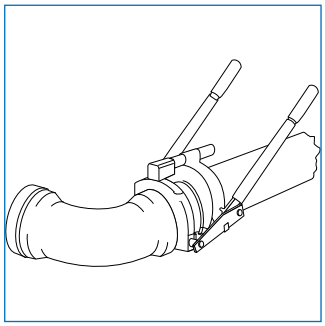
DN 125 and more

Insert a wooden plank between the bucket and the pipe.



ASSEMBLY

Anchored / STANDARD Vi joint assembly



DN 80 to 300

Solution recommended for assembling fittings.
The device can be ordered from PAM.

DN 350 to 600

Assemble in-line with two pull lift (6 tonnes each)

Possible dismantling

The STANDARD Vi joint can be dismantled with special tooling **before being put under pressure**.
(Consult PAM)

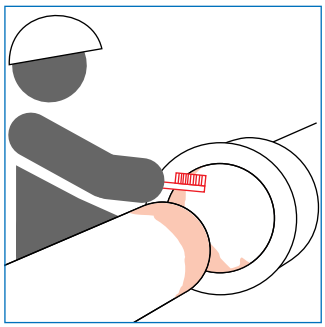
The Vi joint can no longer be dismantled after being put under pressure.



Anchored / EXPRESS Vi joint assembly

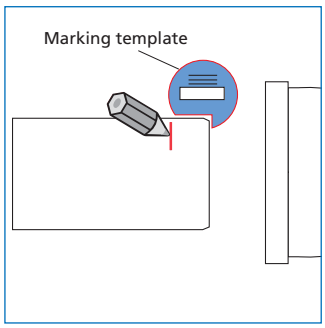
Respect the jointing depths and the tightening torques (use a torque wrench).

Applicable to DN 60, 125, 200, 250, and 300



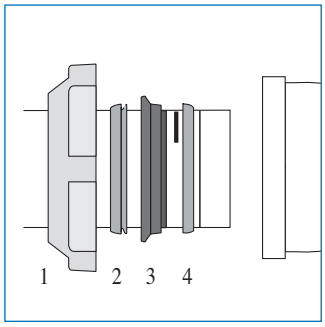
Clean

Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.



Mark the jointing depth

- Use the cardboard template delivered with the pieces to mark the jointing depth.
- Read carefully the assembly recommendations written on the back of the template.



Install the pieces

In the following order according to the diagram opposite:

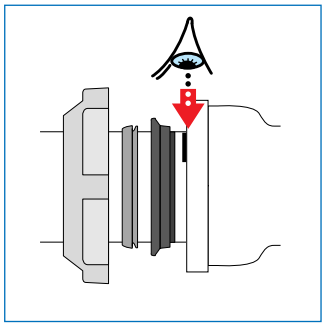
- gland (1),
- gasket with inserts (2),
- spacer (3),
- joint gasket (4).

Direct the slope of the spacer and the joint gasket towards the fitting socket.

To fit the joint gasket more easily, apply a little lubricating paste on the socket.
Respect the recommendations for use on the safety data sheets available on www.pamline.com

ASSEMBLY

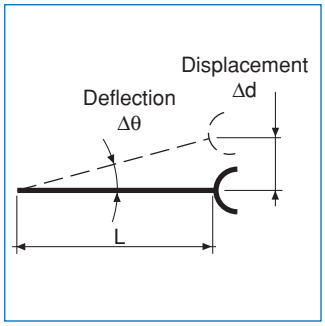
Anchored / EXPRESS Vi joint assembly



Assemble

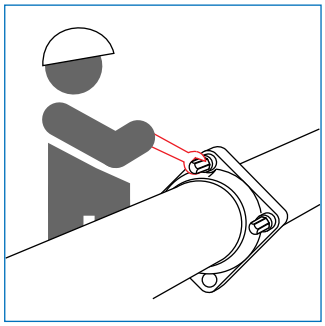
Push the spigot into the socket, making sure to respect the jointing depth (edge of the socket lined up with the mark),
• Insert the joint gasket into its housing,
• Bring the other parts into contact,
• Insert the bolts and tighten the nuts until they touch the gland.

Angular deflection



Maximum allowable deflection

DN	Δθ	L m	Δ d cm
60 et 125	4°	6	42
200 to 300	3°	6	31



Tighten the bolts

• Pre-tighten the nuts with the joint aligned to the **pre-tightening torque***.
• Make the angular deflection if necessary.
• Tighten up to the **final torque***.

Use **only** the bolts supplied in the kits.



in successive passes, in the order shown on the diagram

*** Tightening torques**

DN	pre-tightening m.daN	final tightening m.daN	bolt marking
60 to 125	2	12	D2L (22x80)
200	6	18	D2L (22x80)
250 to 300	6	18	D7L (27x102)

Important! for a preassembled and handled section (e.g. bayonet), always check the tightening torque of the EXPRESS Vi joints of the section after final positioning.

Anchored / EXPRESS Vi New joint assembly

Respect the jointing depths and the tightening torques (use a torque wrench).

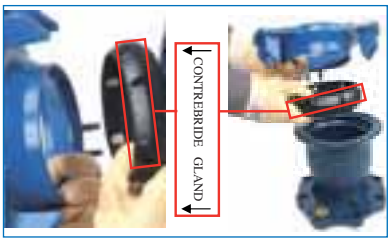
Applicable to DN 80, 100 and 150

Clean

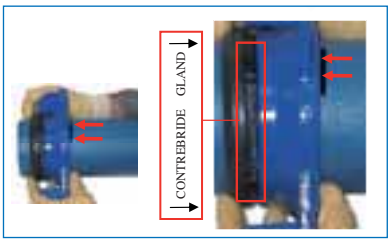
Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.
Lubricate the spigot and inside the gland. See steps 2 and 6 page 322 and steps 2, 3 and 6 page 323.

Slide on the joint and the gland

Position the side of the joint marked "gland" towards the gland.



See step 3 page 322



See step 5 page 323

Insertion

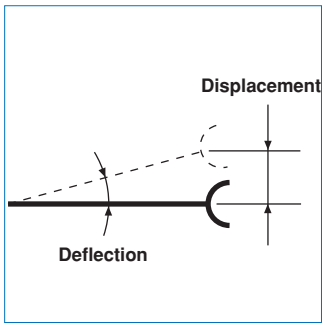
Position the gland exactly against the line marked 11 cm from the spigot.
Respect the jointing depth. See step 12 page 322 and page 323.

Respect the recommendations for use on the safety data sheets available on www.pamline.fr

Assembly and tightening the bolts

After tightening the bolts (14 m.daN), the line must be visible right next to the gland.

Angular deflection



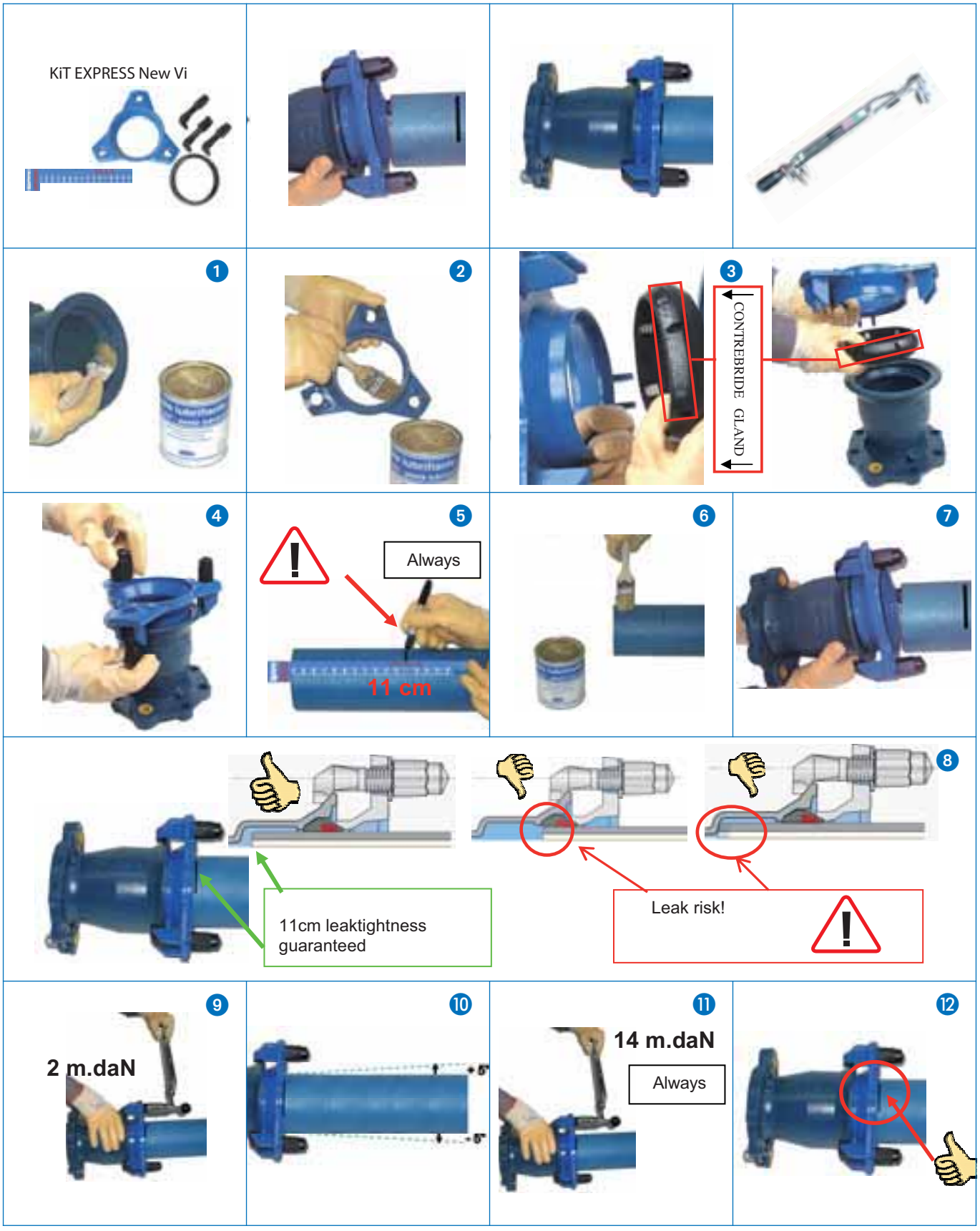
DN	PFA on pipe C40 in bar	Angular deflection
80	23	5°
100		
150	18	

DN	End play	
	Aligned mm	Deflected mm
80	42	34
100	43	33
150	47	33

ASSEMBLY

Anchored / EXPRESS New Vi DN 80 - DN 100 - DN 150

Accessories installation with pre-assembly

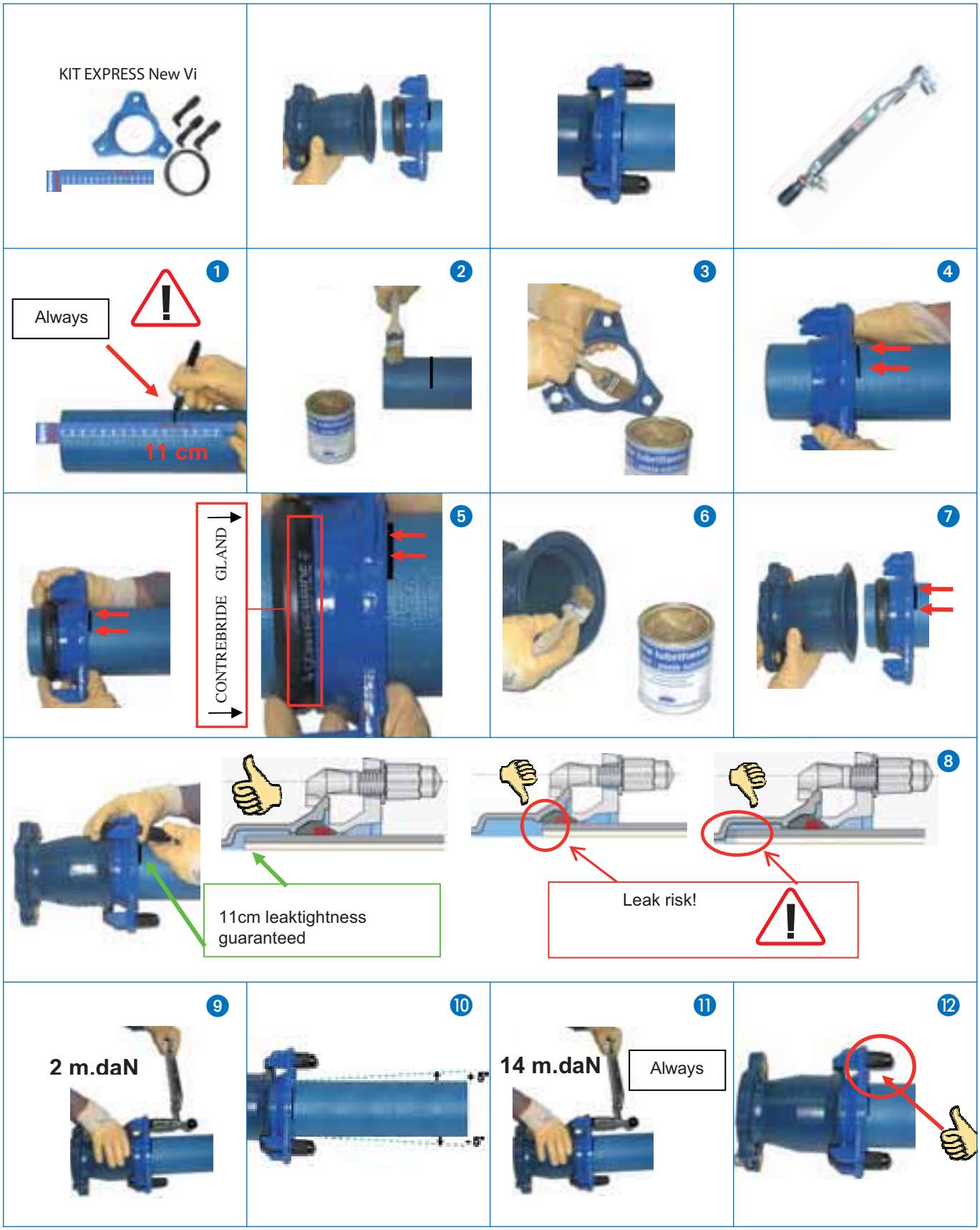


These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

ASSEMBLY

Anchored / EXPRESS New Vi DN 80 - DN 100 - DN 150

Accessories installation without pre-assembly



These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

Anchored / EXPRESS New Vi joint "special insertion" DN 80 - DN 100 - DN 150

Respect the jointing depths and the tightening torques (use a torque wrench).

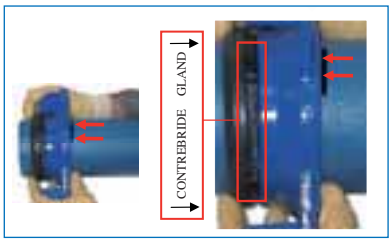
Applicable to DN 80, 100 and 150

Clean

Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.
Lubricate the spigot and inside the gland.

Slide on the joint and the gland

Position the side of the joint marked "gland" towards the gland.



See step 5 page 325

Insertion

First, position the gland exactly against the line marked 11 cm from the spigot.
Respect the jointing depth for the EXPRESS New Vi kit (see steps 4, 5 in the installation instructions page 325).

Then position the Special insertion EXPRESS New kit. First insert the joint gasket and the sealing gland, then continue with the locking ring and the locking gland (see step 6 of the installation instructions page 325).

Assemble and tighten

First tighten the EXPRESS New Vi kit with the torque wrench to 14 m.daN then move to the special insertion kit, tighten the first sealing gland to 12 m.daN with a flat torque wrench and finally tighten the second locking gland of the special insertion kit to 4 m.daN (see step 8 of the installation instructions page 325).

ASSEMBLY

Anchored / EXPRESS New Vi joint "special insertion" DN 80 - DN 100 - DN 150

Accessories installation

1 Kit EXPRESS New Vi



1 Kit EXPRESS New Vi « special insertion »





1



2



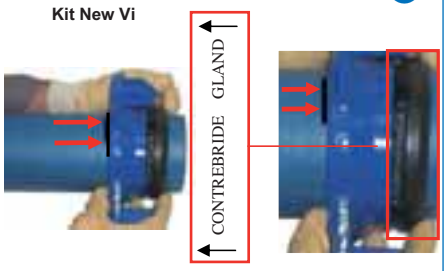
3



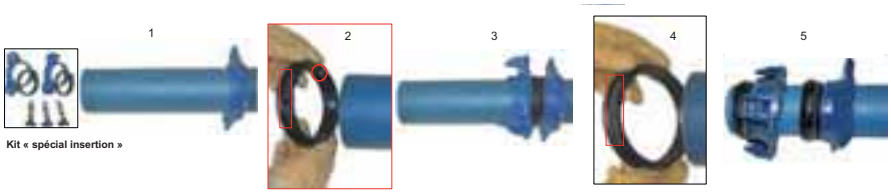
4



5



6



14 m.daN

7



8



9



10



11



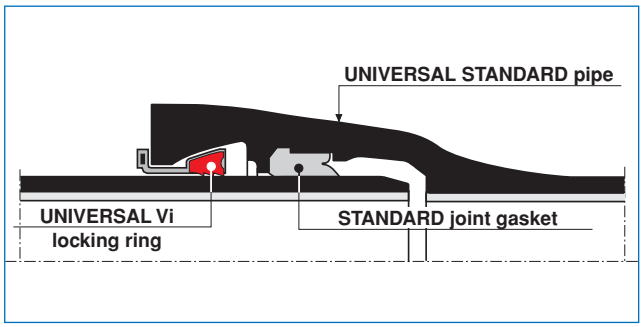
These recommandations are based upon PAM knowledge. It is the contractor's responsibility to ensure that installations are carried out according to the best rules of practice.

ASSEMBLY

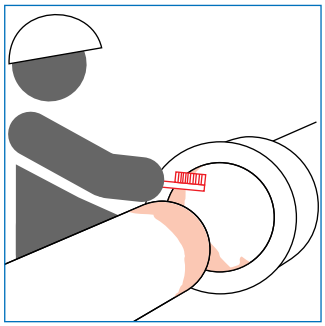
Anchored / UNIVERSAL Vi joint assembly

The UNIVERSAL Vi self-anchoring system must not be used to lock a string of pipes which is to be pulled (e.g. directional drilling).
For these types of situation, use the UNIVERSAL Ve self-anchoring system (with a weld bead).

Prior remark



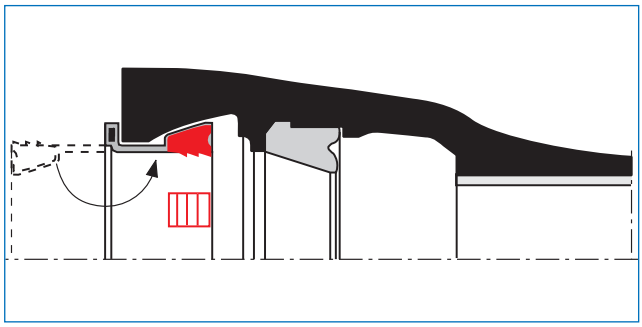
The UNIVERSAL STANDARD Vi joint must be used with UNIVERSAL STANDARD pipes with a double chamber socket designed to receive:
– the STANDARD joint gasket,
– the UNIVERSAL Vi locking gasket with inserts.
The assembly is locked by teeth on the **metal inserts** of the joint gasket which grip the spigot end of the pipe during jointing.
The STANDARD joint gasket provides watertightness.



Clean

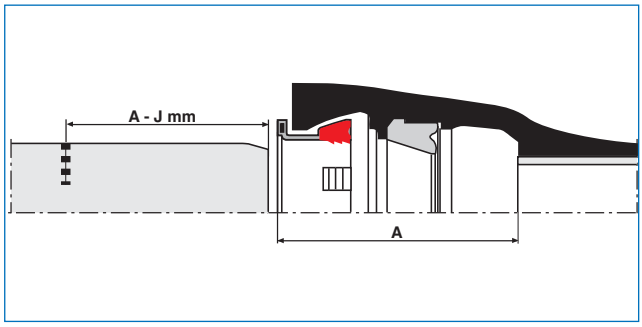
Clean thoroughly inside the socket, the pipe spigot, the joint gasket and the locking ring.
Keep them clean until the end of the assembly operation.

Install the gaskets



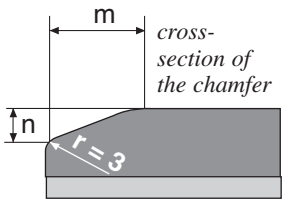
It is recommended to carry out this operation before laying the pipe in the trench.
Install the joint gasket then the locking ring in their housings in the socket.

Mark the jointing depth



(When not marked during manufacture: on a cut or if a STANDARD spigot is used).
Mark the spigot at a distance of **A - J mm**. (J=20)
Also check the conformity and condition of the chamfer.

On a cut, restore the chamfer according to the following dimensions.

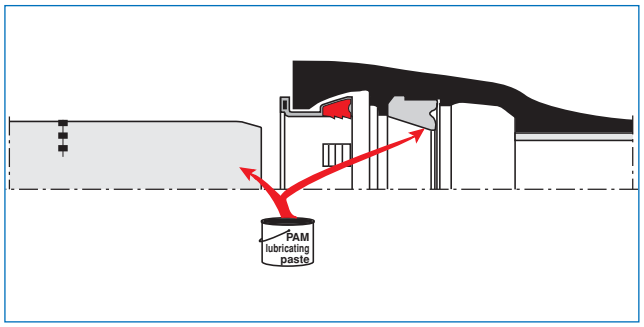


DN	A mm	DN	A mm	DN	A mm	DN	A mm
80	147	150	155	300	187	450	198
100	147	200	162	350	19	500	210
125	147	250	173	400	186	600	217

DN	m (mm)	n (mm)
80 to 600	9	3

Anchored / UNIVERSAL Vi joint assembly

Lubricate

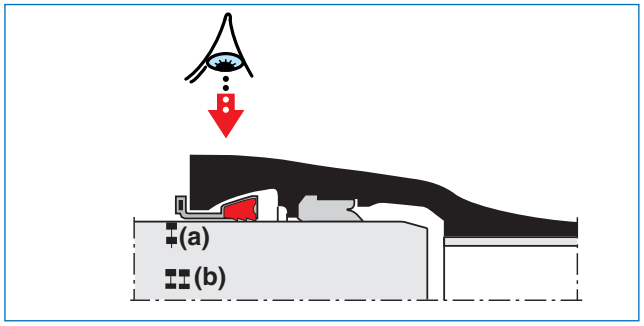


Coat with lubricating paste:
- the visible face of the joint gasket,
- the chamfer and the pipe spigot,
- brush on a reasonable quantity of lubricating paste

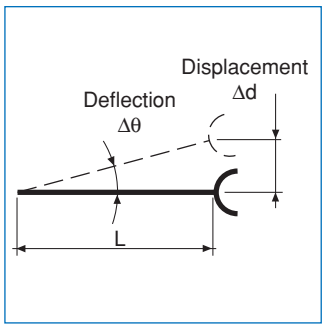
Number of cans for 100 joints:

DN	Nbr	DN	Nbr	DN	Nbr	DN	Nbr
80	2	150	3	300	5	45	6
100	2	200	3	350	5	500	7
125	2	250	4	400	6	600	9

Assemble



Centre and fit the spigot in the perfectly aligned socket:
(a) up to the line drawn at a distance A - 20 mm, in case of cut, or if a Standard spigot is used
b) up to between the 2 lines when they are marked on UNIVERSAL pipes during manufacture



Angular deflection

The pipe axes must be perfectly aligned during the jointing operation.
The deflection must only be carried out once the joint has been fully assembled and before pressurization.

Maximum allowable deflection

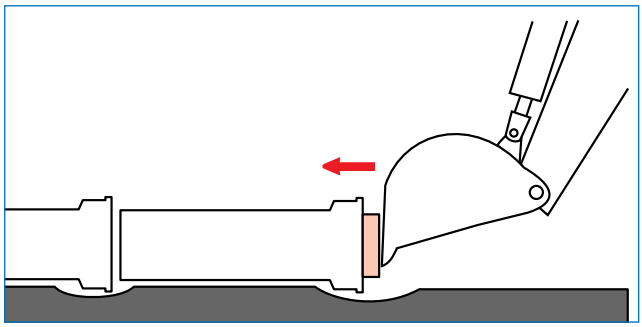
DN	Δθ	L m	Δ d cm
80 to 450	3°	6	31
500	2°	6	21
600	2°	6	21

ASSEMBLY

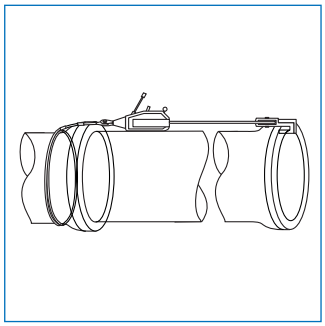
Anchored / UNIVERSAL Vi joint assembly

Equipment for assembly

Bucket of the mechanical shovel



Insert a wooden plank between the bucket of the mechanical shove and the pipe.



Winch

Practical solution when access is difficult.
• DN 100 to 300
Use a T516 type winch (2.5 tonnes; Ref. 158023) to join 2 pipes or a pipe and a fitting.
• DN 350 to 600
Use a T532 type winch (5 tonnes, Ref. 158024) to join 2 pipes and 2 winches for a pipe and a fitting.
Can be ordered from PAM.
A Pull-lift can also be used.

Possible dismantling

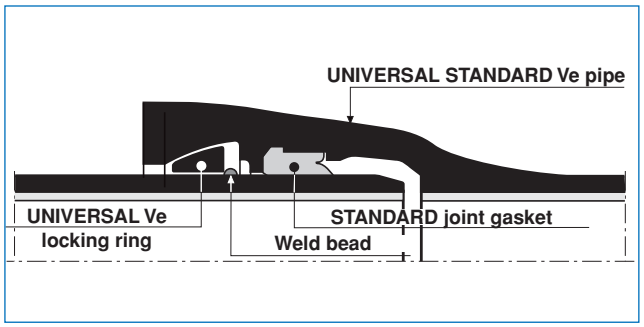
The UNIVERSAL STANDARD Vi joint can be dismantled with special tooling before being put under pressure (consult PAM).
The UNIVERSAL Vi joint can no longer be dismantled after being put under pressure.

The UNIVERSAL Vi locking ring must not be reused after dismantling.

Anchored / UNIVERSAL Ve joint assembly

The UNIVERSAL Ve self-anchoring system must not be used to push a string of pipes, but only to pull it (in a casing, when directional drilling for example).

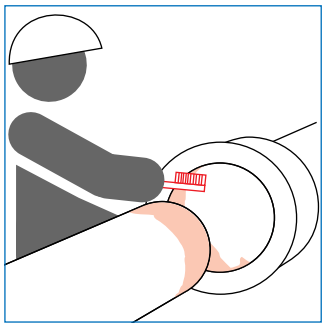
Prior remark



The UNIVERSAL STANDARD Ve joint must be used with UNIVERSAL STANDARD pipes with a weld bead and a double chamber socket designed to receive:

– the STANDARD joint gasket,
– the UNIVERSAL Ve locking ring.

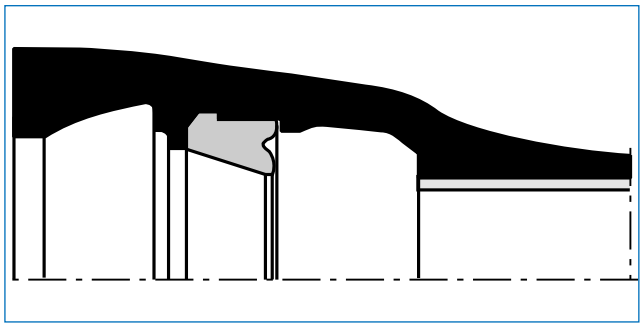
The assembly is locked by a ring and weld bead deposited on the pipe spigot.
The STANDARD joint gasket provides watertightness.



Clean

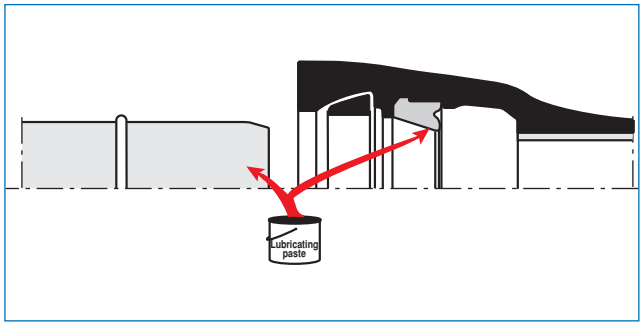
Clean thoroughly inside the socket, the pipe spigot, the joint gasket and the locking ring.
Keep them clean until the end of the assembly operation.

Install the joint gasket



It is recommended to carry out this operation before laying the pipe in the trench.

Lubricate



Coat with lubricating paste:

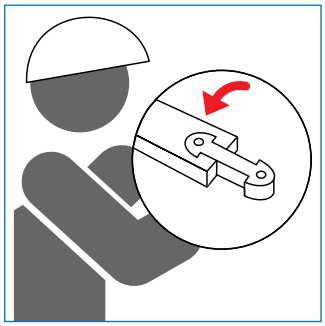
– the visible face of the joint gasket,
– the chamfer and the pipe spigot.

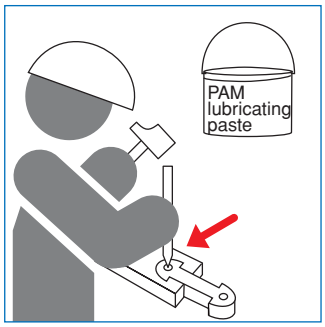
Number of cans for 100 joints:

DN	Nbr	DN	Nbr	DN	Nbr	DN	Nbr
100	2	300	5	600	9	1100	21
125	2	350	5	700	13	1200	24
150	3	400	6	800	15		
200	3	450	6	900	17		
250	4	500	7	1000	19		

ASSEMBLY

Anchored / UNIVERSAL Ve joint assembly



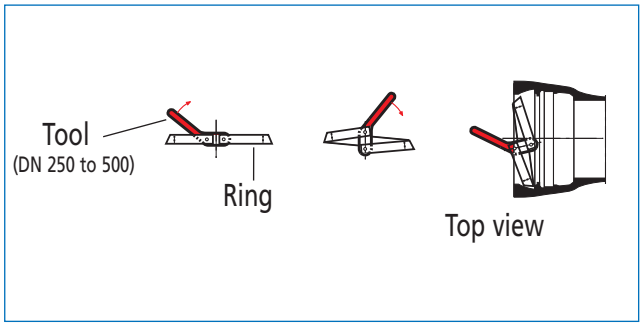


Assembling the locking ring

Assembling the elements

- Insert a connector at the end of a first ring segment, on the flat side (internal),
- Line up a pin (previously coated with lubricating paste) opposite its housing and point its inclined face like that of the connector,
- Drive in the pin with a hammer and a ø3.9 mm drift,
- Repeat the process to produce a closed chain.

Install the locking ring



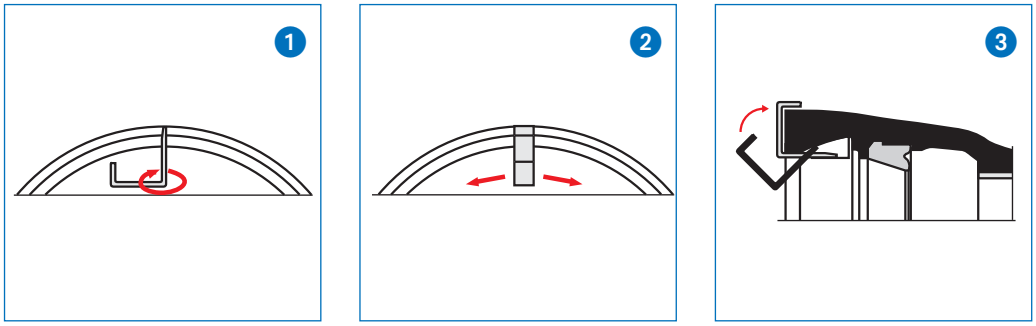
- **For DN 100 to 200:** The ring is preassembled. Fit the ring in its housing.
- **For DN 250 to 700:** fit the ring in its housing in the socket, reducing its outer diameter using the special tool (see drawing opposite) for diameters DN 250 to 500 and manually for DN 600 and 700.

Make sure to position the ring opening on the upper generator of the pipe (so that the locking ring is easier to dismantle, if necessary).

- **or DN 800 to 1200:** Assembling the segment ring: fit an elastomer connector in each metal segment then connect them together with the metal pins, using a hammer. Fit the ring in its housing in the socket.

Open the locking ring

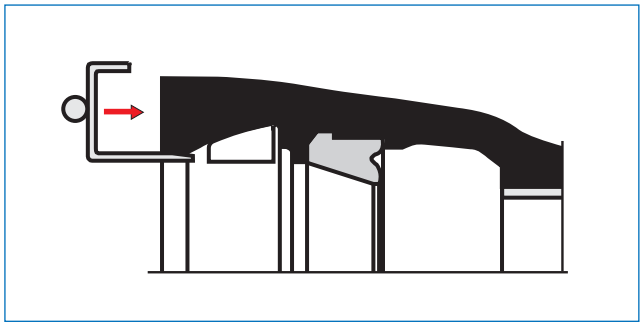
- **For DN 250 to 700:**

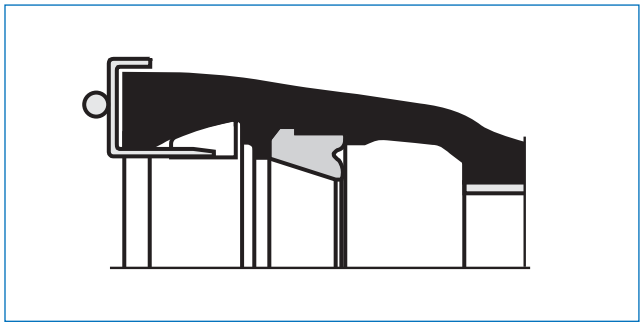


1. Insert the wedge sideways on the end edge of the ring.
2. Turn 90° to separate the two ends.
3. Fold down the wedge on the face of the socket.

Anchored / UNIVERSAL Ve joint assembly

• **For DN 100 to 200 and 800 to 1200:**

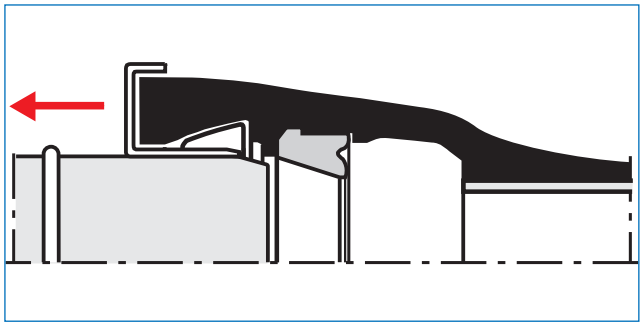


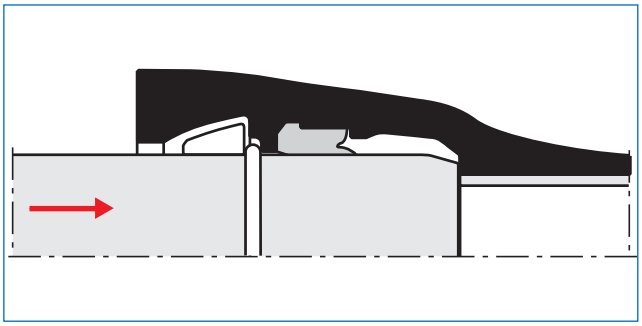


Hold the ring and insert the assembly wedge in the metal elements at the notches. Start with the top element and continue inserting wedges evenly spaced around the pipe.

● Assemble

The joint must be assembled with the pipe sections perfectly aligned.

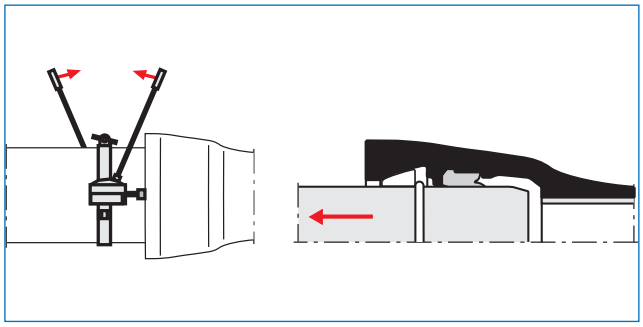




Insert the spigot in the locking ring then remove the wedge.

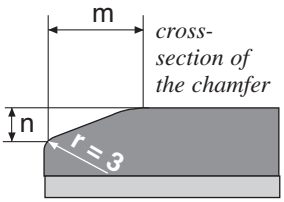
Push the spigot fully into the socket and use the hook to check that the ring is correctly positioned.

● Extend the joint



Extend the joint by pulling the spigot out of the socket until the ring comes up against its housing in the socket. Use a collar equipped with two hydraulic cylinders or pull with the bucket of the mechanical shovel using a suitable textile strap.

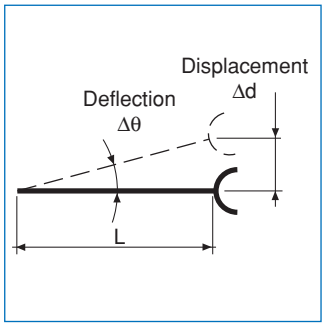
● Chamfer dimensions



DN	m (mm)	n (mm)
100 to 600	9	3
700 to 1200	15	5

ASSEMBLY

Anchored / UNIVERSAL Ve joint assembly



Angular deflection

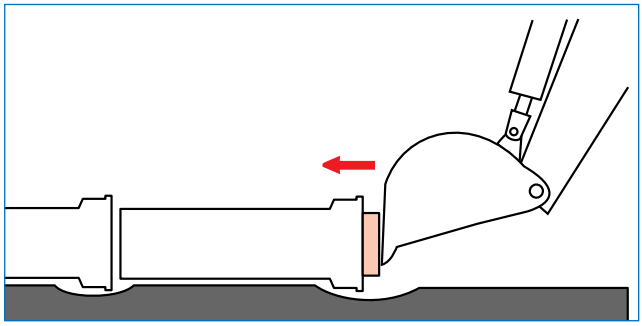
The **pipe axes must be perfectly aligned** during the jointing operation.
The deflection must only be carried out once the joint has been fully assembled and before pressurization.

Maximum allowable deflection

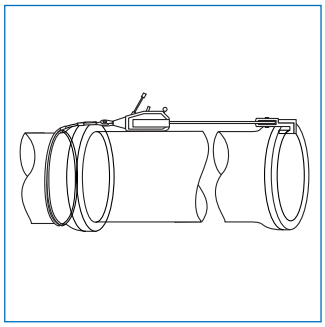
DN	Δθ	L m	Δ d cm
100 to 450	3°	6	31
500 to 700	2°	6	21
800	2°	7	24
900	1.5°	7	18
1000	1.2°	7	15
1200	1.1°	8	15

Equipment for assembly

Bucket of the mechanical shovel

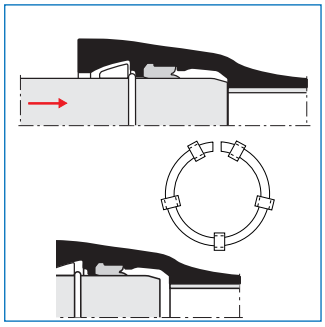


Insert a wooden plank between the bucket of the mechanical shovel and the pipe.



Winch

Practical solution when access is difficult.
Use one or more winches* depending on the DN.
(*) Available on order, see "Equipment for assembly"
A pull-lift can also be used.



Possible dismantling

Push the spigot fully into the socket.
Open the ring using wedges inserted between the pipe barrel and the ring (the number of wedges depends on the DN).
Pull the spigot out of the socket using a collar equipped with two hydraulic cylinders.
Available on order.

Anchored / PAMLOCK joint assembly

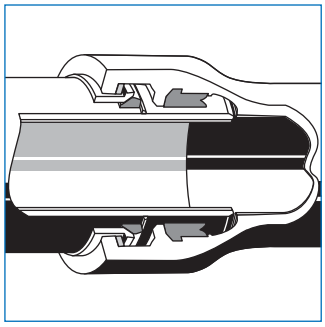
See also: *page*
- STANDARD joint 164
- Self-anchoring 63
- Angular deflection 77
- STANDARD PAMLOCK joint assembly 207

The PAMLOCK (Pk) joint is a STANDARD joint equipped with a special anchoring system, designed in particular for large diameters. The main feature of this system is based on the use of shot, to ensure self-anchoring without the need for bolts.

Self-anchoring takes up the axial forces, making concrete thrust blocks unnecessary.

Range: DN ≥ 1400.

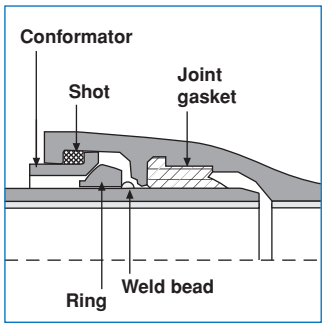
Principle



The basic principle of the anchored joint consists of transferring the axial forces from one pipeline element to the next, therefore making it impossible to separate the junction.

The anchored joints distribute the axial thrusts created at the singular points (bends, tapers, Tees, blank flanges) over one or more pipes, thereby avoiding the need to construct concrete thrust blocks.

Description



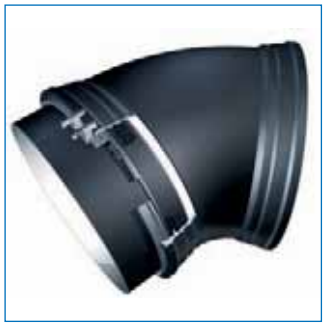
- Tightness is provided by a STANDARD joint gasket.
- The axial forces are transferred by an mechanical device independent of the tightness function, which includes:
  - a weld bead produced in the factory,
  - a ring composed of several segments held together by elastomer connecting parts,
  - a conformator, which transmits the axial force to the internal face of the socket via shot filling the annular cavity located between the socket and the conformator.
- The shot acts as a fluid and guarantees:
  - distribution of the axial force on the faces of the socket and the conformator,
  - automatic extension of the main during assembly.

Any movements of the pipeline during tests are therefore limited to the residual packing of the shot.

Range

Pipes and fittings: DN 1400 to 1800.
DN 2000. Please contact us.

Anchored / PAMLOCK joint assembly



Field of use

The PAMLOCK joint is especially useful when concrete blocks are difficult to construct due to restricted space or in areas of land where there is low cohesion.

Performances

The PAMLOCK joint combines the advantages of flexible joint pipelines and welded joint pipelines.

- **Leaktightness:**

The tightness of this joint is based on the recognized qualities of the STANDARD push-in joint.

- **Angular deflection:**

– 1° (14 cm displacement at the end): DN 1400 to 1600.
– 0.8° (11 cm displacement at the end): DN 1800

- **Allowable operating pressure (PFA):**

– DN 1400 to 1600: 25 bars
– DN 1800: 16 bars

Installation

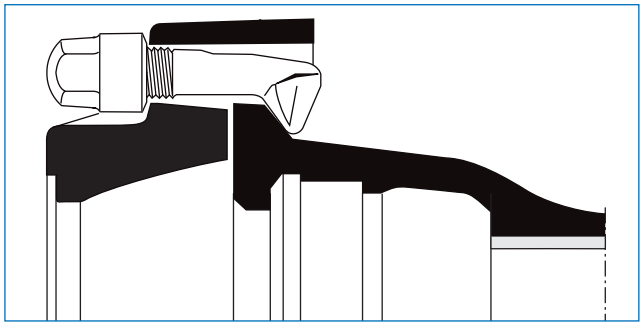
Assembly of the PAMLOCK joint is described in a separate guide. Please contact us.

ASSEMBLY

Anchored / STANDARD V+i joint assembly

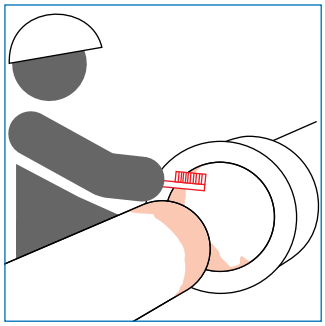
The V+i self-anchoring system must not be used to lock a string of pipes which is to be pulled (e.g. directional drilling).
For these types of situation, use the Ve self-anchoring system (with a weld bead).
The V+i self-anchoring system must not be used with class 30 pipes.

● Install the gland and the bolts



Fit the gland and the bolts on the socket of the STANDARD fitting. Tighten the nuts until the gland and the face of the fitting are touching, **keeping the assembly properly centred on the socket.**

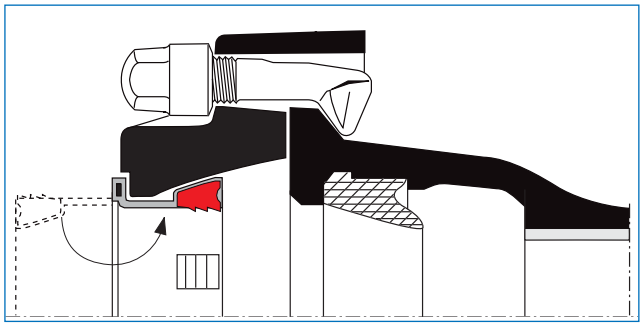
To obtain correct centring, first insert 2 bolts at the top and tighten by hand.



● Clean

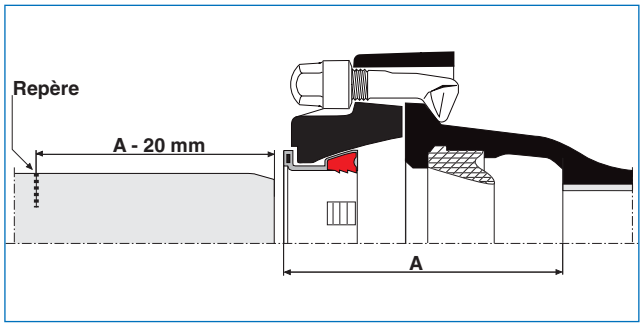
Clean thoroughly inside the fitting socket, inside the gland, the pipe spigot, the joint gasket and the locking ring.
Keep them clean until the end of the assembly operation.

● Install the gaskets



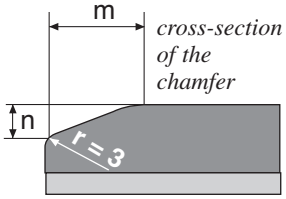
It is recommended to carry out this operation before laying the pipe in the trench.
Fit the STANDARD joint gasket in the socket then the UNIVERSAL Vi locking ring in the gland.

● Mark the jointing depth



When not marked during manufacture: on a cut or if a STANDARD spigot is used.
Dimension A must be measured and will be marked on the spigot. Mark the spigot at a distance of **A - 20 mm**.
On a cut, restore the chamfer according to the following dimensions.

DN	m (mm)	n (mm)
350 to 600	9	3



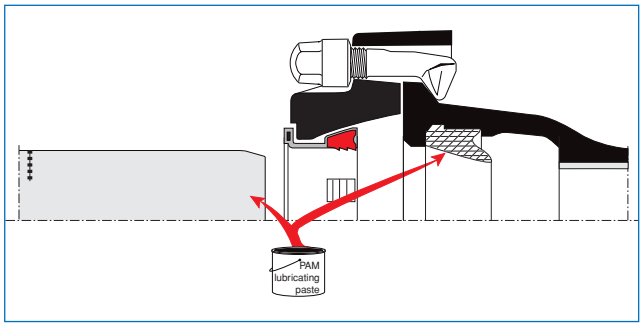
ASSEMBLY

Anchored / STANDARD V+i joint assembly

Length A

DN	A (mm)	DN	A (mm)
350	191	500	202
400	192	600	209
450	192		

● Lubricate



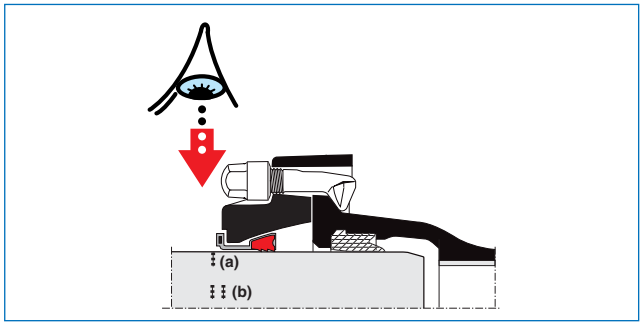
Coat with lubricating paste:
- the visible face of the joint gasket,
- the chamfer and the pipe spigot,
- brush on a reasonable quantity of lubricating paste.

Respect the recommendations for use on the safety data sheets available on www.pamline.fr

Number of cans for 100 joints:

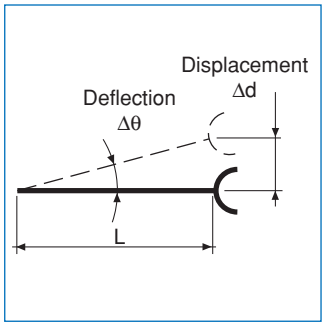
DN	350	400	450	500	600
Number of cans	5	6	6	7	9

● Assemble



Centre and fit the spigot in the perfectly aligned socket.

(a) up to the line drawn at a distance A - 20 mm, in case of cut, or if a STANDARD spigot is used
(b) up to between the 2 lines when they are marked on **UNIVERSAL pipes** during manufacture



Angular deflection

The axes of the pipes and fittings must be **perfectly aligned** during the pipe jointing operation.
The deflection must only be carried out once the joint has been fully assembled and before pressurization.

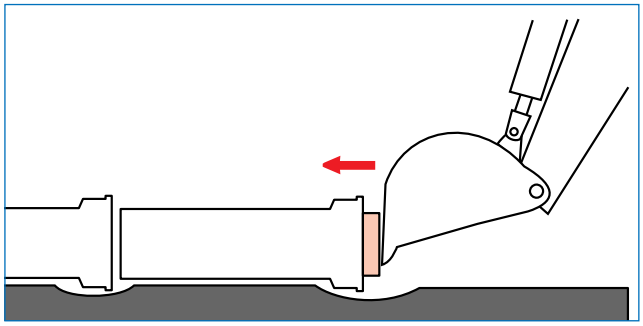
Maximum allowable deflection

DN	Δθ	L m	Δ d cm
350 to 450	3°	6	32
500 to 600	2°	6	21

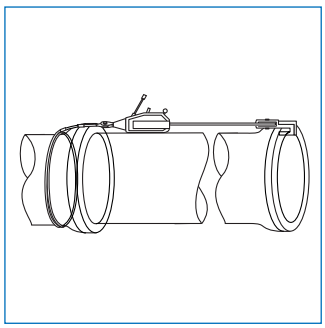
Anchored / STANDARD V+i joint assembly

Equipment for assembly

Bucket of the mechanical shovel



Insert a wooden plank between the bucket of the mechanical shovel and the pipe.



Winch

Practical solution when access is difficult.
Use a T532 type winch (5 tonnes, Ref. 158024) to join 2 pipes and 2 winches for a pipe and a fitting.
Can be ordered from PAM.
A Pull-lift can also be used.

Possible dismantling

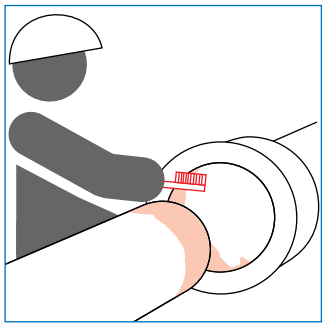
The STANDARD V+i joint can be dismantled with special tooling before being put under pressure (consult PAM).
The STANDARD V+i joint can no longer be dismantled after being put under pressure.

The UNIVERSAL Vi locking ring must not be reused after dismantling.

ASSEMBLY

Anchored / STANDARD Ve joint assembly

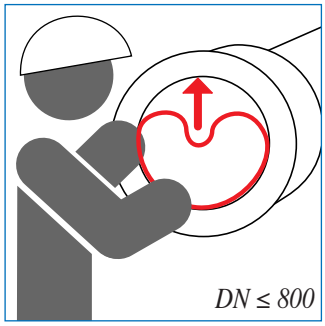
The STANDARD Ve self-anchoring system must not be used to push a string of pipes, but only to pull it (in a casing for example).

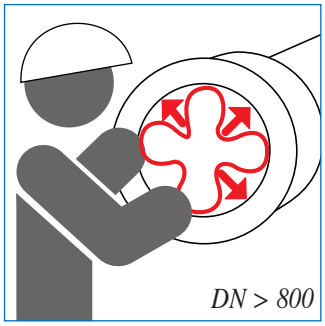


Clean

Clean thoroughly inside the socket, the pipe spigot and the joint gasket.
Keep them clean until the end of the assembly operation.

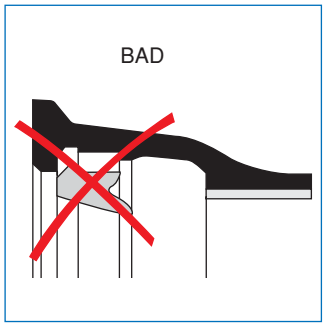
Install the joint gasket

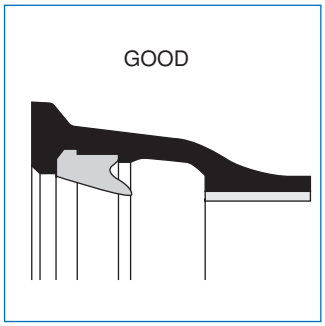




Position the joint gasket before laying the pipe in the trench.

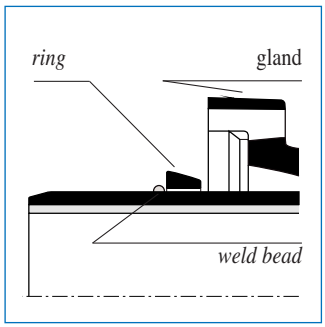
Check the positioning





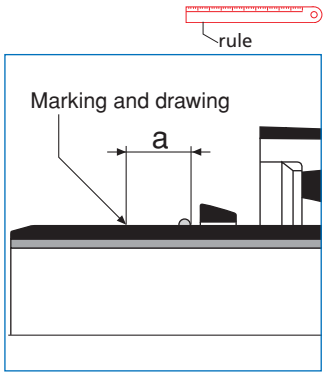
Make sure that the joint gasket is correctly positioned in its housing.

Slide on the gland and the locking ring



First remove the weld bead protection
Place the parts past the weld bead, as shown opposite (see ring assembly below).

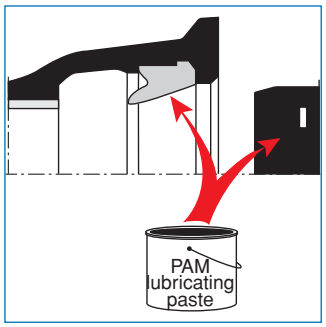
Anchored / STANDARD Ve joint assembly



Mark the jointing depth

Mark and draw from the weld bead according to dimension "a"

DN	80 to 125	150 to 200	250 to 500	600 to 1100	1200
a (mm)	20	25	30	35	25

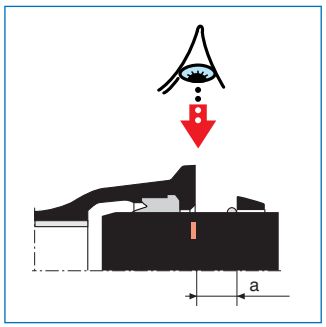


Lubricate

Coat:

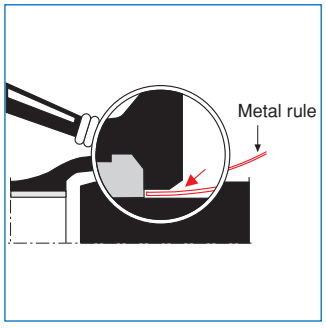
- the visible surface of the joint gasket,
- the chamfer and the pipe spigot.

Brush on a reasonable quantity of lubricating paste.
Respect the recommendations for use on the safety data sheets available on www.pamline.fr



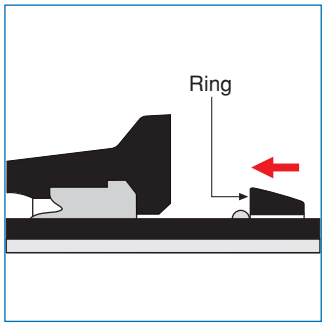
Assemble

Centre and fit the spigot in the perfectly aligned socket up to the line marked at distance a.



Check the assembly

The rule must enter the same depth all the way around the outside.

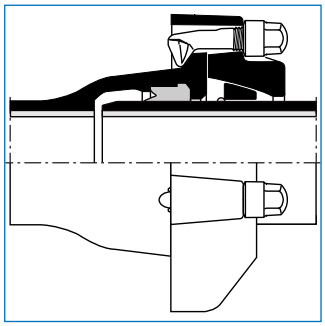


Position the locking ring

- Bring the ring up against the weld bead.
- Check that it is touching the weld bead **around the entire circumference** of the pipe spigot.

ASSEMBLY

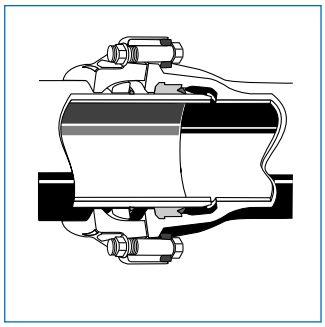
Anchored / STANDARD Ve joint assembly



Position the gland

Cast iron nuts and bots

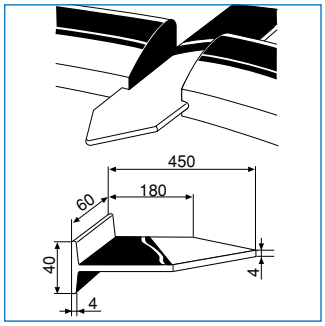
- Bring the gland up against the ring and centre it.
- Insert the bolts, put on the nuts.
- Screw up the nuts by hand until they touch the gland.
- Tighten the nuts diagonally using a torque wrench, until **the gland touches the edge of the socket** (with a slight tightening torque).



Steel nuts and bolts

DN 800 to 1200 (16 bar < PFA ≤ 25 bar).

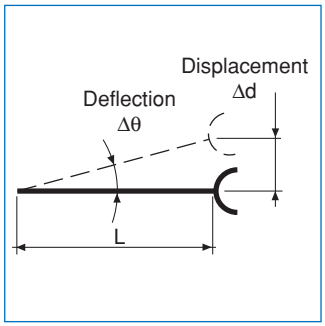
- Proceed as above, with:
  - steel bolts,
  - bearing flanges,
  - steel nuts.



Assembling the one-piece ring

One-piece ring for DN 250 to 700

The one-piece ring is open.
To fit it on the pipe spigot, use a trapezoidal wedge* to help it slide over the weld bead.
(*)Available on order.



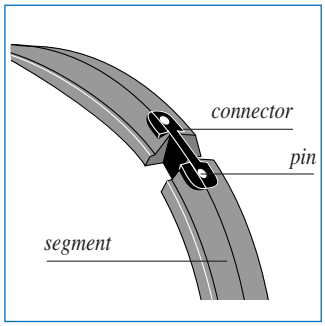
Angular deflection

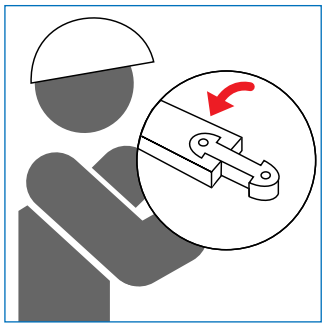
The pipe axes must be perfectly aligned during the jointing operation. The deflection must only be carried out once the joint has been fully assembled and before pressurization.

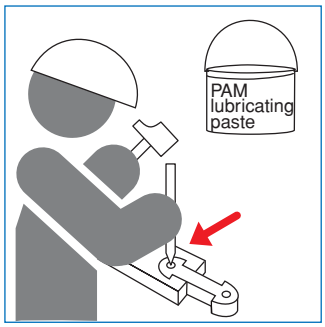
Maximum allowable deflection

DN	Δθ	L m	Δ d cm
60 to 150	5°	6	52
80 to 300	4°	6	42
100 to 600	3°	6	31
700 to 800	2°	7	24
900 to 1000	1.5°	7	18
1000 to 1200	1.5°	8	21

Anchored / STANDARD Ve joint assembly







Assembling the segment ring

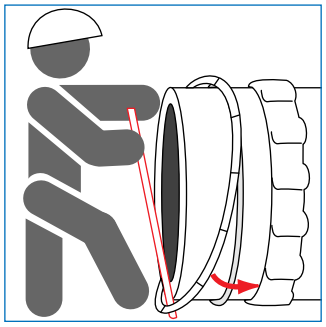
Segmented rings for DN 80 to 200 and 800 to 1200

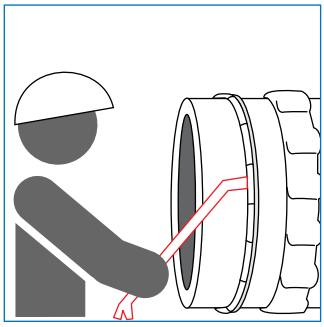
The segment ring consists of:
- cast iron segments,
- elastomer connectors,
- pins.

DN 80 to 200 : the ring is delivered **preassembled.**
DN 800 to 1200 : the ring must be assembled as shown below.

Assembling the elements
- Insert a connector at the end of a first ring segment, **on the flat side (internal)**,
- Line up a pin (previously coated with lubricating paste) opposite its housing and point its inclined face like that of the connector,
- Drive in the pin with a hammer and a ø3.9 mm drift,
- Repeat the process to produce a closed chain.

Passing over the weld bead with a crowbar

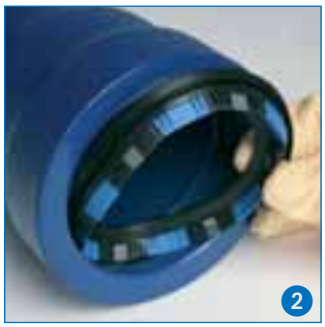




ASSEMBLY

Anchored / BLUTOP anchored joint assembly











Installing the joint

Clean ends

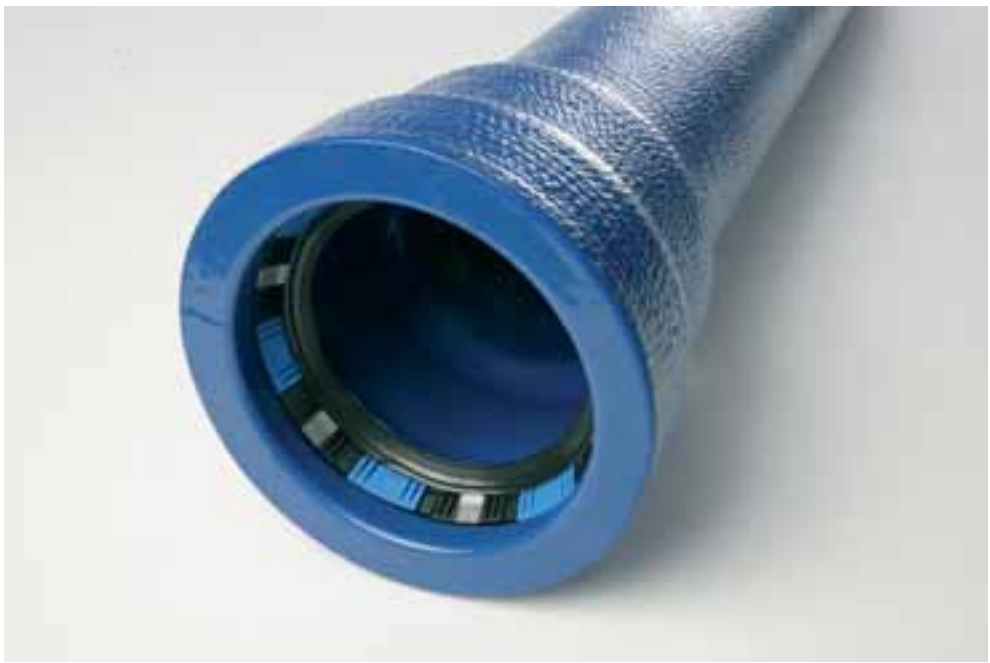
• Position the joint gasket before laying the pipe in the trench

Assembling the joint gasket

• Lubricate inside the socket [1]
• Offer up the joint without prior deformation, with the blue segments pointing towards the outside [2]
• Press gently to insert the joint fully into its housing in the socket [3]
• Make sure that the joint is correctly positioned in its housing [4]
• Lubricate inside the joint gasket [5]

Tip

• Keep the spigot and socket plugged until jointing
• The BLUTOP sleeve allows the tube spigot to be laid in the trench without getting it dirty
• Use the can of special lubricating paste for the BLUTOP range.



Anchored / KLIKSO anchored joint assembly

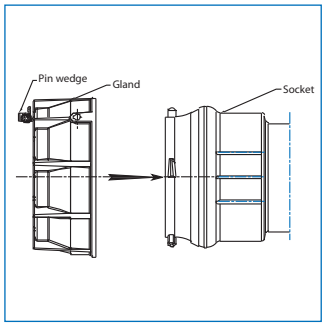
See also: *page*
• KLIKSO 179

KLIKSO fittings are assembled by insertion on the spigot of a PVC or PE tube.

The KLIKSO fitting is anchored by simply adding a locking gland, to be screwed a quarter turn on its socket.

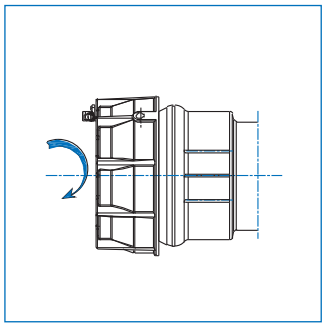
KLIKSO anchored joint assembly

Do not remove the pin wedge before jointing the tube. If the wedge is removed inadvertently, it will still be possible to insert the tube but the force required will be increased by about 10 %.



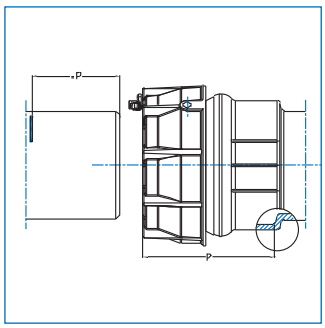
Installing the gland

Push the gland on the socket of the KLIKSO fitting to be locked, positioning it so that the pin wedge remains accessible.



Screwing

Screw the gland clockwise until it is tight (about1/4 turn).

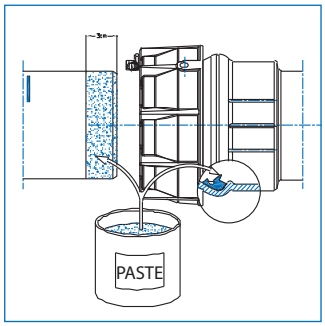


Assembling the tube and anchored fitting junction

Using a soft pencil or a felt tip pen, mark the KLIKSO fitting jointing depth "D" on the tube spigot.

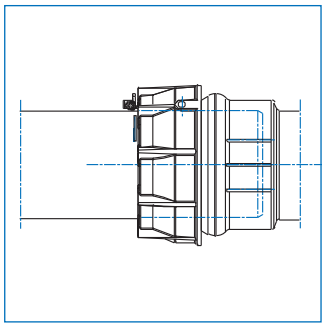
ASSEMBLY

Anchored / KLIKSO anchored joint assembly



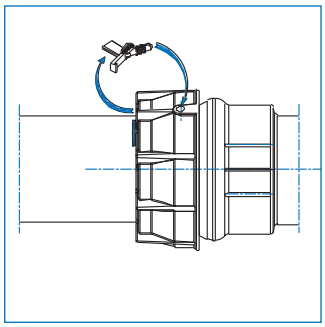
Lubrication

• Coat the end of the tube with lubricating paste, over a length of about 30 mm, as well as the visible face of the fitting joint gasket.



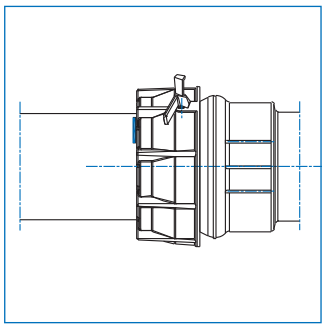
Jointing

• Align and centre the parts to be assembled.
• Push one pipe inside the other until the edge of the gland reaches the line.



Locking

• Take out the pin wedge and keep it.
• If necessary, make the angular deflection within the permissible limit (3°), after assembly and locking only.



Blocking with the pin

• After assembly, insert the pin wedge in the hole provided to prevent the flange from accidentally becoming unscrewed.

Anchored / KLIKSO anchored joint assembly

Do not remove the pin wedge before jointing the pipe. If the wedge is removed inadvertently, it will still be possible to insert the pipe but the force required will be increased by about 10 %.
Before insertion, check that the chamfer on the end of the pipe to be assembled is conform.
If the pipe is cut, redo the chamfer on the cut edge before assembly.

Use

On PE pipelines of PFA 10 or 16 bar (EN 12201) and PVC pipelines of PFA 10 or 16 bar (EN 1452).
Angular deflection: 4° in Non-anchored version and 3° in anchored version.



Self-anchoring systems are not designed to withstand the forces generated by restrained expansion of PE or PVC tubes.





Laying of a double PUX pipeline with DN 1600 - SHUWEIHAT, ABU DHABI 2002-2004

TT PE and TT PUX

See also: *page*
- External coating (selection) 216
- Soil aggressivity 88
- TT PE 224
- TT PUX 226
- STANDARD joint assembly 299
- UNIVERSAl Ve joint assembly 329
- UNIVERSAL Vi joint assembly 326
- Cutting pipe 279

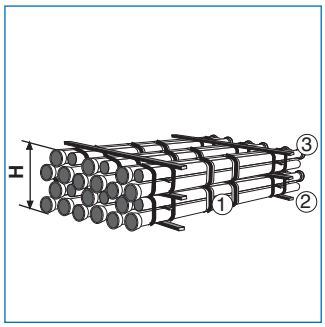


STANDARD TT pipes are just as easy to lay as STANDARD joint pipes. The few operations and precautions specific to STANDARD TT pipes are described in this section.

Storage

● Pipe and fitting storage

Pipes and fittings must be stored on flat ground free of any stones.



Pipes DN 60 to 300 (polyethylene coating)
The pipes are delivered in bundles. They can be stored secured by timber wedges. Stacked height should not exceed 2.50 m. Between two adjacent bundles, the pipes must be laid alternately spigot to socket, and aligned to ensure there is no contact between the pipes.
1 - Pipe bundle.
2 - Timbers, 120 mm wide.
3 - Timber wedges, 120 mm wide.
H = 2.50 m.



Pipes DN 350 to 700 (polyethylene coating) and pipes DN 800 to 2 000 (polyurethane coating)
Pipes DN 350 to 2 000 are delivered individually. Pipes must be stored as follows:
- The pipes in the same layer are placed spigot to socket alternately to the layer below (without any timber wedges between layers).
- The first layer rests on timbers 120 mm wide secured by timber wedges.

The maximum number of layers, for pipes K = 9, must not exceed the following:

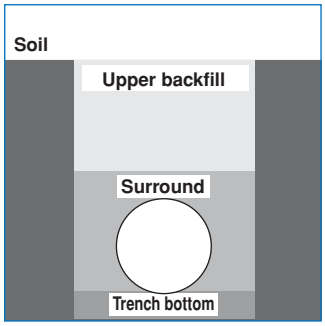
DN	Number of layers	DN	Number of layers
350	18	1 000	3
400	16	1 100	3
450	14	1 200	2
500	12	1 400	2
600	10	1 500	2
700	7	1 600	2
800	6	1 800	2
900	5	2 000	2

INSTALLATION OF SPECIAL COATINGS

TT PE and TT PUX

Fittings

Fittings should be stored by type and by diameter on timbers or boards.
Avoid stacking fittings, or make sure there is intermediate protection to avoid damaging the epoxy coating.



● Earthworks

If the extant soil presents any risks to the coating (rocks, stones, etc.), it is necessary to prepare the trench bottom with a minimum thickness of 10 cm.
After having laid the pipe, the same precautions must be taken with regard to the pipe surround and backfill.

Assembly

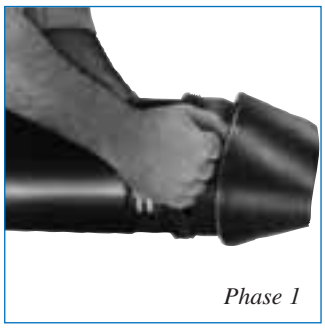
● Joint assembly

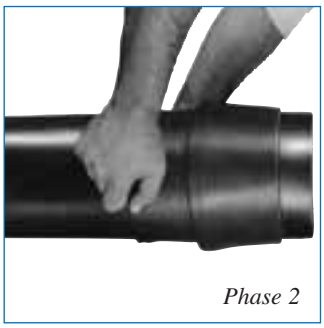
Pipes and fittings, see ASSEMBLY - STANDARD JOINT, ASSEMBLY - ANCHORED UNIVERSAL STANDARD Ve JOINT, ASSEMBLY - ANCHORED UNIVERSAL STANDARD Vi JOINT.

● Protection of joints

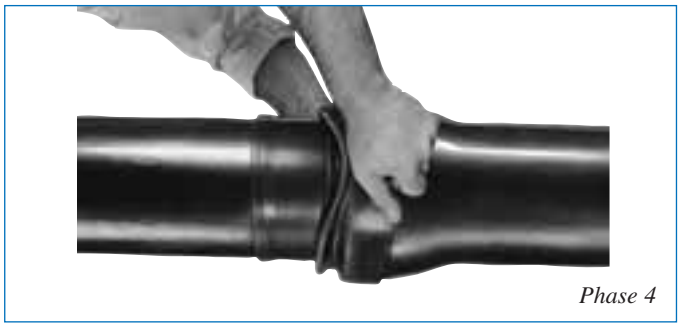
Pipes and fittings DN 60 to DN 300 (polyethylene coated pipes)

Install the sleeve on the spigot before assembling the joint


Phase 1


Phase 2


Phase 3


Phase 4


Phase 5

– Check the spigot chamfer.
– Slide the sleeve onto the pipe spigot (steps 1 and 2).
If necessary use lubricating paste.
– Turn the sleeve back so it is ready for joint assembly (step 3).

INSTALLATION OF SPECIAL COATINGS

TT PE and TT PUX


Phase A

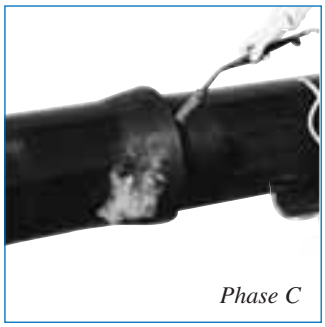
Joint protection
After jointing and checking, turn the sleeve over the joint to protect it (steps 4 and 5).

Pipes and fittings DN 350 to 700 (polyethylene coated pipes)
Install the RAYCHEM-type heat-shrink tubular sleeve

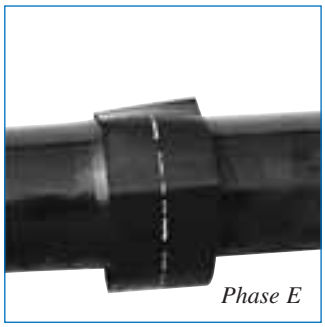
– Check the spigot chamfer.
– Place the sleeve behind the socket (Step A).
– Joint the two parts and check.


Phase B

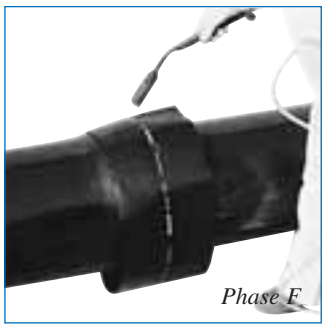
– Clean with a rag the area to be protected.
– Roughen the polyethylene surface with emery paper over the same area as the sleeve width (Step B).


Phase C

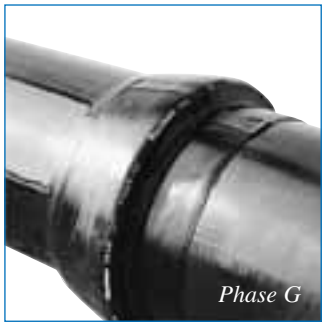

Phase D


Phase E

– Pre-heat the roughened polyethylene area with a gas flare (Step C).
Raise the temperature without going beyond 60°.
– Remove the protective sheet from inside the sleeve (Step D).
– Centre the sleeve on the joint to be protected (Step E).


Phase F

– Using the gas flare (soft flame), start shrinking the sleeve by successive sweeps across the entire surface, starting with the largest section of the joint diameter (Step F).


Phase G

– The operation is complete when the adhesive starts to run out each side of the sleeve. Smooth the sleeve with a gloved hand, if necessary (Step G).

TT PE and TT PUX

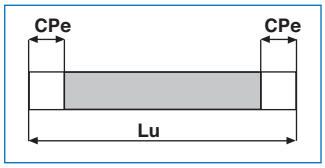
Pipes and fittings DN 100 to 2 000 (polyurethane coated pipes)
Given the coating applied to these pipes and fittings, no protection is required for conventional joints of these products.

Cutting

● Cutting pipes DN 60 to 700 (polyethylene coating)

It is impossible to joint with the polyethylene coating. The polyethylene coating must therefore be removed and the cut prepared as follows.
If the pipe must be cut, only use so-called "calibrated" pipes (see MARKING). These pipes must be stipulated on ordering.

Marking the cut (Lu), and cutting the pipe



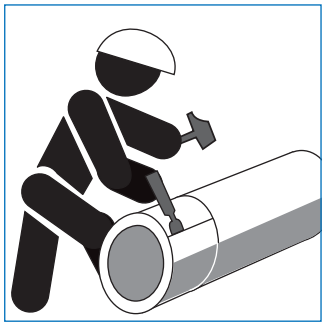
Take into account the jointing depth when marking the cut (Lu).
Cut the pipe (see CUTTING PIPE)

DN	STANDARD TT pipes	UNIVERSAL TT pipes
	mm	mm
60 and 80	95	NC
100	100	NC
125 and 150	105	NC
200 and 250	115	NC
300	120	NC
350 and 400	120	205
450 and 500	125	225
600 eand 700	NC	NC

NC : please, consult us.

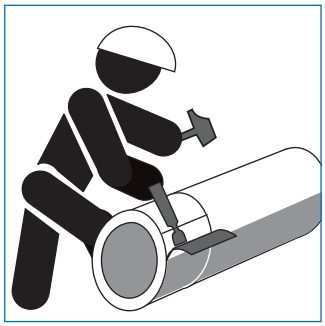
Polyethylene area to be stripped
Mark the maximum distance from which the polyethylene must be stripped (CPe)

Cutting the polyethylene coating



Cut the polyethylene coating through to the ductile iron. Use a chisel, a cutter or a pipe cutter (be careful not to cut into the iron).
If using a pipe cutter, bring the wheel into contact with the iron, then release by a half turn before cutting.
Also make a lengthwise cut, so the polyethylene can be stripped.

Preheating and stripping the polyethylene



Use a gas flare to preheat the area from which the polyethylene is to be stripped, working from inside the pipe and without damaging the cement mortar coating.
Gradually raise the temperature without exceeding 40°C (you should be able to lay your hand on the heated cement lining).
Once the pipe has warmed through, lift one edge of the polyethylene with a chisel and then strip if off in a single piece. The adhesive should remain attached to the polyethylene.

INSTALLATION OF SPECIAL COATINGS

TT PE and TT PUX



Cutting pipes DN 800 to 2 000 (polyurethane coated pipes)

It is possible to joint with the polyurethane coating.
If so-called "calibrated" pipes were not specified on the order (see DIMENSIONS and MARKING), it is essential to first measure the outside diameter of the pipe where it is to be cut, with a circumference tape.
The maximum outside diameter, including the polyurethane coating, should not exceed the following values:

DN	DE maxi	DN	DE maxi
	mm		mm
800	844.2	1 400	1 464.2
900	947.2	1 500	1 567.2
1000	1 050.2	1 600	1 670.2
1100	1 153.2	1 800	1 877.2
1200	1 257.2	2 000	2 084.2

Remaking the chamfer and repairing the external coating on spigot ends
See CUTTING PIPE.



INSTALLATION OF SPECIAL COATINGS

ISOPAM

See also: *page*
- ISOPAM (PREINSULATED PIPELINES) 127
- STANDARD joint assembly 299
- Bridge crossing 270
- Pipe laying above ground 255
- Cutting pipes 279



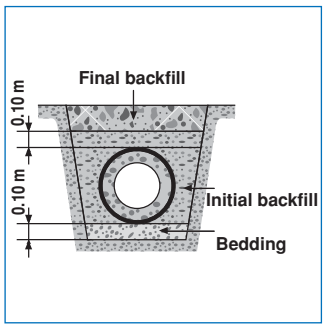
The ISOPAM preinsulated pipelines are as easy to lay as the push-in joint ductile cast iron pipes. Consequently, only those operations or precautions specific to ISOPAM are described below.

● Laying above ground or bridge crossing

Recommendations
Refer to LAYING ABOVE GROUND or BRIDGE CROSSING.

Dimensions of collars and supports.
The dimensions of the collars and supports must take into account the outer diameter DR of the polyethylene sleeve.
Recommendations:
- plan one support for each pipe (behind each socket),
- respect a minimum collar width w,
- fit a protective rubber pad under the collar to avoid pinching or deforming the polyethylene sleeve.

DN	DR	l	Pipe weight	DN	DR	l	Pipe weight
	mm	mm	kg		mm	mm	kg
100	200	60	115	300	450	80	421
125	225	60	140	350	500	100	512
150	250	60	172	400	560	100	605
200	315	60	245	500	670	150	836
250	400	80	337	600	Please contact us		



● Trench pipe laying

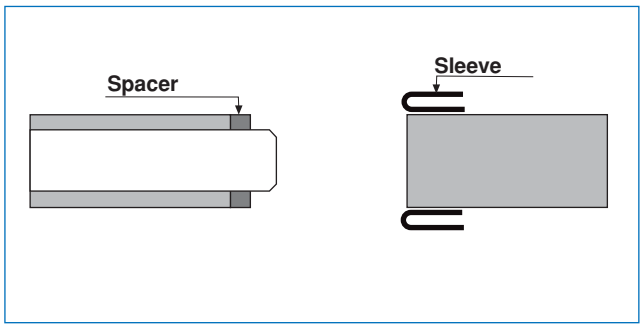
Pipe laying conditions
Plan a 10 cm thick layer of sand at the bottom of the trench and a rock-free backfill, suitably compacted up to 10 cm above the upper generator.
The rest will be filled with ungraded material and compacted according to applicable rules.

Minimum depth of cover
The minimum depth of cover with traffic loads (10-tonne wheel) is:
- 0.50 m for DN ≤ 300,
- 0.75 m for DN > 300.

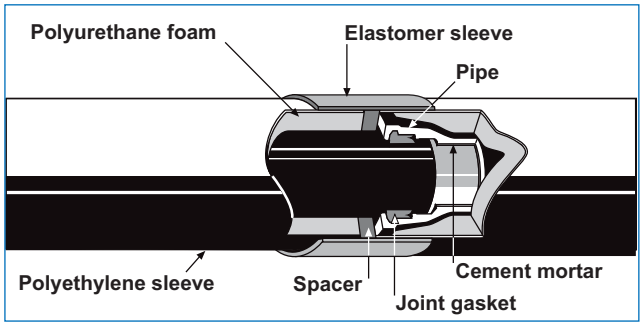
INSTALLATION OF SPECIAL COATINGS

ISOPAM

● Protecting the junction

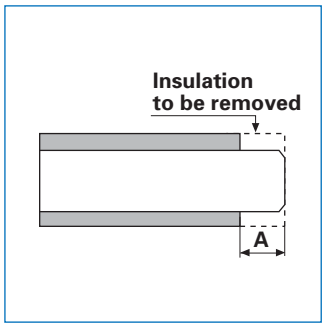


– Fit the elastomer foam spacer on the spigot,
– Fit the elastomer sleeve on the sheath, socket end, and fold it back over itself.



– Assemble the joint. See STANDARD JOINT ASSEMBLY.
– Fold the elastomer sleeve on the sheath, spigot end.

● Cutting STANDARD socketed pipes



Marking the cut and the area of insulation to be removed
Allow for the jointing depth and mark the cutting plane.

Area where the insulation will be removed
Draw a line indicating up to where the insulation will be removed, respecting the following dimensions:

DN	Insulation to be removed A	DN	Insulation to be removed A
	mm		mm
100	97	300	130
125	100	350	148
150	103	400	150
200	109	500	155
250	108	600	Please contact us

Cutting the pipe
Cut off the pipe (see CUTTING PIPES) with the sleeve and the insulation.

Cutting the insulation
Cut the polyethylene sleeve and the insulation (take care not to damage the cast iron).
Remove the insulation and clean the spigot thoroughly.

Restoring the chamfer and applying the coating
Deburr and restore the chamfer to avoid the possibility of damaging the joint gasket during assembly.
See CUTTING PIPES.
Apply the coating on the uncoated spigot and the chamfer.
See REPAIRING THE EXTERNAL COATING.

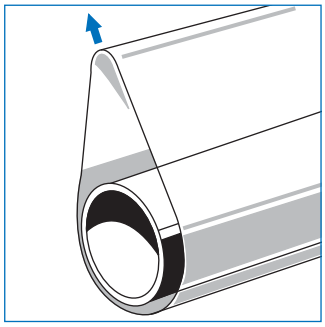
● Angular deflection

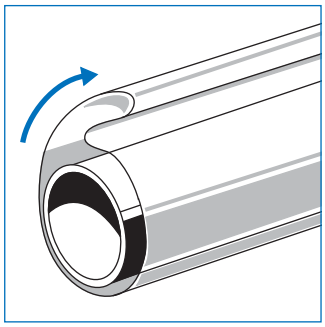
See JOINT ANGULAR DEFLECTION.

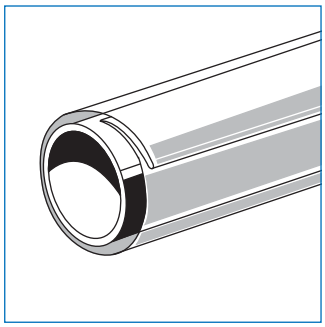
INSTALLATION OF SPECIAL COATINGS

Polyethylene sleeving (application)

See also: *page*
• Polyethylene sleeving 222







Polyethylene sleeving is made up of overlapping elements:

– a "barrel sleeve" along the barrel of every pipe,

– a "joint sleeve" at every joint.

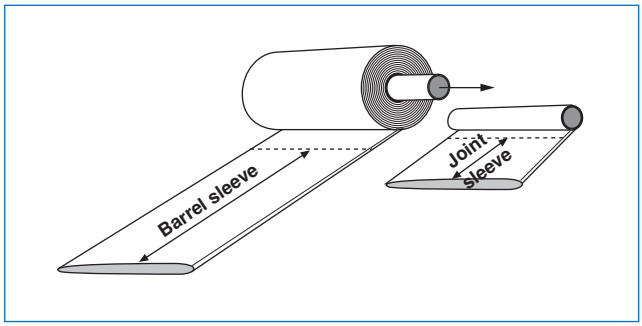
Basic instructions

Pipes and fittings must be as clean and dry as possible before sleeving.
In particular avoid soil entrapment between the pipe and sleeving.
The pipe bed and natural soil, or backfill, must only consist of fine material, to avoid sleeving damage occurring during laying or in service (top loads, weight of full main, wheel loads).
The sleeving must fit the pipes as snugly as possible (importance of the fold and ties). See sketches opposite.
The barrel and joint sleeve overlaps must provide total continuity of protection.

The fold must always be made at the top of the pipes, to limit the risk of damage during backfilling.
Do not use ripped sleeving and avoid damage during backfilling.
Small tears can be repaired with adhesive tape. Larger defects can be covered with extra sleeving of the same type, which must be sufficiently long to cover the damaged area.
The same application technique must be used as for the joint sleeves.
The polyethylene sleeve must be stored under cover, protected from heat and sunlight.

Sleeving preparation

Cut the barrel and joint sleeves to the dimensions indicated in the section **"Material required and dimensions"**.

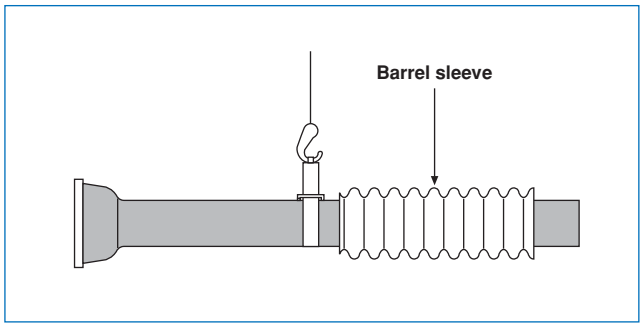


● **Note:**

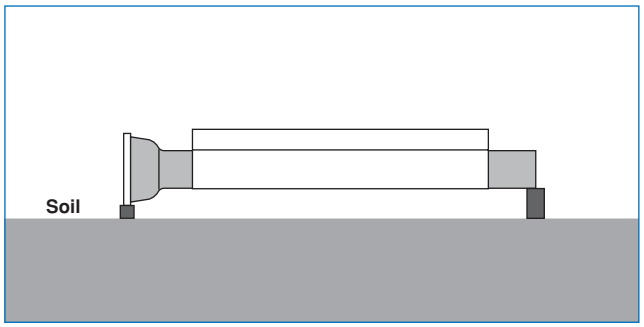
For STANDARD DN 60 to 600 pipes, the barrel and joint sleeves are supplied pre-cut to size in one package.

Polyethylene sleeving (application)

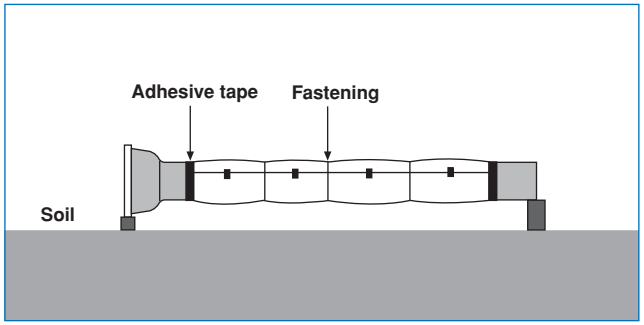
Barrel sleeve



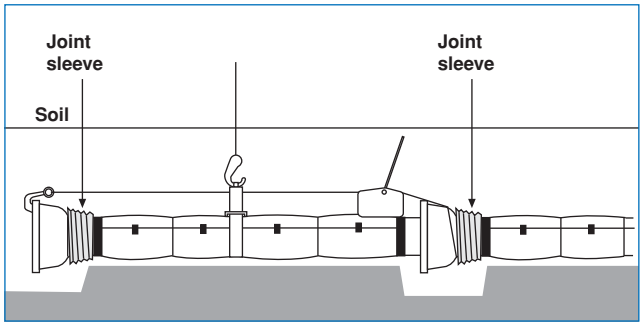
• Before lowering the pipe into the trench, raise it up and slip the pleated sleeving along the barrel.



• With the pipe supported on two wooden blocks, spread the sleeving along the whole length of the barrel and fit it snugly to the latter by folding it over at the top of the pipe. The sleeve must not billow.



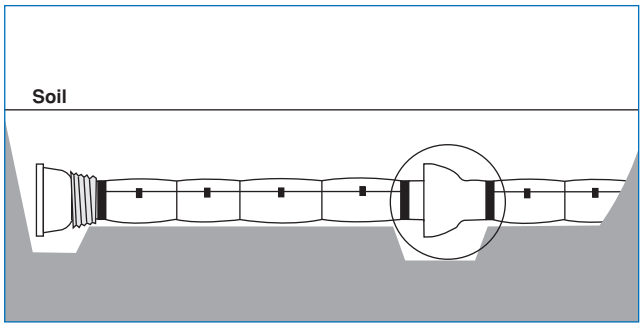
• Fasten the fold down with tape.
• Fasten the sleeve ends to the barrel by wrapping adhesive tape around the circumference, overlapping the barrel sleeving junction, to give a watertight overwrap.
• Apply intermediate fastenings (plastic coated steel wire) every 1.50 m
• Slip on the joint sleeve.



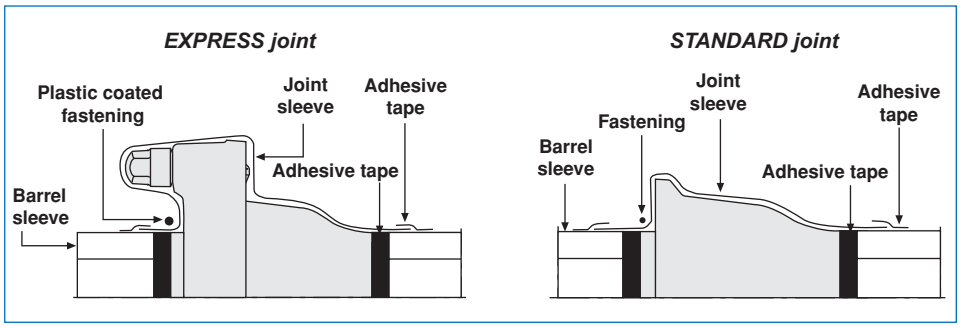
• Lower the pipe into the trench.
• Joint the pipe with appropriate equipment. The fold must still be at the top of the pipe.

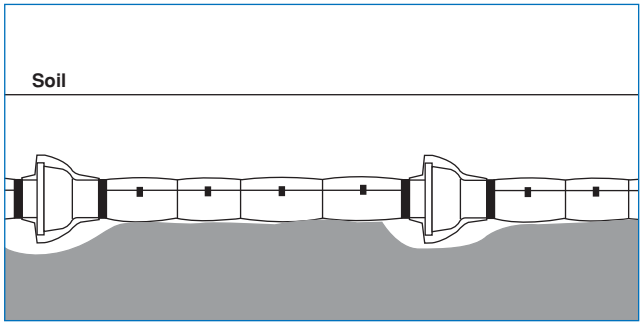
Polyethylene sleeving (application)

Joint sleeving



• Bring the joint sleeve over the socket and spigot. A sufficiently large excavation must have been made under the joint to allow satisfactory application of this sleeve (room for tape wrapping and ties).





• Fold the joint sleeve over, fitting it as snugly as possible, overlapping the barrels of the adjoining pipes (the fold must again be made at the top).
• Secure it with a tie, as near as possible to the gland in the case of the EXPRESS joint, or the socket face, in the case of the STANDARD joint.
• Fasten the ends on to the sleeves of the adjoining pipe barrels with adhesive tape wrapped around the whole circumference to make a watertight overwrap.

Sleeving of fittings

- Successive assembly of barrel and joint sleeves must form a continuous protection.
- Use the same polyethylene sleeving to protect fittings.

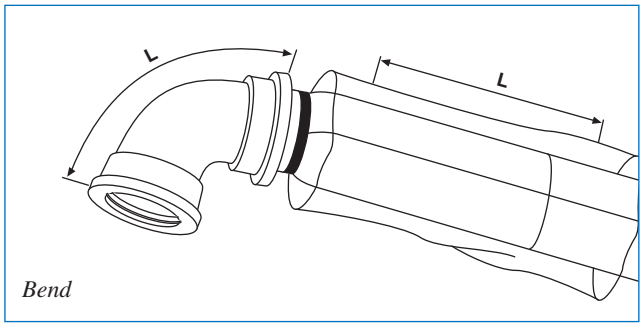
Depending on their shape, two or three pieces of sleeving may be necessary. Application must comply with the same recommendations (particularly fitting the sleeving as snugly as possible).

INSTALLATION OF SPECIAL COATINGS

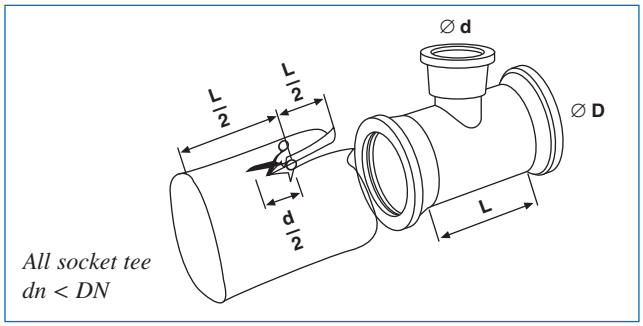
Polyethylene sleeving (application)

Examples

Cutting to length

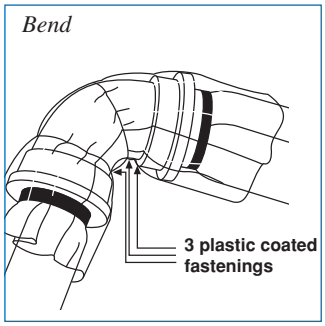


Bend

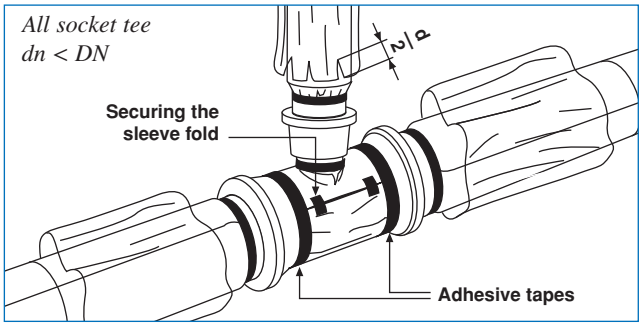


All socket tee
dn < DN

Application

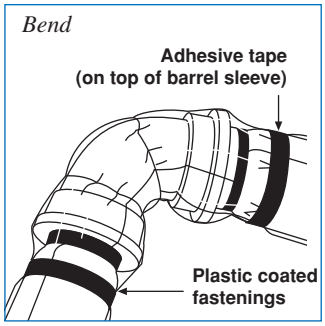


Bend

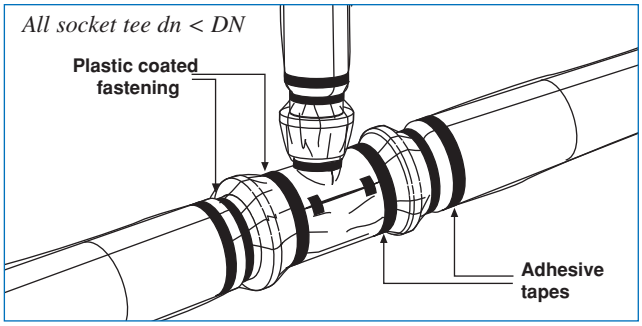


All socket tee
dn < DN

Final assembly



Bend



All socket tee dn < DN

The application of polyethylene sleeving to different types of fittings is dealt with in a special leaflet. Please consult us.

Polyethylene sleeving (application)

Materials required and dimensions

Pre-cut sleeve for EXPRESS pipes DN 100 to 300 or for STANDARD pipes DN 60 to 600

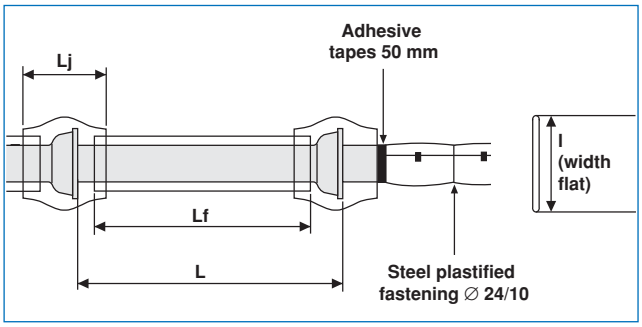
DN	Sleeve							Fastening		Adhesive tape	
	I	Lf	Lj	Thickness E	Number of barrel and joint sleeves per roll	Length of pipes protected per roll	Roll weight	Qty per pipe	Length per pipe	Qty per pipe	Length per pipe
	mm	*m*	*m*	*µm*			*kg*		*m*		*m*
60	315	5.80	0.80	200	20	120	15	4	1.8	4	1.2
80	315	5.80	0.80	200	20	120	15	4	2	4	1.6
100	315	5.80	0.80	200	20	120	15	4	2.3	4	1.8
125	400	5.80	0.80	200	20	120	19	4	2.6	4	2.2
150	400	5.80	0.80	200	20	120	19	4	2.9	4	2.6
200	560	5.80	0.80	200	20	120	27	4	3.6	4	3.4
250	710	5.80	0.80	200	20	120	34	4	4.2	4	4.4
300	710	5.80	0.80	200	20	120	34	4	4.9	4	5.2
350	900	5.80	0.80	200	15	90	33	4	5.6	4	6
400	900	5.80	0.80	200	15	90	33	4	6.2	4	6.8
450	1 120	5.80	0.80	200	15	90	40	4	7.6	4	7.6
500	1 120	5.80	0.80	200	15	90	40	4	8.3	4	8.4
600	1 250	5.80	0.80	200	15	90	45	4	9.6	4	10

The pipes coated with ZINALIUM do not need the use of polyethylene sleeve.

INSTALLATION OF SPECIAL COATINGS

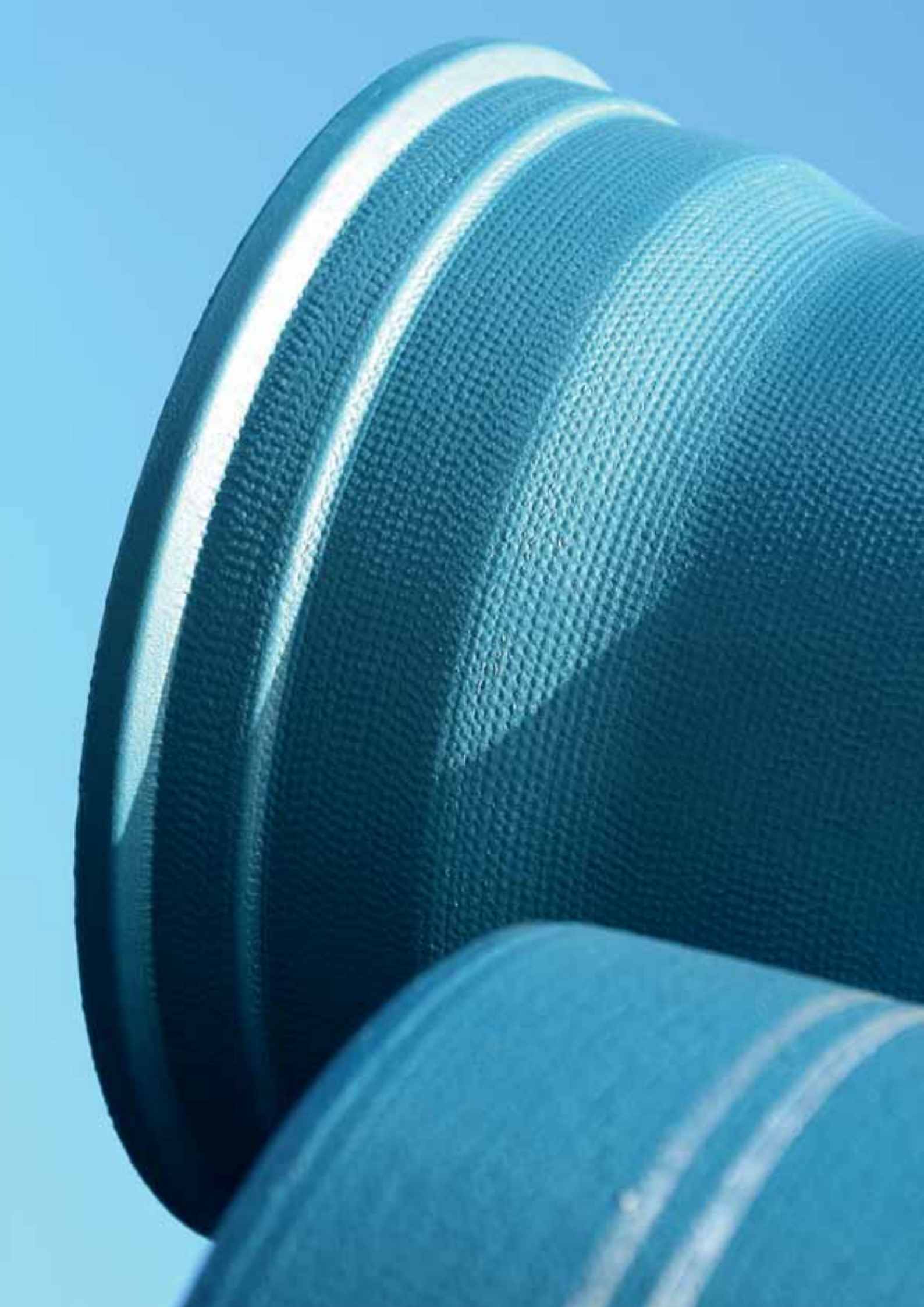
Polyethylene sleeving (application)

Sleeve to be cut



DN		Sleeve						Fastening		Adhesive tape		Sleeve weight by metre		
		barrel		joint			Thick-ness	Qty per pipe	Length per pipe	Qty per pipe	Length per pipe	barrel	joint	
				STD UNI STD Pk	EXP STD Ve STD V + i								STD UNI STD Pk	EXP STD Ve STD V + i
	L	l	Lf	l	l	Lj	E							
	m	*m*	*m*	*m*	*m*	*m*	*µm*		*m*		*m*	*kg*	*kg*	*kg*
60*	6	0.315	5.80	0.315	0.400	0.80	200	4	1.8	4	1.2	0.117	0.117	0.148
80*	6	0.315	5.80	0.315	0.400	0.80	200	4	2	4	1.6	0.117	0.117	0.148
100*	6	0.315	5.80	0.315	0.560	0.80	200	4	2.3	4	1.8	0.117	0.117	0.210
125*	6	0.400	5.80	0.400	0.560	0.80	200	4	2.6	4	2.2	0.148	0.148	0.210
150*	6	0.400	5.80	0.400	0.560	0.80	200	4	2.9	4	2.6	0.148	0.148	0.210
200*	6	0.560	5.80	0.560	0.710	0.80	200	4	3.6	4	3.4	0.210	0.210	0.263
250*	6	0.710	5.80	0.710	0.900	0.80	200	4	4.2	4	4.4	0.263	0.263	0.333
300*	6	0.710	5.80	0.710	0.900	0.80	200	4	4.9	4	5.2	0.263	0.263	0.333
350*	6	0.900	5.80	0.900	1.120	0.80	200	4	5.6	4	6	0.333	0.333	0.437
400*	6	0.900	5.80	0.900	1.120	0.80	200	4	6.2	4	6.8	0.333	0.333	0.437
450*	6	1.120	5.80	1.120	1.120	0.80	200	4	7.6	4	7.6	0.437	0.437	0.437
500*	6	1.120	5.80	1.120	1.250	0.80	200	4	8.3	4	8.4	0.437	0.437	0.463
600*	6	1.250	5.80	1.250	1.600	0.80	200	4	9.6	4	10	0.463	0.463	0.593
700*	7	1.600	6.70	1.600	1.600	0.80	200	5	13.6	4	11.6	0.593	0.593	0.593
800*	7	1.800	6.70	1.800	2.240	0.80	200	5	15.3	4	13.2	0.666	0.666	0.829
900*	7	2.240	6.70	2.240	2.240	0.80	200	5	16.9	4	14.8	0.829	0.829	0.829
1 000*	7	2.240	6.70	2.240	2.500	0.80	200	5	18.5	4	16.4	0.829	0.829	0.925
	8.27		7.70					6	22.2					
1 100*	7	2.500	6.70	2.500	2.500	0.80	200	5	20.1	4	18.2	0.925	0.925	0.925
1 200*	8.26	2.500	7.70	2.500	2.500	0.80	400	6	26.1	4	19.8	1.850	1.850	1.850
1 400*	8.19	2.800	7.70	2.800		0.80	400	6	30.6	4	23	2.070	2.070	
1 500*	8.18	3.100	7.70	3.100		0.80	400	6	32.5	4	24.6	2.290	2.290	
1 600*	8.18	3.100	7.70	3.100		0.80	400	6	34.4	4	26.2	2.290	2.290	
1 800*	8.17	3.600	7.70	3.600		0.80	400	6	38.4	4	29.4	2.610	2.610	
2 000*	8.13	4.500	7.70	4.500		0.80	400	6	40.2	4	31.2	3.310	3.310	

** For pipes DN 60 to 600, see the table for pre-cut sleeve*



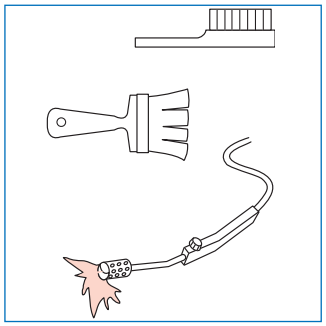
Repairing NATURAL and CLASSIC external coating

The operation proceeds in 2 stages:

1 - Repairing of the zinc or zinc-aluminium coating

2- Repairing of the blue epoxy or black bituminous external coating

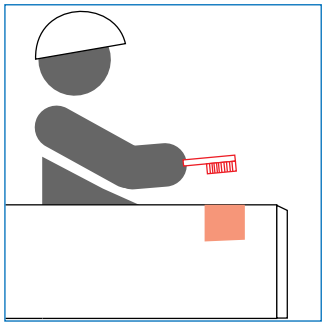
Zinc and ZINALIUM coatings



Equipment required

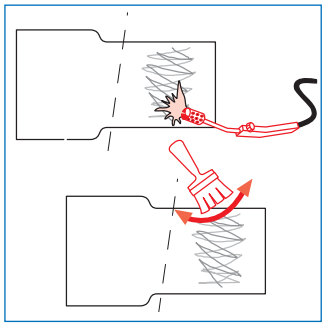
- brush,
- paint brushes,
- roller,
- gas torch.

Paint ref.*:
ZINC EPOXY 90 PRIMER: 11 kg



Procedure

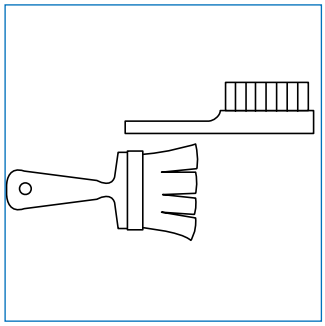
Brush to remove dirt.

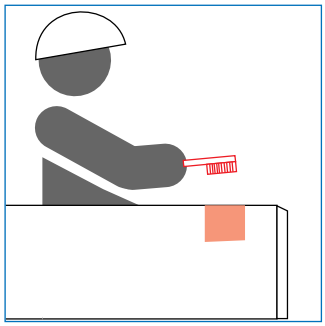


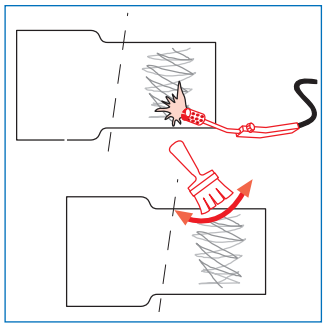
Dry the surfaces to be coated (in case of low temperatures or humidity, it may be necessary to dry with a gas torch).
Apply the product making strokes in different directions.

** Respect the recommendations for use on the safety data sheets available on www.pamline.com*

Repairing NATURAL and CLASSIC external coating







NATURAL blue epoxy or black bituminous external coating

Equipment required

- brush,
- paint brushes,
- roller,
- gas torch.

Paint ref.*:

– EUROKOTE 448 Blue Graphite - Dose 1 kg - (Réf 223751)

– ENDOLAC 245-30 for black coating:

• 1 kg (Ref. 158134) • 5 kg (Ref. 158131)

Procedure

Brush to remove dirt.

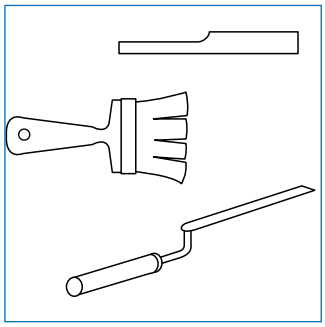
Dry the surfaces to be coated (in case of low temperatures or humidity, it may be necessary to dry with a gas torch).

Apply the product making strokes in different directions.

** Respect the recommendations for use on the safety data sheets available on www.pamline.com*

Repairing TT PE external coating

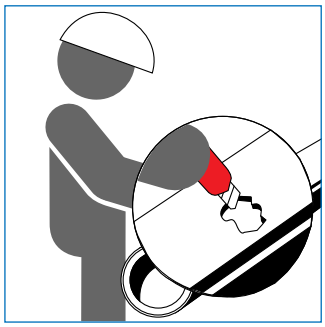
PE external coating



Equipment required

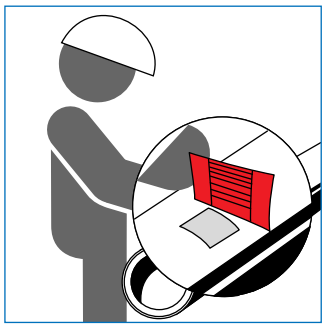
- cuter,
- paint brushes,
- putty knife,
- gas torch.

Repair kit**: patches and mastic.

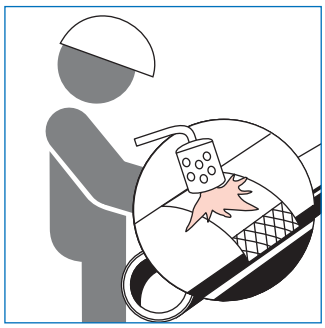


Procedure

Cut and remove the damaged PE.
Clean and dry the exposed area.
Heat to about 60 °C.



Apply the mastic, smooth with a putty knife.
Apply the repair tape overlapping 50 mm over the edges of the cut area.

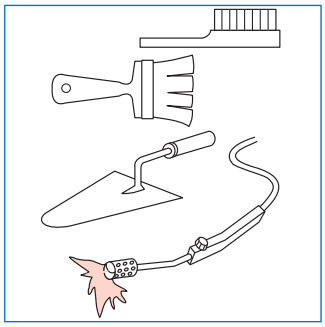


Warm the tape with the gas torch until the heat sensitive paint changes colour.
Press down the tape with a suitable glove.

** Available on order

Repairing TT PUX external coating

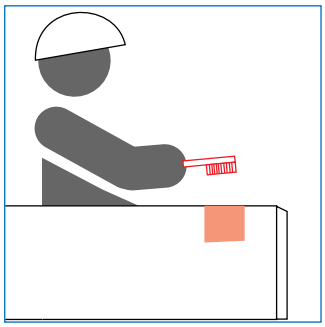
Polyurethane coating



Equipment required

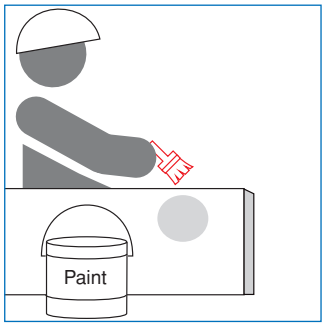
- brush,
- paint brushes,
- spatula,
- gas torch.

Paint ref.*:
EUROKOTE 4820 Ivory:
- 1 kg (Ref. 158254)
- 50 ml (Ref. 184727)



Procedure

Brush, clean and dry the surfaces to be coated.

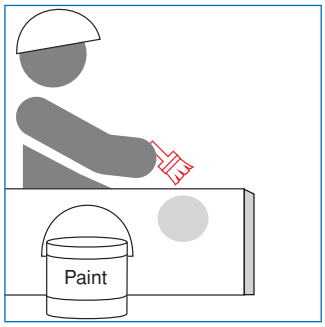


Apply the epoxy paint with a paint brush or spatula, respecting the proportions of the components indicated on the products.

** Respect the recommendations for use on the safety data sheets available on www.pamline.com*

Repairing epoxy coating of fittings

Epoxy coating 250 microns (fusion bonded epoxy)



Brush and clean the area to be repaired.
Apply the epoxy paint with a paint brush or spatula, respecting the proportions of the components indicated on the products.

Paint ref.*: EUROKOTE 4820 blue:
• 1 kg (Ref. 158255) • 50 ml (Ref. 184725)

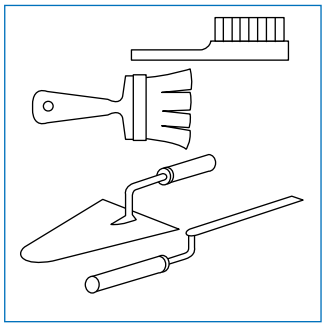
** Respect the recommendations for use on the safety data sheets available on www.pamline.com*



Epoxy cataphoresis coating

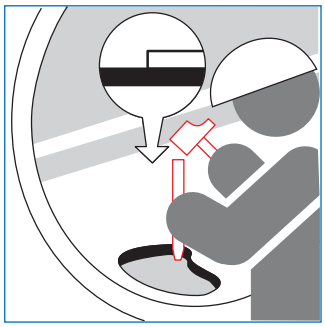
Repairing cement internal lining

With cement mortar



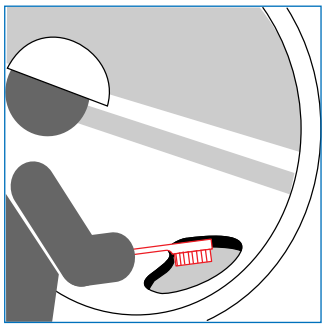
Equipment required

- brushes,
- paint brushes,
- trowel,
- palette knife,
- repair products.



Procedure

Position the part so that the area to be repaired points downwards.
Eliminate the damaged parts of the cement by making a clean cut perpendicular to the cast iron.



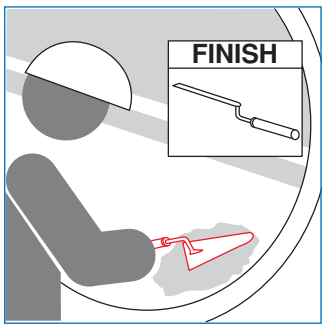
Eliminate any loose parts with the wire brush.
Clean thoroughly.
Wet the area to be repaired.
Wet around the area to be repaired a few minutes before making the repair.



Prepare the mixture as indicated below:
Proportions by weight

Cement (suitable for water supply)	100
Fine sand	200
Emulsion (50/50) water / ICOMENT or equivalent	15
Water	20

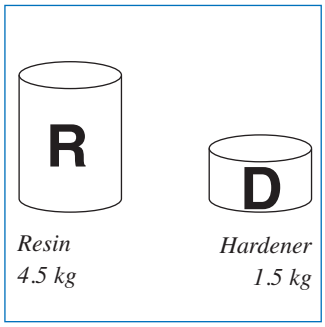
Mix the 2 dry components, then the 2 liquid components to obtain a pasty consistency.
Add a little water if necessary.



Apply the mortar, compacting correctly to build up the required thickness.
Smooth the surface.
Apply an additional protective layer (water and emulsion) to prevent the cement from drying out too quickly.
Cover with a damp cloth.

Repairing cement internal lining

With epoxy cement



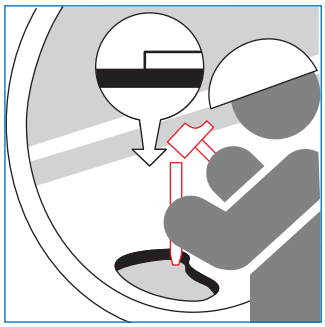
Packaging (SIKADUR 31DW)

6 kg kit (Ref. 158009)

Preparing the mixture

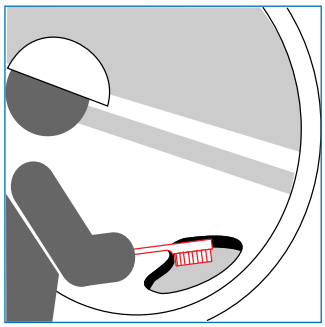
Proportions by weight
3 parts of R (resin) and
1 part of H (hardener)

Prepare only the quantity required; mix thoroughly.

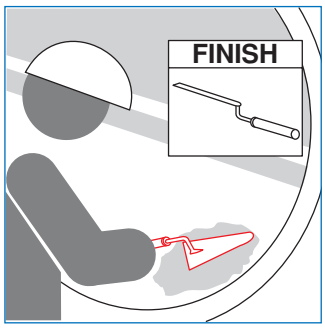


Procedure

If possible, position the part so that the area to be repaired points downwards.
Eliminate any damaged and loose parts.



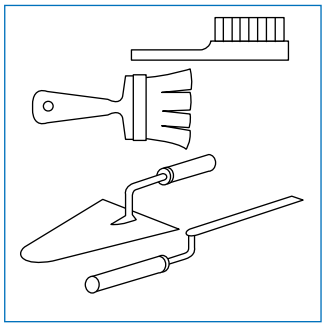
Eliminate any loose parts with the wire brush.
Clean thoroughly.



Apply the mixture, compacting correctly to build up the required thickness.
Smooth the surface.

Repairing PUR internal lining

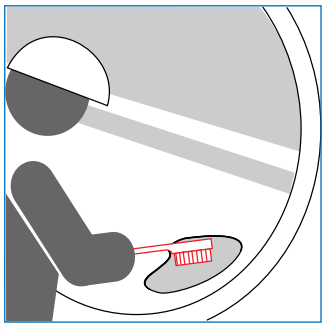
Polyurethane coating (PUR range pipes)



Equipment required

- brush,
- paint brushes,
- spatula,
- gas torch.

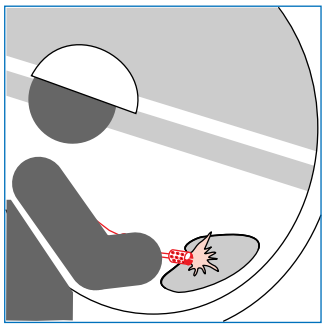
Paint ref.*:
EUROKOTE 4820 Ivory
• 1 kg (Ref. 158254) • 50 ml (Ref. 184727)



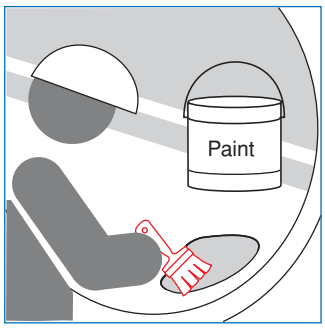
Procedure

Eliminate any loose parts with the wire brush.

Clean thoroughly.



Dry the surfaces to be coated (in case of low temperatures or humidity, it may be necessary to dry with a gas torch).



Apply the epoxy paint with a paint brush or spatula.

** Respect the recommendations for use on the safety data sheets available on www.pamline.com*

RECEPTION ON SITE

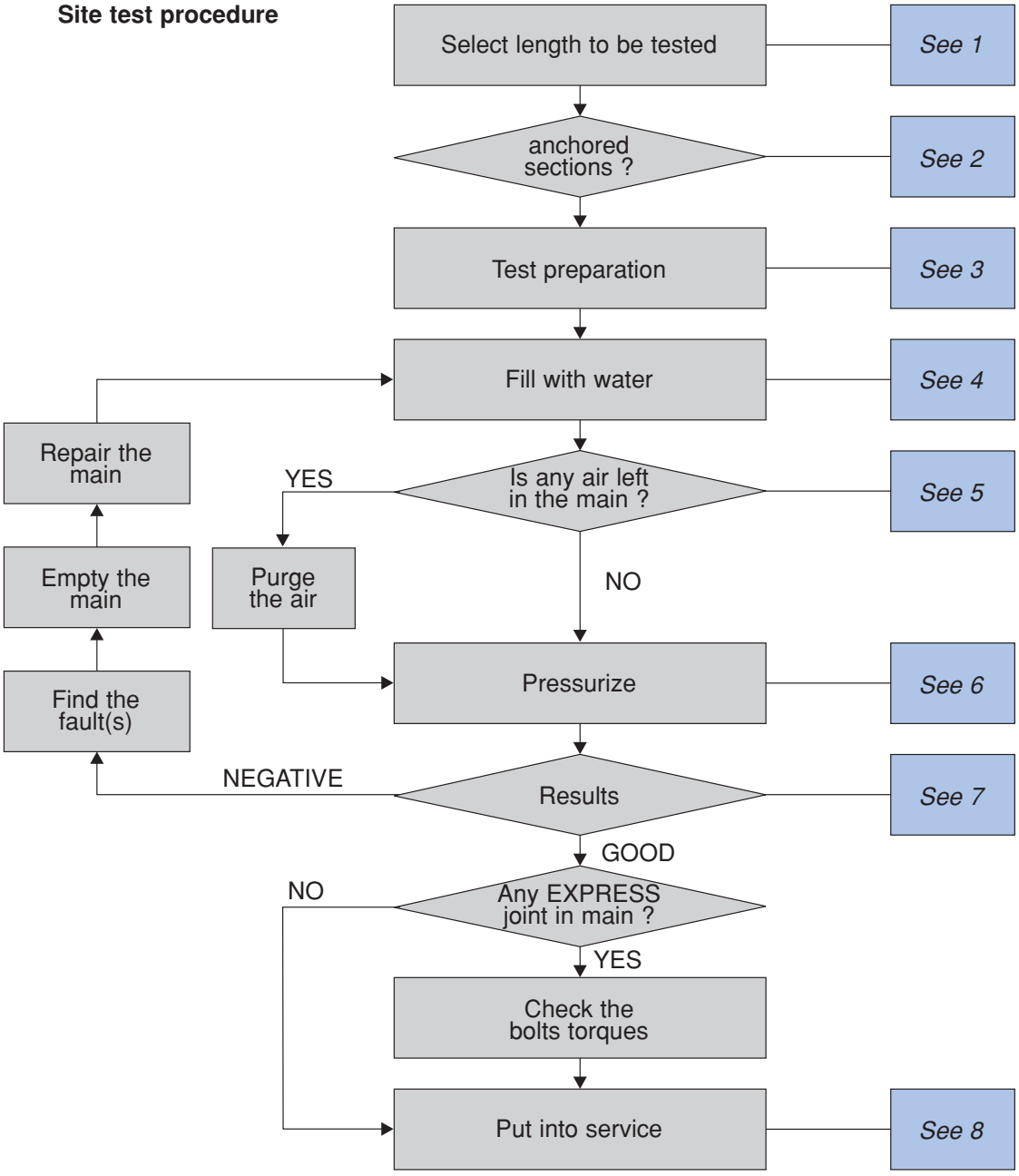
Site tests

See also: *page*
- Pressures (terminology) 54
- Maximum allowable pressures 57

Site tests check the stability and leaktightness of a main before it goes into service.

A successful hydraulic test is a prerequisite for the acceptance of a newly installed pipeline. One of the objectives of that test is to check the leaktightness of the joints. The test must be carried out as soon as possible after laying.
The instructions of the job's Technical Specifications should be followed, or those of other valid regulations.
The test is usually carried out as described below.

Site test procedure



Site tests

1. Test section length

The test section length depends on the layout configuration.
As recommended in French Fascicule 71 (article 63), and unless otherwise stipulated by the job's Technical Specifications, test lengths should not exceed 2 000 m.
Detection of leaks is more difficult the longer the test section. In practice short lengths can be tested at the beginning of a job and then extended to longer lengths. Responsibility for this lies with the contractor.

2. Anchored section

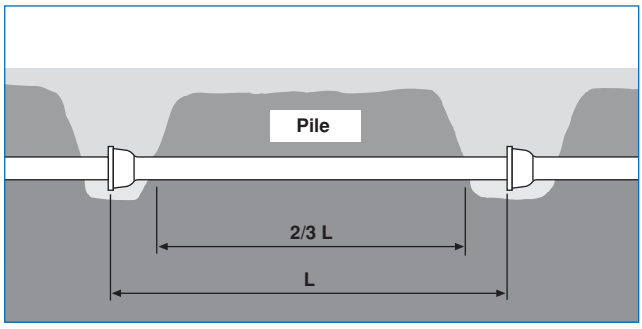
Partial joint anchoring

In the event of partial joint anchoring using the pipes to provide their own support, the anchored areas are tested at the same time as the non- anchored areas.

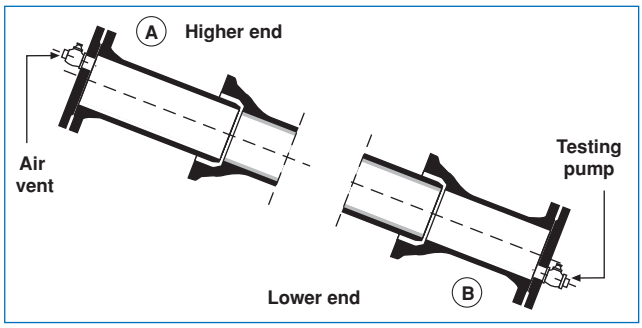
Fully anchored section

When testing a fully anchored section, special arrangements must be made to allow pipe traction under the effect of the pressure applied. The ends of these sections must not be mounted on thrust blocks.

3. Test preparation

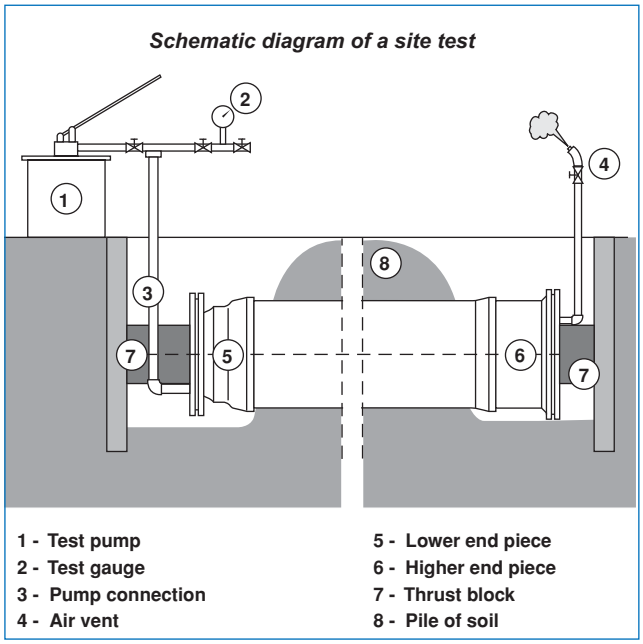


Testing a section length (non-anchored, partially or fully anchored) can, as stipulated in Article 63.1 of Fascicule (French Specification) 71, generally be carried out after backfilling the trench, unless specified otherwise in the public works specifications or by the contractor.
In the case of tests before final backfill, saddles are made over the pipe barrel, leaving just the joints exposed.



• Block the ends of the test section with blank flanges (A and B) equipped with valves for water filling and air venting.
• Calculate the hydraulic forces developed at the ends of the main and install a suitably sized restraint system. The forces are absorbed by timbers laid across the trench, or by an equivalent arrangement (sheet piling for example).

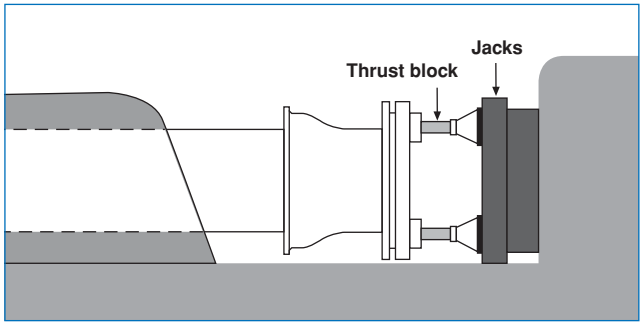
Site tests



• Do not use the end of a previously laid hydraulically tested pipe section as a buttress.
• The ends of a main under test may also move sideways, therefore lateral support must also be provided.

4. Pipe filling

The main is gradually filled with water, preferably from the low points.
It is important to ensure that the main has been completely purged of air at any high spots in the section before it is pressurized.
During pressurization, the temporary end restraints become compressed. If necessary any play has to be taken up to restore the main to its initial length. Jacks are used for this purpose, allowing precise adjustment.



• If a pumping main is involved, pumps are used to fill from the bottom end, limiting the flow rate.
• In the case of a large diameter siphon it is preferable to fill it from the lowest point by means of a small diameter feed tube. The water then rises steadily in both legs without turbulence.
Whenever possible, wait 24 hours before pressure testing, for the main to reach equilibrium.

5. Checking filling

Thorough removal of air from the main is essential. The vital importance of this has already been indicated.
• Check that the air valves are functioning,
• Check that the valves at the base of the air valves are open,
• Use the wash out valves to check the progressive arrival of water.

Site tests

6. Pressurizing

First ensure that the test pressure is compatible with the pressure each pipeline component in the test section can withstand. If not, isolate those items.
The pressure must be increased gradually, to allow checking of the end restraints and for jack adjustments. The pressure test must not only reveal any joint leakage but provide a positive check on the main for any damage caused during transport and laying.



According to Article 63.5 of Fascicule 71, 1998 edition, the test pressure (STP) used for the section of pipe installed shall be equal to the section's maximum design pressure (MDP). The MDP corresponds to the static level under gravity flow, or dynamic flow when on a discharge line, plus the effects of temporary status changes. The maximum amplitude for the temporary status changes is calculated taking into account the protection system installed, if any. The above test pressure is determined by the public works specifications, and is the result of calculations made by the contractor.

7. Results

Article 63-5-1 of Fascicule 71 states that "the section shall be maintained at this pressure for 30 minutes, during which the pressure drop, measured using a suitable instrument, should not exceed 20 kPa".

8. Commissioning the main

• Empty the main, remove the test equipment and connect up the section.
• Flush out the main thoroughly to remove any stones or soil trapped during laying.
In the case of a potable water main, sterilize it before it goes into service.

Disinfection

Cleaning and disinfection





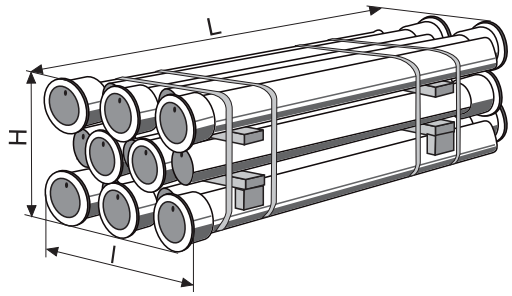
- Wash inside the new pipes by flushing with water or other suitable method.
- Wash again if necessary until the water turbidity is less than the maximum allowed by applicable standards and regulations.
- Disinfect and rinse the pipes.
- Take a water sample for internal control according to the applicable instructions.
- Use a suitable method to rinse the pipeline again.
- Immediately have control samples taken by the approved laboratory responsible for water monitoring.
- Repeat the procedure under the same conditions if the results are unfavourable.
- Cleaning and disinfection of pipes are carried out by the contractor.

Packaging

See also: *page*
- Storage - pipes 288
- Transport 292

DN ≤ 300: pipes bundled and protected with blue plugs, fittings packed on pallets.
DN > 300: pipes and fittings unpacked

DN ≤ 300 pipes



Small diameter pipes are delivered from our works in bundles. The bundles are designed to facilitate and speed up pipe handling.
See STORAGE - PIPES.



DN		Bundle composition		Overall width	Overall height	Average bundle weight
			L	l	H	Pipes
		nb lits x nb tuyaux	*m*	*m*	*m*	*kg*
NATURAL	**60**	4 x 6	6.30	0.54	0.49	1 411
	80	3 x 5	6.30	0.57	0.42	1 148
	100	3 x 5	6.30	0.67	0.50	1 398
	125	3 x 4	6.30	0.65	0.58	1 380
	150	3 x 3	6.30	0.59	0.66	1 272
	200	2 x 3	6.30	0.75	0.56	1 190
	250	2 x 2	6.30	0.63	0.67	1 044
	300	2 x 2	6.30	0.74	0.77	1 319
BLUTOP	**90**	6 x 5	6.30	0.60	0.64	1 100
	110	5 x 4	6.30	0.62	0.61	900
	125	5 x 4	6.30	0.70	0.67	1 030

DN > 300 pipes

Pipes larger than DN 300 are not bundled.

DN ≤ 300 fittings and glands

When the quantity ordered corresponds to a complete packaging unit (or a multiple), fittings and glands are delivered on non-returnable pallets, covered with plastic film.

DN > 300 fittings and glands

These fittings and glands are not packaged.

Bolts

Bolts are supplied in boxes or bags, depending on the quantities ordered.

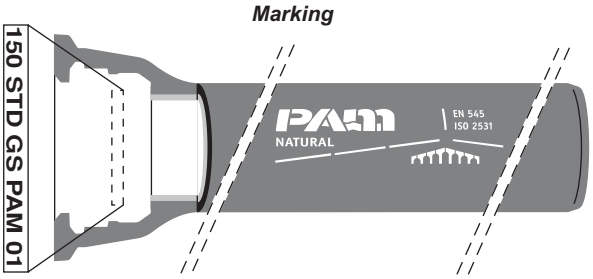
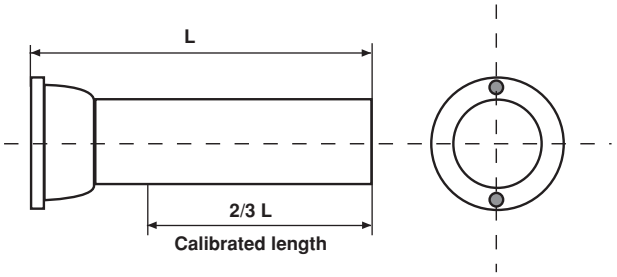
PACKAGING

Marking

See also: *page*
- Quality management 247
- Storage - pipes 288
- Storage - joint gaskets 291

Pipes, fittings and joint gaskets supplied by PAM carry a number of markings for an easy identification on site.

Pipes

Marking	Position	Nature
Socket pipes DN Type of socket Material (GS) Year of manufacture PAM Logo EN 545*		Cast on or painted on the barrel
Flanged pipes DN PN Working length Material (GS) Year of manufacture EN 545		Painted on the barrel (welded flanges) or cast on (integrally cast flanges)
Insertion calibrated pipes** 2 diametrically opposed coloured dots		Grey metallic paint

** The EN 545 marking is located:*
– inside the socket for DN ≤125,
– on the barrel outside wall for DN > 125.

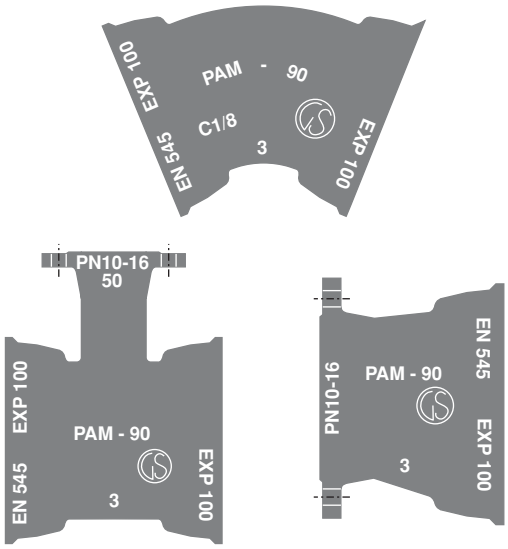
*** For DN > 300, Standard EN 545 makes provision for "the possibility of supplying, at the customer's request, pipes with the guarantee that they can be assembled over a distance of at least two thirds of the barrel length, working from the spigot, when the pipe must be cut on site".*

Pipes supplied with this guarantee are said to be "calibrated" and bear the above markings.

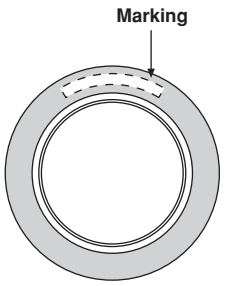
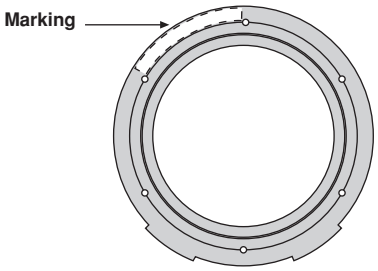
PACKAGING

Marking

Fittings

Marking	Position	Nature
Socket fittings DN Type of socket Material (GS) Year of manufacture PN Bend angle EN 545 **Flanged fittings** DN on flanges	***Marking examples***  	Cast on or label
	Socket type marked on socket interior or exterior	

Gaskets

Marking	Position	Nature
Joint gaskets Type of joint PAM logo DN Usage code* Material* Year/Month of manufacture	 	Moulded on
Metal reinforced flat flange gasket Type (JAB) PAM logo DN Usage code* Material* Quarter/Year of manufacture	 	Moulded or painted on

For internal management reasons (especially for part traceability), the products may marking other than those indicated in the above tables. PAM reserves the right to modify the characteristics of the markings shown.

* EN 681-1 / WA / 70 EPDM

PAM

PIPES, FITTINGS, JOINTS AND ACCESSORIES

Drinking water supply

Irrigation

Dedicated applications

Repair and maintenance components

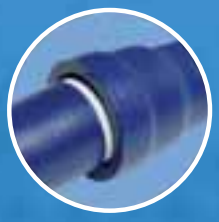
NATURAL



CLASSIC



BLUTOP



KAMELEO



PMI Couplings



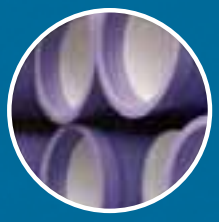
IRRIGAL



ALPINAL



URBITAL



SAINT-GOBAIN

PAM

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Pipes, fittings, joints and accessories

Drinking water supply

NATURAL range	DN 60 to 600
CLASSIC range	DN 700 to 2000
Flanged fittings range	DN 40 to 2000
KAMELEO range	DN 80, 100, 150
BLUTOP range	DN 90 to 125
KLIKSO range	DN 63 to 225

Irrigation

IRRIGAL range	DN 100 to 1000

Dedicated applications

ALPINAL range	DN 80 to 500
FM range	DN 100 to 300
URBITAL range	DN 100 to 1000

Repair and maintenance components

- Flange adaptors – Large tolerance flange adaptors
- Couplings – Repair couplings – Large tolerance couplings
- Dismantling joints

Ranges compatible with ductile iron pipes diameters

DN 60 to 600 - NATURAL
Pipes – Fittings - Joints - Accessories
- EN 545 - ISO 2531
- Cement mortar or PUR internal lining
- ZINALIUM, ISOPAM or TT external coating
- Fittings: cataphoresis, epoxy or ISOPAM coating

DN 700 to 2000 - CLASSIC
Pipes – Fittings - Joints - Accessories
- EN 545 - ISO 2531
- Cement mortar or PUR internal lining
- Zinc + pore sealer, bituminous or TT external coating
- Fittings: cataphoresis, epoxy, bituminous or PUX coating

DN 40 to 2000 - Flanges
Pipes – Fittings - Joints - Accessories
- EN 545 - ISO 2531
- Cement mortar or PUR internal lining
- Zinc + pore sealer, bituminous or TT external coating
- Fittings: cataphoresis, epoxy, bituminous or PUX coating

DN 80, 100 and 150 - KAMELEO
Variable angle fittings
- Epoxy coating

Ranges compatible with plastic pipes

BLUTOP Range
Pipes – Fittings - Joints - Accessories
- DN/OD 90, 110, 125
- DUCTAN internal lining
- ZINALIUM external coating
- Fittings : epoxy coating

KLIKSO Range
Fittings - Joints - Accessories
- DN 63 to 225
- Epoxy coating

DN 60 to 600

NATURAL range

Pipes – Fittings – Joints – Accessories

DRINKING WATER SUPPLY

Pipes DN 60 to 600 Non anchored

DN	Field of use							
	Current situations			Highly aggressive soils		Soft or aggressive waters		Protection against frost
	NATURAL			TT		NATURAL PUR		ISOPAM
	STD	EXP	UNI	STD	UNI	STD	UNI	STD
60								
80								
100								
125								
150								
200								
250								
300								
350								
400								
450								
500								
600								NC

Abbreviations:
STD: Pipe with STANDARD joint
EXP: Pipe with EXPRESS joint
UNI: Pipe with UNIVERSAL joint
NC: Please, contact us

Pipes DN 60 to 600 Anchored

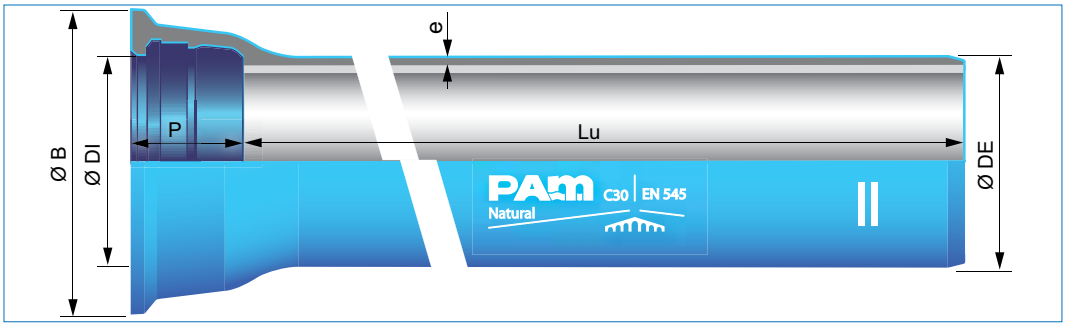
DN	Field of use										
	Current situations					Highly aggressive soils			Soft or aggressive waters			Protection against frost
	NATURAL					TT			NATURAL PUR			ISOPAM
	STD Vi	STD Ve	EXP Vi	UNI Vi	UNI Ve	STD Vi	UNI Vi	UNI Ve	STD Ve	UNI Vi	UNI Ve	STD Vi
60												
80												
100												
125												
150												
200												
250												
300												
350												
400												
450												
500												
600												NC

Abbreviations:
STD Vi: Pipe with STANDARD Vi anchored joint
STD Ve: Pipe with STANDARD Ve anchored joint
EXP Vi: Pipe with EXPRESS Vi anchored joint
UNI Vi: Pipe with UNIVERSAL Vi anchored joint
UNI Ve: Pipe with UNIVERSAL Ve anchored joint
NC: Please, contact us

DRINKING WATER SUPPLY

Pipes DN 60 to 600 / NATURAL Pipe with STANDARD joint



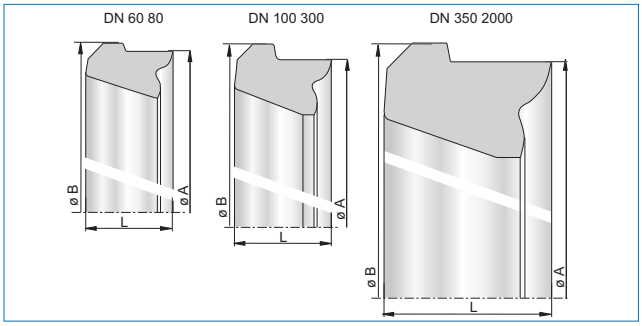


Field of use:
For drinking water mains

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
60	6.00	C40	4.8	77	80.3	89.5	144	10.0	NSA60F60-E00
80	6.00	C40	4.8	98	101.4	92.5	167	13.0	NSA80F60-E00
100	6.00	C40	4.8	118	121.4	94.5	188	15.9	NSB10F60-E00
125	6.00	C40	4.8	144	147.4	97.5	215	19.6	NSB12F60-E00
150	6.00	C40	5.0	170	173.4	100.5	242	24.1	NSB15F60-E00
200	6.00	C40	5.4	222	225.2	106.5	295	33.8	NSB20F60-E00
250	6.00	C40	5.8	274	276.8	105.5	352	46.2	NSB25F60-E00
300	6.00	C40	6.2	326	328.8	107.5	409	56.1	NSB30F60-E00
350	6.00	C30	6.3	378	380.9	110.5	464	67.9	NSB35G60-E00
400	6.00	C30	6.5	429	431.9	112.5	516	79.3	NSB40G60-E00
450	6.00	C30	6.9	480	483.0	115.5	574	93.7	NSB45G60-E00
500	6.00	C30	7.4	532	535.0	117.5	629	106.9	NSB50G60-E00
600	6.00	C30	8.6	635	638.1	132.5	738	149.1	NSB60G60-E00

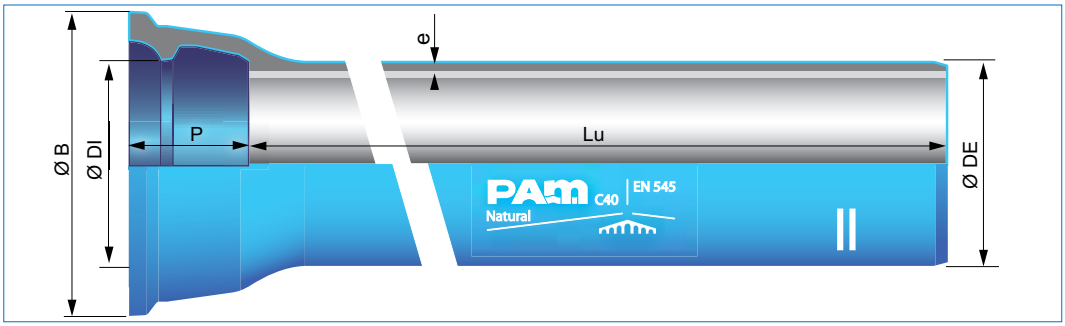
Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

Joint:
- STANDARD joint
- Material: EPDM
- EN 681.1



Angular deflection	
DN	**Angle**
60 to 300	5°
350 to 600	4°

Pipes DN 100 to 300 / NATURAL Pipe with EXPRESS joint



Field of use:

- For drinking water mains
- Well adapted to above ground and in gallery laying

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference* without joint
100	6.00	C40	4.8	118	121.4	86.0	188	15.7	NEB10F60
150	6.00	C40	5.0	170	173.4	94.5	242	23.9	NEB15F60
200	6.00	C40	5.4	222	225.2	101.0	295	33.4	NEB20F60
250	6.00	C40	5.8	274	276.8	98.0	352	43.9	NEB25F60
300	6.00	C40	6.2	326	328.8	100.5	409	55.5	NEB30F60

**Kit EXPRESS or EXPRESS New joint to order separately*

Main characteristics:

- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

Joint:

- EXPRESS kit
- EXPRESS New kit
- Material: EPDM
- EN 681.1

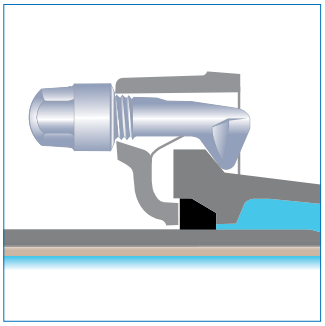


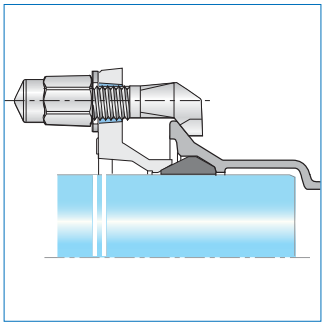
EXPRESS kit



EXPRESS New kit

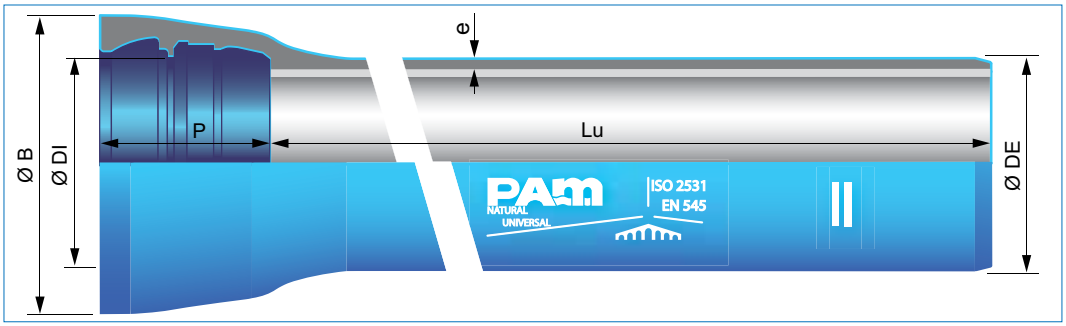
Angular deflection	
DN	**Angle**
100 to 150	5°
200 to 300	4°





Pipes DN 80 to 600 / NATURAL Pipe with UNIVERSAL joint



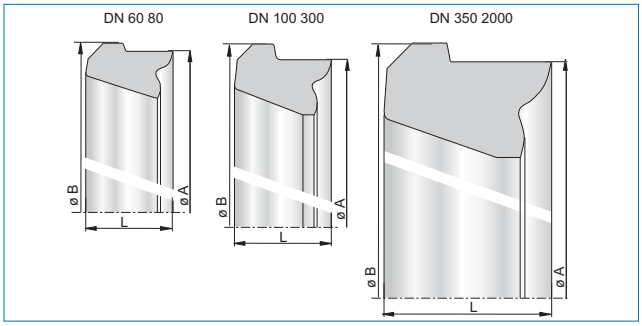


Field of use:
For drinking water mains

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference without joint
80	5.97	K9	6.0	98	100.5	112	159	15.5	NGA80N60
100	5.97	K9	6.0	118	121.4	140	188	19.4	NGB10N60
125	5.97	K9	6.0	144	147.4	140	215	23.9	NGB12N60
150	5.97	K9	6.0	170	173.4	148	230	28.2	NGB15N60
200	5.97	K9	6.3	222	225.2	155	290	39.1	NGB20N60
250	5.97	K9	6.8	274	276.8	166	350	52.2	NGB25N60
300	5.97	K9	7.2	326	328.8	180	408	65.9	NGB30N60
350	5.97	K9	7.7	378	380.9	184	463	83.4	NGB35N60
400	5.97	K9	8.1	429	431.9	176	510	98.1	NGB40N60
450	5.97	K9	8.6	480	483.0	190	570	117.2	NGB45N60
500	5.97	K9	9.0	532	535.0	200	625	135.7	NGB50N60
600	5.97	K9	9.9	635	638.2	209	740	174.1	NGB60N60

Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

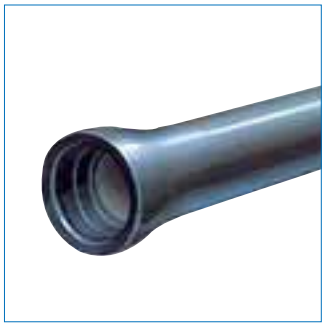
Joint:
- STANDARD joint in UNIVERSAL socket
- Material: EPDM
- EN 681.1

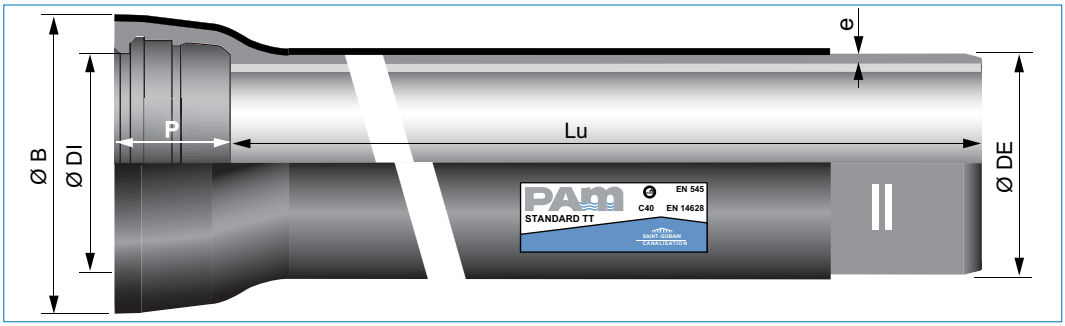


Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

DRINKING WATER SUPPLY

Pipes DN 60 to 600 / TT PE Pipe with STANDARD joint





Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

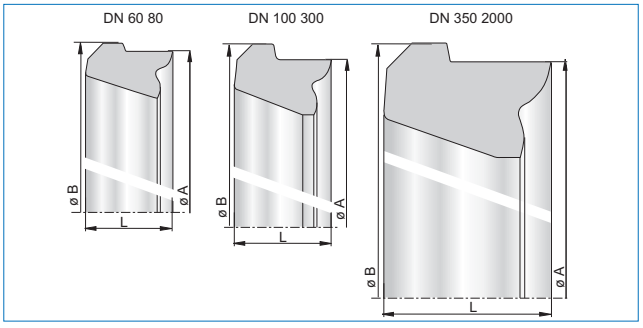
Main characteristics:

- PEhd External coating conform to EN 14628
- Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
60	6.00	C40	4.8	77	80.3	89.5	127.2	10.5	SSA60F60AG-E00
80	6.00	C40	4.8	98	101.4	92.5	147.0	13.5	SSA80F60AG-E00
100	6.00	C40	4.8	118	121.4	94.5	168.0	16.5	SSB10F60AG-E00
125	6.00	C40	4.8	144	147.4	97.5	195.0	20.3	SSB12F60AG-E00
150	6.00	C40	5.0	170	173.4	100.5	222.0	25.1	SSB15F60AG-E00
200	6.00	C40	5.4	222	225.2	106.5	279.0	35.0	SSB20F60AG-E00
250	6.00	C40	5.8	274	276.8	105.5	334.0	46.2	SSB25F60AG-E00
300	6.00	C40	6.2	326	328.8	107.5	392.0	58.5	SSB30F60AG-E00
350	6.00	C30	6.3	378	380.9	110.5	446.0	71.7	SSB35G60AG-E00
400	6.00	C30	6.5	429	431.9	112.5	499.5	83.5	SSB40G60AG-E00
450	6.00	C30	6.9	480	483.0	115.5	554.0	98.4	SSB45G60AG-E00
500	6.00	C30	7.4	532	535.0	117.5	608.6	116.2	SSB50G60AG-E00
600	6.00	C30	8.6	635	638.0	132.5	718.0	155.5	SSB60G60AG-E00

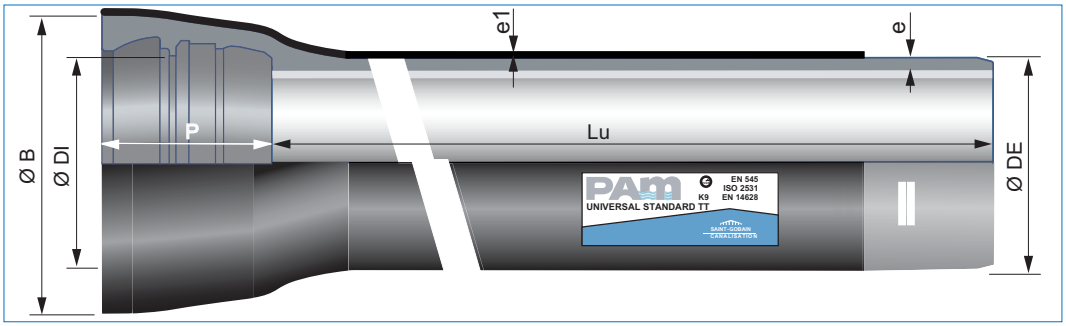
Joint:

- STANDARD joint
- Material: EPDM
- EN 681.1



Angular deflection	
DN	**Angle**
60 to 300	5°
350 to 600	4°

Pipes DN 80 to 600 / TT PE Pipe with UNIVERSAL joint



Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

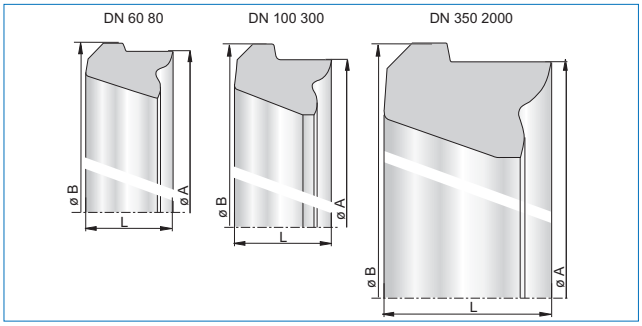
DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference without joint
80	5.97	K9	6.0	98	100.5	112	159	16.1	SGA80N60AG
100	5.97	K9	6.0	118	121.4	140	188	19.9	SGB10N60AG
125	5.97	K9	6.0	144	147.4	140	215	24.7	SGB12N60AG
150	5.97	K9	6.0	170	173.4	148	230	29.2	SGB15N60AG
200	5.97	K9	6.3	222	225.2	155	290	40.4	SGB20N60AG
250	5.97	K9	6.8	274	276.8	166	350	53.8	SGB25N60AG
300	5.97	K9	7.2	326	328.8	180	408	68.0	SGB30N60AG
350	5.97	K9	7.7	378	380.9	184	463	85.1	SGB35N60AG
400	5.97	K9	8.1	429	431.9	176	510	100.5	SGB40N60AG
450	5.97	K9	8.6	480	483.0	190	570	118.7	SGB45N60AG
500	5.97	K9	9.0	532	535.0	200	625	137.3	SGB50N60AG
600	5.97	K9	9.9	635	638.2	209	740	178.7	SGB60N60AG

Main characteristics:

- PEhd External coating conform to EN 14628
- Centrifuged cement mortar lining
- EN 545, ISO 2531

Joint:

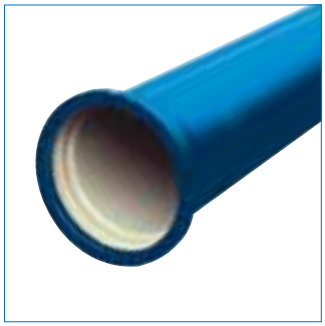
- STANDARD joint
- Material: EPDM
- EN 681.1

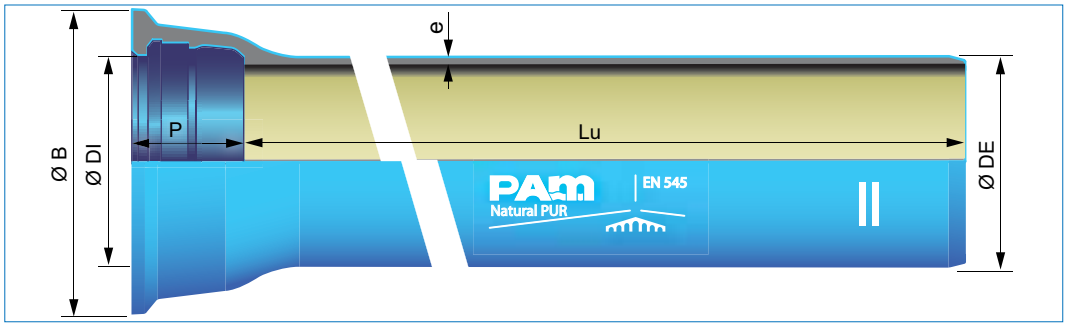


Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

DRINKING WATER SUPPLY

Pipes DN 100 to 600 / NATURAL PUR Pipe with STANDARD joint



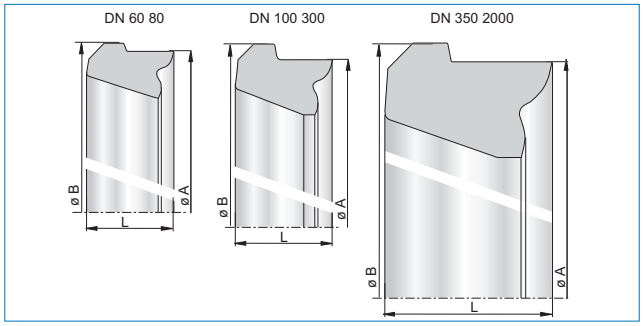


Field of use:
- For drinking water mains
- For soft or aggressive waters

Main characteristics:
- Barrel: ZINALIUM external coating
- Spigot and socket: Rich zinc paint plus blue epoxy
- Internal lining : Sandy color PU average thickness 1 mm
- Conform to EN 15655
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
100	6.00	C40	4.8	118	121.4	94.5	188	13.1	NSB10F60WZ-E00
125	6.00	C40	4.8	144	147.4	97.5	215	16.1	NSB12F60WZ-E00
150	6.00	C40	5	170	173.4	100.5	242	19.9	NSB15F60WZ-E00
200	6.00	C40	5.4	222	225.2	106.5	295	28.1	NSB20F60WZ-E00
250	6.00	C40	5.8	274	276.8	105.5	352	46.2	NSB25F60WZ-E00
300	6.00	C40	6.2	326	328.8	107.5	409.2	56.1	NSB30F60WZ-E00
350	6.00	C30	6.3	378	380.9	110.5	464.2	56.1	NSB35G60WC-E00
400	6.00	C30	6.5	429	431.9	112.5	516.2	65.8	NSB40G60WC-E00
450	6.00	C30	6.9	480	483.0	115.5	574.2	78.6	NSB45G60WC-E00
500	6.00	C30	7.4	532	535.0	117.5	629.2	93.1	NSB50G60WC-E00
600	6.00	C30	8.6	635	638.1	132.5	738.5	129.0	NSB60G60WC-E00

Joint:
- STANDARD joint
- Material: EPDM
- EN 681.1

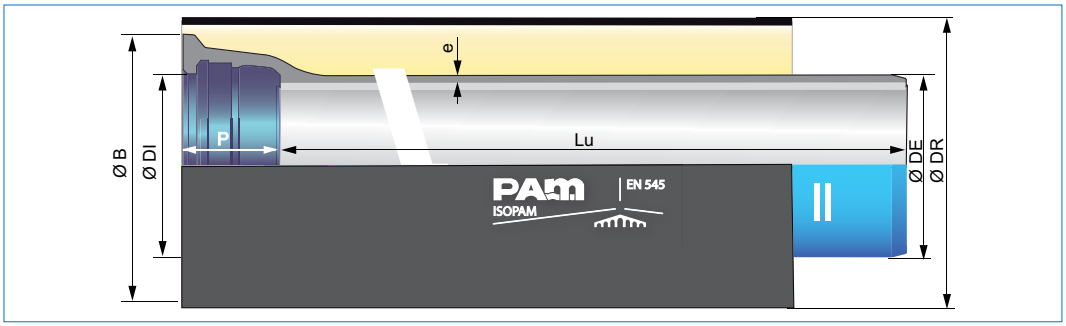


Angular deflection	
DN	**Angle**
100 to 300	5°
350 to 600	4°

DRINKING WATER SUPPLY

Pipes DN 100 to 600 / ISOPAM Pipe with STANDARD joint



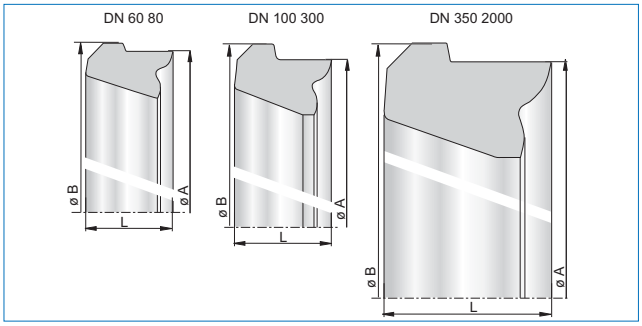


Field of use:
- For drinking water mains
- Pre-insulated pipes against frost

Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531
- Pipe protected by an external insulated coating (PEhd sheath, Polyurethane foam, foam spacer, elastomeric sleeve) for protecting water supply network prone to freezing risks
- Conform to ISO 9394

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	DR mm	P mm	ØB mm	Weight Kg/m	Reference without joint
100	6.00	C40	4.8	118	121.4	200	94.5	188	19.1	YSB10F60
125	6.00	C40	4.8	144	147.4	225	97.5	215	23.4	YSB12F60
150	6.00	C40	5.0	170	173.4	250	100.5	242	28.6	YSB15F60
200	6.00	C40	5.4	222	225.2	315	106.5	295	40.8	YSB20F60
250	6.00	C40	5.8	274	276.8	400	105.5	352	56.1	YSB25F60
300	6.00	C40	6.2	326	328.8	450	107.5	409	70.2	YSB30F60
350	6.00	C30	6.3	378	380.9	500	110.5	464	85.4	YSB35G60
400	6.00	C30	6.5	429	431.9	560	112.5	516	100.9	YSB40G60
450	6.00	C30	6.9	480	483.0	630	115.5	574	121.1	YSB45G60
500	6.00	C30	7.4	532	535.0	670	117.5	629	139.3	YSB50G60
600	6.00	C30	8.6	635	638.1	800	132.5	738	191.4	YSB60G60

Joint:
- STANDARD joint
- Material: EPDM
- EN 681.1

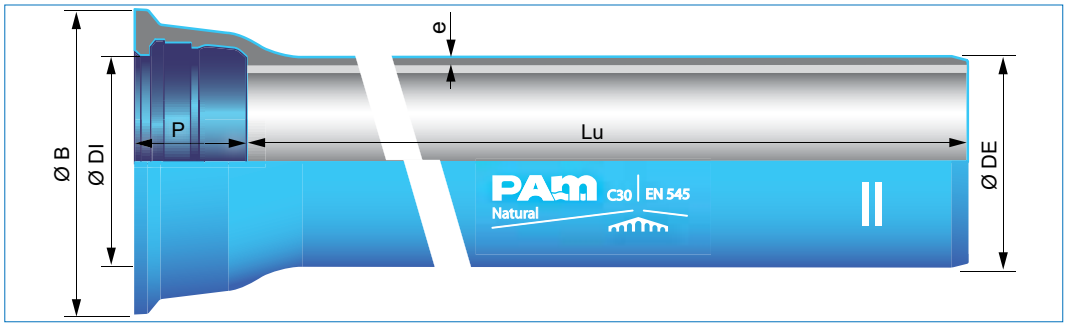


Angular deflection	
DN	**Angle**
100	4°
125 and 150	3,5°
200 and 250	3°
300 and 350	2,5°
400 to 600	2°

DRINKING WATER SUPPLY

Pipes DN 60 to 600 / NATURAL Pipe with STANDARD Vi joint



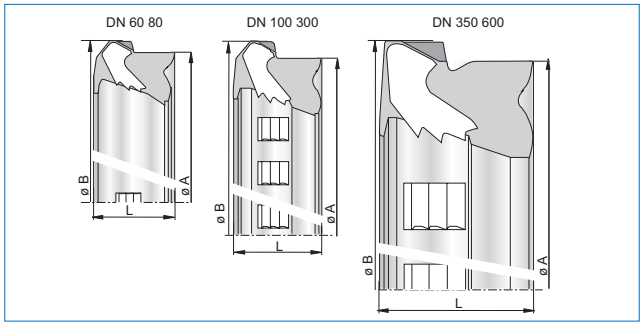


Field of use:
For drinking water mains

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
60	6.00	C40	4.8	77	80.3	89.5	144	10.0	NSA60F60-E06
80	6.00	C40	4.8	98	101.4	92.5	167	13.0	NSA80F60-E06
100	6.00	C40	4.8	118	121.4	94.5	188	15.9	NSB10F60-E06
125	6.00	C40	4.8	144	147.4	97.5	215	19.6	NSB12F60-E06
150	6.00	C40	5.0	170	173.4	100.5	242	24.1	NSB15F60-E06
200	6.00	C40	5.4	222	225.2	106.5	295	33.8	NSB20F60-E06
250	6.00	C40	5.8	274	276.8	105.5	352	46.2	NSB25F60-E06
300	6.00	C40	6.2	326	328.8	107.5	409.2	56.1	NSB30F60-E06
350	6.00	C30	6.3	378	380.9	110.5	464.2	67.9	NSB35G60-E06
400	6.00	C30	6.5	429	431.9	112.5	516.2	79.3	NSB40G60-E06
450	6.00	C30	6.9	480	483.0	115.5	574.2	93.7	NSB45G60-E06
500	6.00	C30	7.4	532	535.0	117.5	629.2	106.9	NSB50G60-E06
600	6.00	C30	8.6	635	638.1	132.5	738.5	149.1	NSB60G60-E06

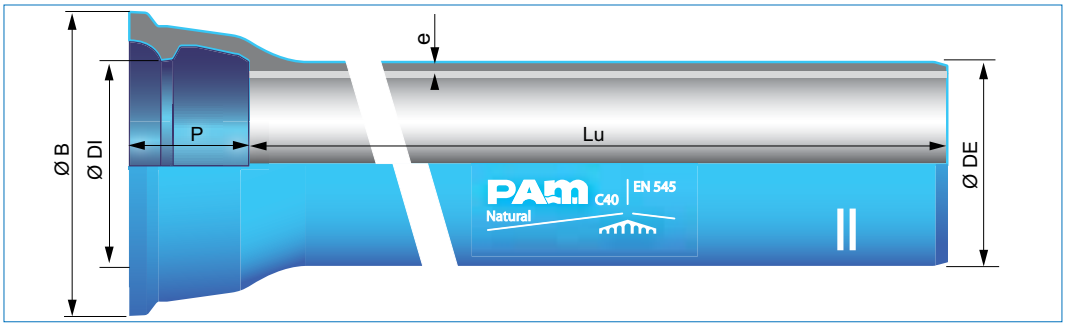
Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

Joint:
- STANDARD joint
- Material : EPDM
- EN 681.1
- Inserts: Stainless steel



Angular deflection	
DN	**Angle**
100	4°
125 and 150	3,5°
200 and 250	3°
300 and 350	2,5°
400 to 600	2°

Pipes DN 100 to 300 / NATURAL Pipe with EXPRESS Vi joint



Field of use:
- For drinking water mains
- Well adapted to above ground and in gallery laying

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference* without joint
100	6.00	C40	4.8	118	121.4	86.0	188	15.7	NEB10F60
150	6.00	C40	5.0	170	173.4	94.5	242	23.9	NEB15F60
200	6.00	C40	5.4	222	225.2	101.0	295	33.4	NEB20F60
250	6.00	C40	5.8	274	276.8	98.0	352	43.9	NEB25F60
300	6.00	C40	6.2	326	328.8	100.5	409	55.5	NEB30F60

**EXPRESS Vi kit joint to order separately.*

Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

EXPRESS Vi kit



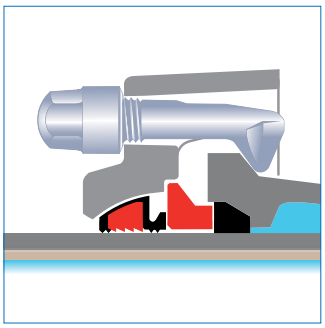
EXPRESS New Vi kit



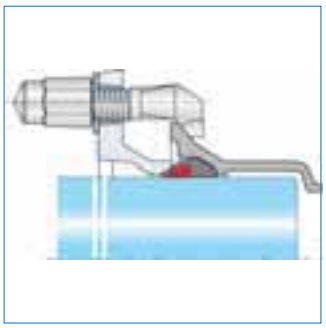
EXPRESS New Vi "Special Insertion" kit



Joint:
- EXPRESS kit
- EXPRESS New kit
- EXPRESS New Vi "Special Insertion" kit
- Material: EPDM
- EN 681.1
- Inserts: stainless steel



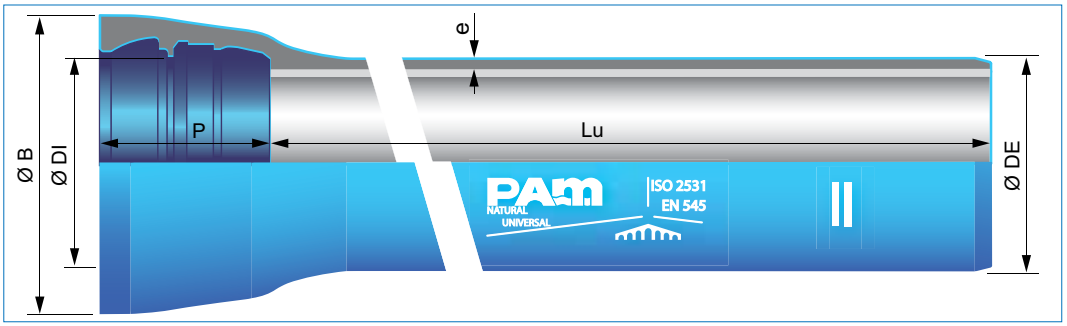
Angular deflection	
DN	**Angle**
100 to 150	4°
200 to 300	3°



DRINKING WATER SUPPLY

Pipes DN 80 to 600 / NATURAL Pipe with UNIVERSAL Vi joint



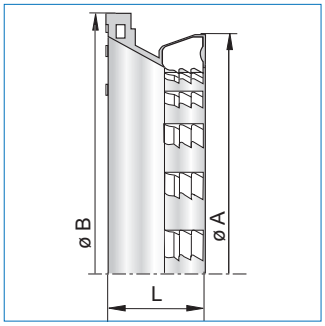


Field of use:
For drinking water mains

Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference without joint
80	5.97	K9	6.0	98	100.5	112	159	15.5	NGA80N60
100	5.97	K9	6.0	118	121.4	140	188	19.4	NGB10N60
125	5.97	K9	6.0	144	147.4	140	215	23.9	NGB12N60
150	5.97	K9	6.0	170	173.4	148	230	28.2	NGB15N60
200	5.97	K9	6.3	222	225.2	155	290	39.1	NGB20N60
250	5.97	K9	6.8	274	276.8	166	350	52.2	NGB25N60
300	5.97	K9	7.2	326	328.8	180	408	65.9	NGB30N60
350	5.97	K9	7.7	378	380.9	184	463	83.4	NGB35N60
400	5.97	K9	8.1	429	431.9	176	510	98.1	NGB40N60
450	5.97	K9	8.6	480	483.0	190	570	117.2	NGB45N60
500	5.97	K9	9.0	532	535.0	200	625	135.7	NGB50N60
600	5.97	K9	9.9	635	638.2	209	740	174.1	NGB60N60

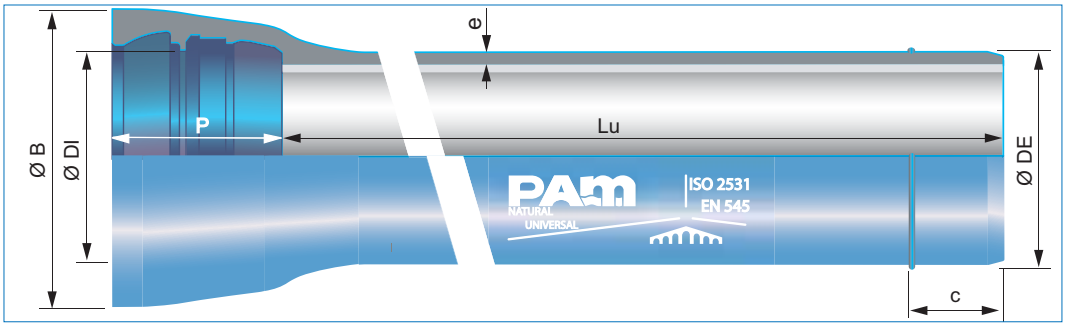
Joint:
- UNIVERSAL Vi joint
- Material: EPDM
- EN 681.1
- Inserts: stainless steel



Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

Pipes DN 100 to 600 / NATURAL Pipe with UNIVERSAL Ve joint (with weld bead)



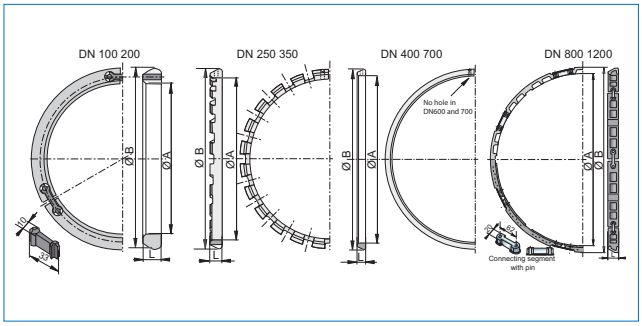


Field of use:
For drinking water mains

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference with joint
100	5.97	K9	6.0	118	121.4	140	188	90	19.4	NFB10N60-E00
125	5.97	K9	6.0	144	147.4	140	215	95	23.9	NFB12N60-E00
150	5.97	K9	6.0	170	173.4	148	230	95	28.2	NFB15N60-E00
200	5.97	K9	6.3	222	225.2	155	290	100	39.1	NFB20N60-E00
250	5.97	K9	6.8	274	276.8	166	350	110	52.2	NFB25N60-E00
300	5.97	K9	7.2	326	328.8	180	408	115	65.9	NFB30N60-E00
350	5.97	K9	7.7	378	380.9	184	463	114	83.4	NFB35N60-E00
400	5.97	K9	8.1	429	431.9	176	510	113	98.1	NFB40N60-E00
450	5.97	K9	8.6	480	483.0	190	570	120	117.2	NFB45N60-E00
500	5.97	K9	9.0	532	535.0	200	625	125	135.7	NFB50N60-E00
600	5.97	K9	9.9	635	638.2	209	740	135	174.1	NFB60N60-E00

Main characteristics:
- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531

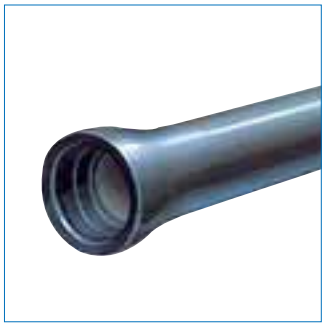
Joint:
- UNIVERSAL Ve joint
- Material: EPDM
- EN 681.1
- Locking ring: ductile iron

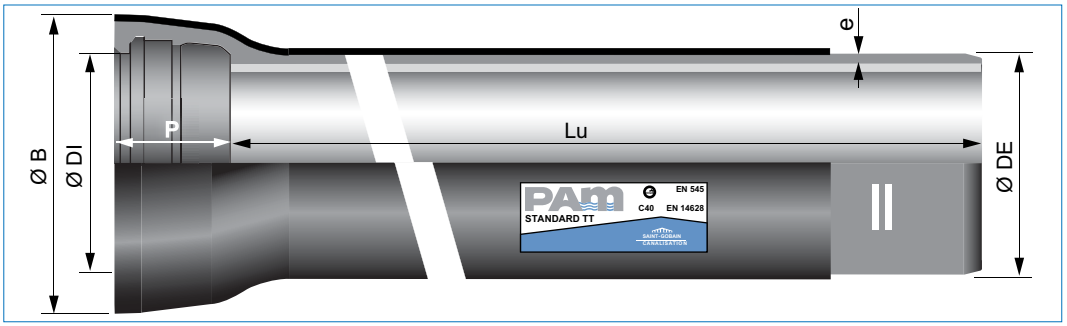


Angular deflection	
DN	**Angle**
100 to 450	3°
500 to 600	2°

DRINKING WATER SUPPLY

Pipes DN 60 to 600 / TT PE Pipe with STANDARD Vi joint



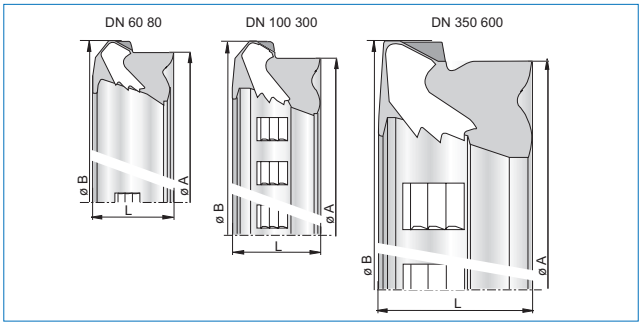


Field of use:
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

Main characteristics:
- PEhd External coating conform to EN 14628
- Centrifuged cement mortar lining
- EN 545, ISO 2531

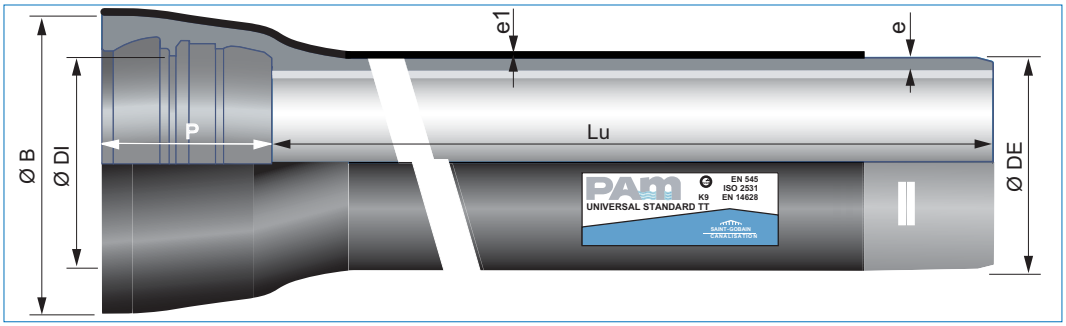
DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
60	6.00	C40	4.8	77	80.3	89.5	127	10.5	SSA60F60AG-E06
80	6.00	C40	4.8	98	101.4	92.5	147	13.5	SSA80F60AG-E06
100	6.00	C40	4.8	118	121.4	94.5	168	16.5	SSB10F60AG-E06
125	6.00	C40	4.8	144	147.4	97.5	195	20.3	SSB12F60AG-E06
150	6.00	C40	5.0	170	173.4	100.5	222	25.1	SSB15F60AG-E06
200	6.00	C40	5.4	222	225.2	106.5	279	35.0	SSB20F60AG-E06
250	6.00	C40	5.8	274	276.8	105.5	334	46.2	SSB25F60AG-E06
300	6.00	C40	6.2	326	328.8	107.5	392	58.5	SSB30F60AG-E06
350	6.00	C30	6.3	378	380.9	110.5	446	71.7	SSB35G60AG-E06
400	6.00	C30	6.5	429	431.9	112.5	499	83.5	SSB40G60AG-E06
450	6.00	C30	6.9	480	483.0	115.5	554	98.4	SSB45G60AG-E06
500	6.00	C30	7.4	532	535.0	117.5	608	116.2	SSB50G60AG-E06
600	6.00	C30	8.6	635	638.0	132.5	718	155.5	SSB60G60AG-E06

Joint:
- STANDARD Vi joint
- Material: EPDM
- EN 681.1
- Inserts: stainless steel



Angular deflection	
DN	**Angle**
60 to 150	5°
200 to 300	4°
350	3°
400 to 600	2°

Pipes DN 80 to 600 / TT PE Pipe with UNIVERSAL Vi joint



Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

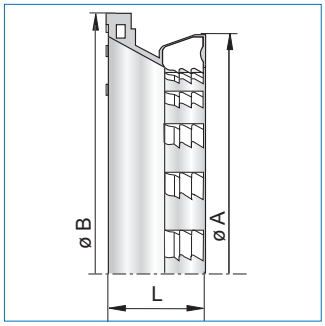
Main characteristics:

- PEhd External coating conform to EN 14628
- Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
80	5.97	K9	6.0	98	100.5	112	159	16.1	SGA80N60AG-E06
100	5.97	K9	6.0	118	121.4	140	188	19.9	SGB10N60AG-E06
125	5.97	K9	6.0	144	147.4	140	215	24.7	SGB12N60AG-E06
150	5.97	K9	6.0	170	173.4	148	230	29.2	SGB15N60AG-E06
200	5.97	K9	6.3	222	225.2	155	290	40.4	SGB20N60AG-E06
250	5.97	K9	6.8	274	276.8	166	350	53.8	SGB25N60AG-E06
300	5.97	K9	7.2	326	328.8	180	408	68.0	SGB30N60AG-E06
350	5.97	K9	7.7	378	380.9	184	463	85.0	SGB35N60AG-E06
400	5.97	K9	8.1	429	431.9	176	510	100.5	SGB40N60AG-E06
450	5.97	K9	8.6	480	483.0	190	570	118.7	SGB45N60AG-E06
500	5.97	K9	9.0	532	535.0	200	625	137.3	SGB50N60AG-E06
600	5.97	K9	9.9	635	638.2	209	740	178.7	SGB60N60AG-E06

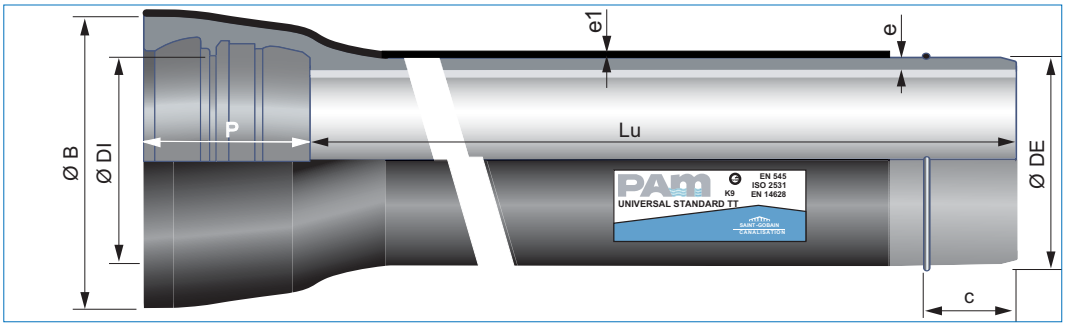
Joint:

- UNIVERSAL Vi
- Material: EPDM
- EN 681.1
- Inserts : stainless steel



Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

Pipes DN 100 to 600 / TT PE Pipe with UNIVERSAL Ve joint (with weld bead)



Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

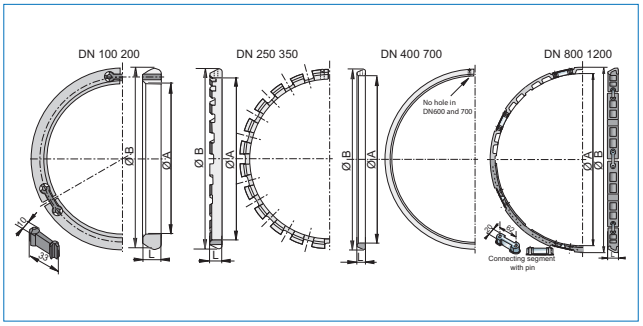
DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference without joint
100	5.97	K9	6.0	118	121.4	140	188	90	19.9	SFB10N60AG
125	5.97	K9	6.0	144	147.4	140	215	95	24.7	SFB12N60AG
150	5.97	K9	6.0	170	173.4	148	230	95	29.2	SFB15N60AG
200	5.97	K9	6.3	222	225.2	155	290	100	40.4	SFB20N60AG
250	5.97	K9	6.8	274	276.8	166	350	110	53.8	SFB25N60AG
300	5.97	K9	7.2	326	328.8	180	408	115	68.0	SFB30N60AG
350	5.97	K9	7.7	378	380.9	184	463	114	85.0	SFB35N60AG
400	5.97	K9	8.1	429	431.9	176	510	113	100.5	SFB40N60AG
450	5.97	K9	8.6	480	483.0	190	570	120	118.7	SFB45N60AG
500	5.97	K9	9.0	532	535.0	200	625	125	137.3	SFB50N60AG
600	5.97	K9	9.9	635	638.2	209	740	135	178.7	SFB60N60AG

Main characteristics:

- PEhd External coating conform to EN 14628
- Centrifuged cement mortar lining
- EN 545, ISO 2531

Joint:

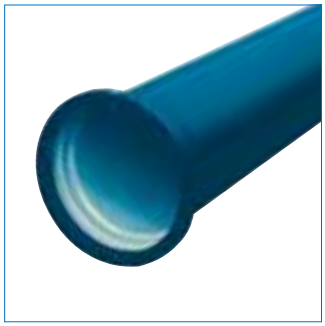
- UNIVERSAL Ve
- Material: EPDM
- EN 681.1
- Locking ring: ductile iron

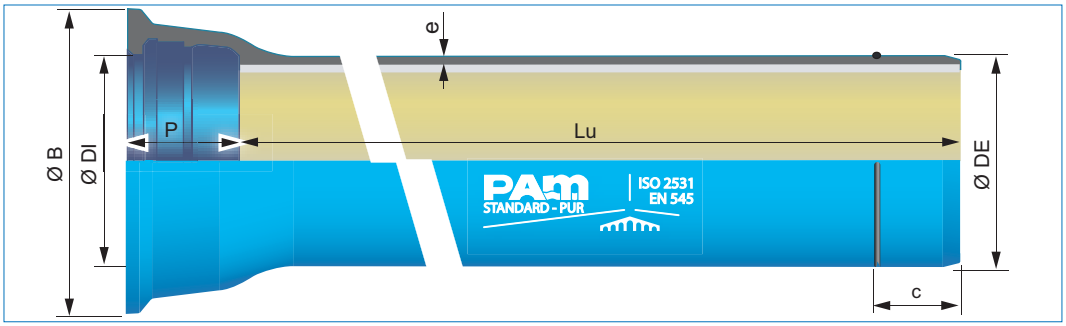


Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

DRINKING WATER SUPPLY

Pipes DN 100 to 600 / Blue K9 PUR Pipe with STANDARD Ve joint



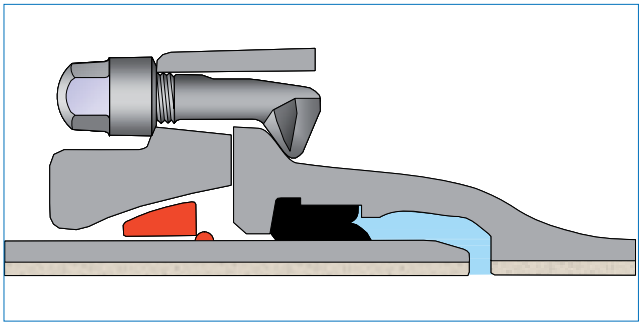


Field of use:
- For drinking water mains
- For soft or aggressive waters

Main characteristics:
- Barrel: ZINALIUM external coating
- Spigot and socket: Rich zinc paint plus blue epoxy
- Internal lining: Sandy color PU average thickness 1 mm
- Conform to EN 15655
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference without joint
100	6.00	K9	6.0	118	121.4	94.5	188	90	16.0	NQB10N60WZ
125	6.00	K9	6.0	144	147.4	97.5	215	95	19.7	NQB12N60WZ
150	6.00	K9	6.0	170	173.4	100.5	242	95	23.4	NQB15N60WZ
200	6.00	K9	6.3	222	225.2	106.5	295	100	32.3	NQB20N60WZ
250	6.00	K9	6.8	274	276.8	105.5	352	110	43.1	NQB25N60WZ
300	6.00	K9	7.2	326	328.8	107.5	409	115	54.5	NQB30N60WZ
350	6.00	K9	7.7	378	380.9	110.5	464	114	67.4	NQB35N60WC
400	6.00	K9	8.1	429	431.9	112.5	516	113	80.5	NQB40N60WC
450	6.00	K9	8.6	480	483.0	115.5	574	120	96.0	NQB45N60WC
500	6.00	K9	9.0	532	535.0	117.5	629	125	111.3	NQB50N60WC
600	6.00	K9	9.9	635	638.1	132.5	738	135	111.3	NQB60N60WC

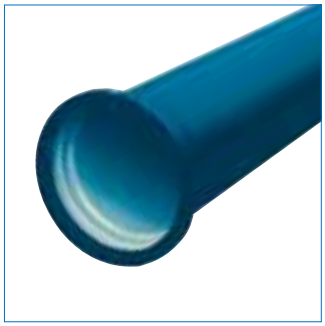
Joint:
- STANDARD Ve
- Material : EPDM
- EN 681.1
- Locking ring and counterflange: Ductile iron

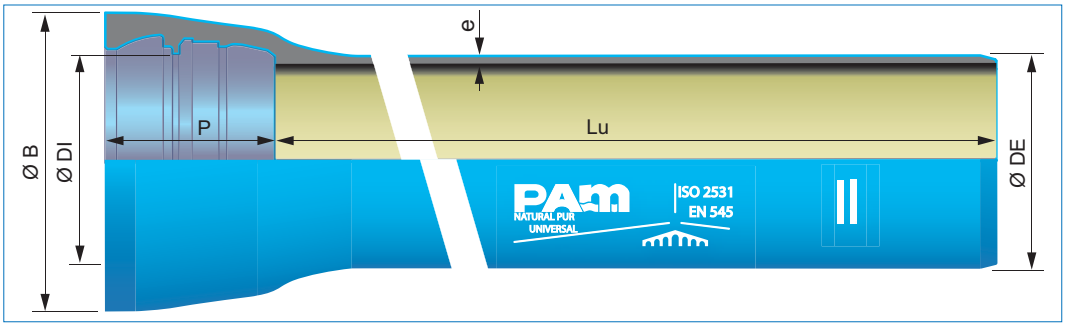


Angular deflection	
DN	**Angle**
100 to 150	5°
200 to 300	4°
350 to 600	3°

DRINKING WATER SUPPLY

Pipes DN 100 to 600 / NATURAL PUR Pipe with UNIVERSAL Vi joint



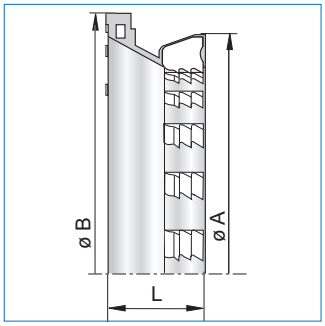


Field of use:
- For drinking water mains
- For soft or aggressive waters

Main characteristics:
- Barrel: ZINALIUM external coating
- Spigot and socket: Rich zinc paint plus blue epoxy
- Internal lining : Sandy color PU average thickness 1 mm
- Conform to EN 15655
- EN 545, ISO 2531

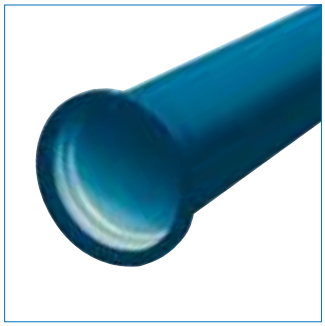
DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference with joint
100	5.97	K9	6.0	118	121.4	140	188	16.6	NGB10N60WC-E06
125	5.97	K9	6.0	144	147.4	140	215	20.4	NGB12N60WC-E06
150	5.97	K9	6.0	170	173.4	148	230	24.3	NGB15N60WC-E06
200	5.97	K9	6.3	222	225.2	155	290	33.6	NGB20N60WC-E06
250	5.97	K9	6.8	274	276.8	166	350	45.3	NGB25N60WC-E06
300	5.97	K9	7.2	326	328.8	180	408	57.6	NGB30N60WC-E06
350	5.97	K9	7.7	378	380.9	184	463	71.3	NGB35N60WC-E06
400	5.97	K9	8.1	429	431.9	176	510	84.2	NGB40N60WC-E06
450	5.97	K9	8.6	480	483.0	190	570	101.6	NGB45N60WC-E06
500	5.97	K9	9.0	532	535.0	200	625	118.3	NGB50N60WC-E06
600	5.97	K9	9.9	635	638.2	209	740	153.2	NGB60N60WC-E06

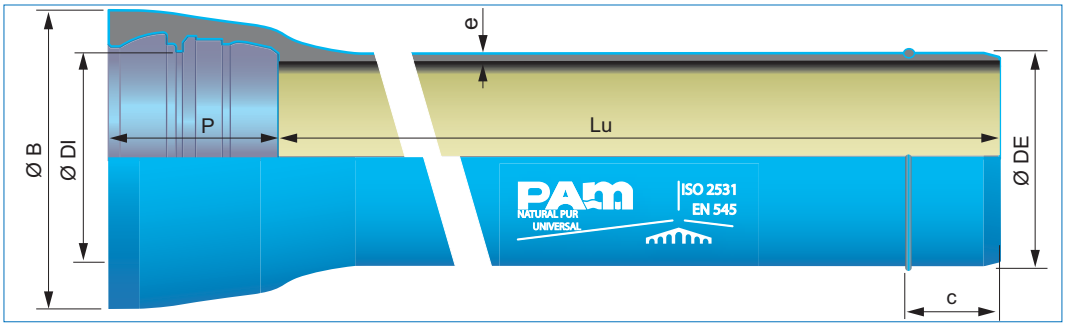
Joint:
- UNIVERSAL Vi
- Material: EPDM
- EN 681.1
- Inserts: Stainless steel



Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

Pipes DN 100 to 600 / NATURAL PUR Pipe with UNIVERSAL Ve joint (with weld bead)





Field of use:

- For drinking water mains
- For soft or aggressive waters

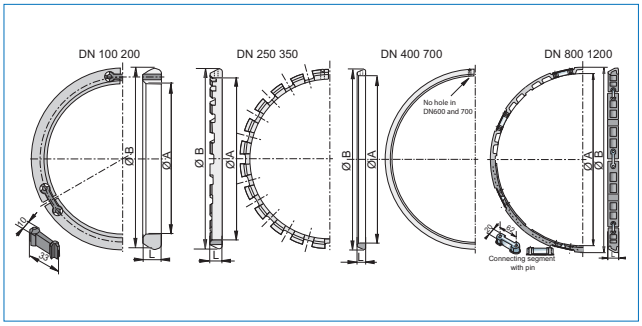
Main characteristics:

- Barrel: ZINALIUM external coating
- Spigot and socket: Rich zinc paint plus blue epoxy
- Internal lining : Sandy color PU average thickness 1 mm
- Conform to EN 15655
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c	Weight Kg/m	Reference with joint
100	5.97	K9	6.0	118	121.4	140	188	90	16.6	NFB10N60WC-E00
125	5.97	K9	6.0	144	147.4	140	215	95	20.4	NFB12N60WC-E00
150	5.97	K9	6.0	170	173.4	148	230	95	24.3	NFB15N60WC-E00
200	5.97	K9	6.3	222	225.2	155	290	100	33.6	NFB20N60WC-E00
250	5.97	K9	6.8	274	276.8	166	350	110	45.3	NFB25N60WC-E00
300	5.97	K9	7.2	326	328.8	180	408	115	57.6	NFB30N60WC-E00
350	5.97	K9	7.7	378	380.9	184	463	114	71.3	NFB35N60WC-E00
400	5.97	K9	8.1	429	431.9	176	510	113	84.2	NFB40N60WC-E00
450	5.97	K9	8.6	480	483.0	190	570	120	101.6	NFB45N60WC-E00
500	5.97	K9	9.0	532	535.0	200	625	125	118.3	NFB50N60WC-E00
600	5.97	K9	9.9	635	638.2	209	740	135	153.2	NFB60N60WC-E00

Joint:

- UNIVERSAL Ve
- Material: EPDM
- EN 681.1
- Locking ring: Ductile iron

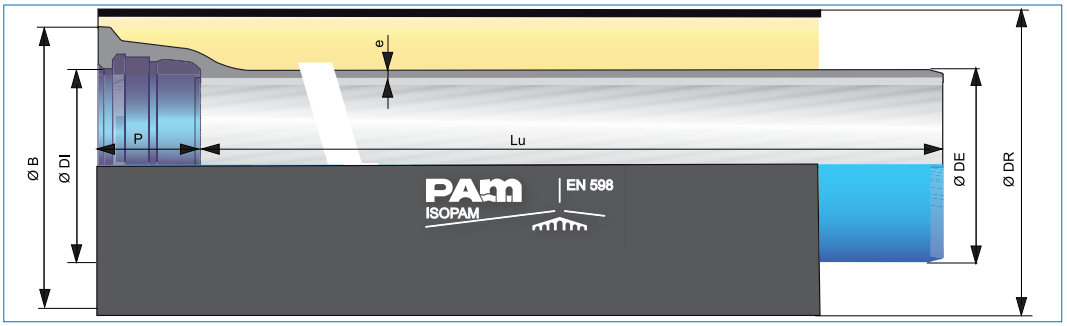


Angular deflection	
DN	**Angle**
80 to 450	3°
500 to 600	2°

DRINKING WATER SUPPLY

Pipes DN 100 to 600 / ISOPAM Pipe with STANDARD Vi joint





Field of use:

- For drinking water mains
- Pre-insulated pipes against frost

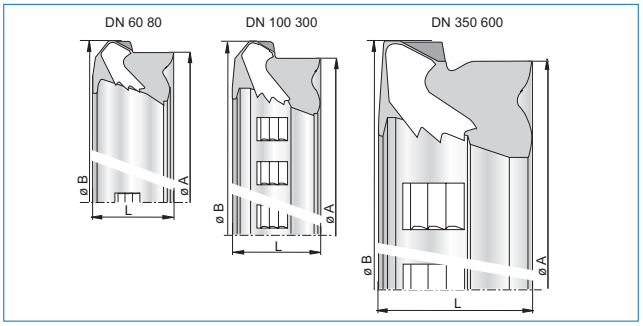
Main characteristics:

- ZINALIUM external coating
- Centrifuged cement mortar lining
- EN 545, ISO 2531
- Pipe protected by an external insulated coating (PEhd sheath, Polyurethane foam, foam spacer, elastomeric sleeve) for protecting water supply network prone to freezing risks
- Conform to ISO 9394

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	DR mm	P mm	ØB mm	Weight Kg/m	Reference with joint
100	6.00	C40	4.8	118	121.4	200	94.5	188	15.9	YSB10F60-E06
125	6.00	C40	4.8	144	147.4	225	97.5	215	19.6	YSB12F60-E06
150	6.00	C40	5.0	170	173.4	250	100.5	242	24.1	YSB15F60-E06
200	6.00	C40	5.4	222	225.2	315	106.5	295	33.8	YSB20F60-E06
250	6.00	C40	5.8	274	276.8	400	105.5	352	44.45	YSB25F60-E06
300	6.00	C40	6.2	326	328.8	450	107.5	409.2	56.1	YSB30F60-E06
350	6.00	C30	6.3	378	380.9	500	110.5	464.2	67.9	YSB35G60-E06
400	6.00	C30	6.5	429	431.9	560	112.5	516.2	79.3	YSB40G60-E06
450	6.00	C30	6.9	480	483.0	630	115.5	574.2	93.7	YSB45G60-E06
500	6.00	C30	7.4	532	535.0	670	117.5	629.2	106.9	YSB50G60-E06
600	6.00	C30	8.6	635	638.1	800	132.5	738.5	149.1	YSB60G60-E06

Joint:

- STANDARD Vi joint
- Material : EPDM
- EN 681.1
- Inserts: Stainless steel



Angular deflection	
DN	**Angle**
100 to 150	5°
200 and 250	4°
300 and 350	3°
400 to 600	2°

Fittings DN 60 to 600 Non anchored

DN	Field of use: Current situations – NATURAL – EXP*	STD	UNI	Highly aggressive soils – TT – STD	UNI	Soft or aggressive waters – NATURAL PUR – STD	UNI	Protection against frost – ISOPAM – STD
60		NC						
80		NC						
100		NC						
125		NC	NC		NC		NC	
150		NC						
200								
250								
300								
350			NC		NC		NC	
400								
450			NC		NC		NC	
500								
600								NC

Abbreviations:
STD: Pipe with STANDARD joint
EXP: Pipe with EXPRESS joint
UNI: Pipe with UNIVERSAL joint
NC: Please, contact us

Fittings DN 60 to 600 Anchored

DN	Field of use: Current situations – NATURAL – EXP Vi*	STD Vi	STD Ve	UNI Vi	UNI Ve	Highly aggressive soils – TT – STD Vi	UNI Vi	UNI Ve	Soft or aggressive waters – NATURAL PUR – STD Ve	UNI Vi	UNI Ve	Protection against frost – ISOPAM – STD Vi
60												
80												
100												
125				NC	NC		NC	NC		NC	NC	
150												
200												
250												
300												
350				NC	NC		NC	NC		NC	NC	
400												
450				NC	NC		NC	NC		NC	NC	
500												
600												NC

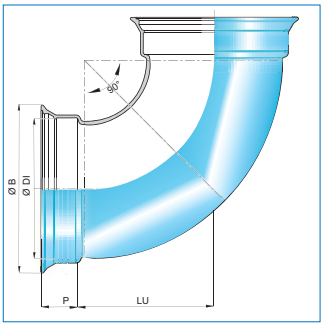
Abbreviations:
STD Vi: Pipe with STANDARD Vi anchored joint
STD Ve: Pipe with STANDARD Ve anchored joint
EXP Vi: Pipe with EXPRESS Vi anchored joint
UNI Vi: Pipe with UNIVERSAL Vi anchored joint
UNI Ve: Pipe with UNIVERSAL Ve anchored joint
NC: Please, contact us

Fittings DN 60 to 600 / NATURAL bend with EXPRESS joint

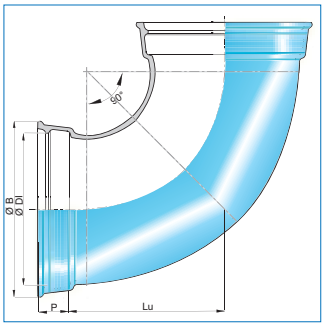
Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN 60-200

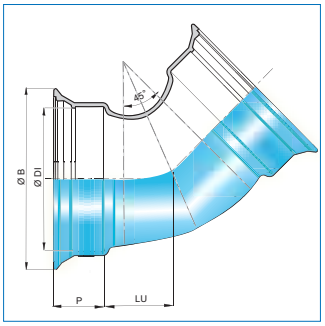


DN 350-600

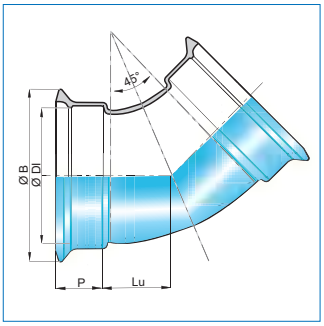
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
90°	60	75	76	80.3	143.5	6.4	NEA60CA
90°	80	91.5	79	101.4	167.5	8.7	NEA80CA
90°	100	102	80	121.4	187.5	6.8	NEB10CA
90°	125	130	83	147.4	214.5	9.0	NEB12CA
90°	150	150	86	173.4	241.5	11.5	NEB15CA
90°	200	200	92	225.5	294.5	18.8	NEB20CA
90°	250	250	100	276.8	351.0	33.5	NEB25CA
90°	300	280	105	328.8	408.2	43.1	NEB30CA
90°	350	390	110	380.8	463.2	95.0	NEB35CA
90°	400	436	110	432.0	515.2	140.0	NEB40CA
90°	450	482	120	483.0	575.0	170.0	NEB45CA
90°	500	525	120	535.0	628.2	215.0	NEB50CA
90°	600	624	135	638.6	737.5	312.0	NEB60CA

Weight: fitting alone
Reference: fitting

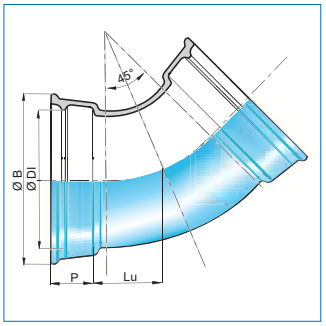




DN 60-200



DN 250-300



DN 350-600

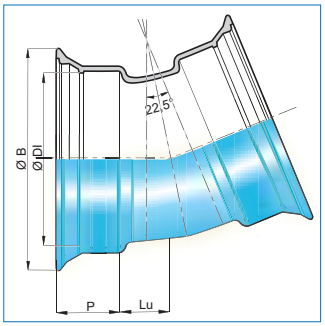
Note :
1 - Fitting reference with EXPRESS joint:
_____.E00
2 - Fitting reference with EXPRESS Vi joint:
_____.E06

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
45°	60	76	76	80.3	143.5	6.7	NEA60CB
45°	80	56.5	79	101.4	167.5	8.1	NEA80CB
45°	100	60	80	121.4	187.5	6.0	NEB10CB
45°	125	65	83	147.4	214.5	7.6	NEB12CB
45°	150	75	86	173.4	241.5	9.5	NEB15CB
45°	200	95	92	225.5	294.5	14.6	NEB20CB
45°	250	115	100	276.8	351.0	25.9	NEB25CB
45°	300	150	105	328.8	408.2	35.6	NEB30CB
45°	350	168	110	380.8	463.2	72.0	NEB35CB
45°	400	189	110	432.0	515.2	91.0	NEB40CB
45°	450	216	120	483.0	575.0	120.0	NEB45CB
45°	500	220	120	535.0	628.2	155.0	NEB50CB
45°	600	283	135	638.6	737.5	224.0	NEB60CB

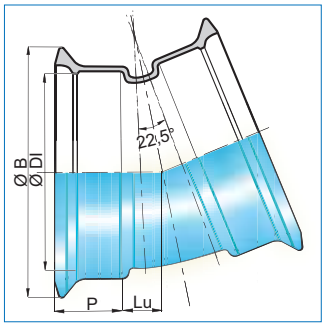
Weight: fitting alone
Reference: fitting

Fittings DN 60 to 600 / NATURAL bend with EXPRESS joint

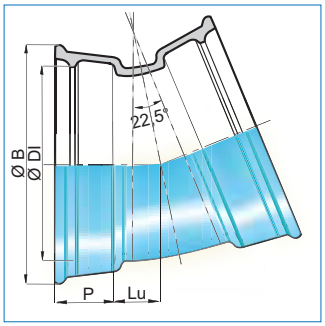




DN 60-200



DN 250-300

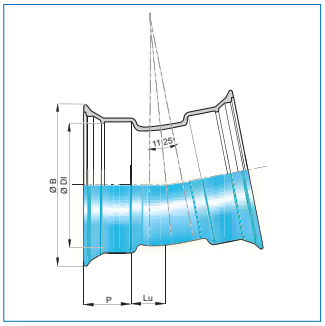


DN 350-600

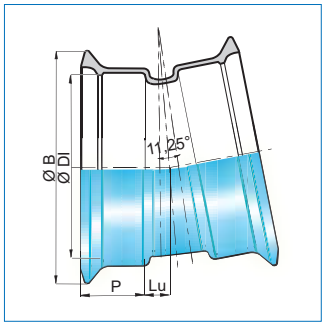
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
22.30°	60	30	76	80.3	143.5	5.6	NEA60CD
22.30°	80	32	79	101.4	167.5	7.4	NEA80CD
22.30°	100	35	80	121.4	187.5	5.4	NEB10CD
22.30°	125	40	83	147.4	214.5	6.8	NEB12CD
22.30°	150	45	86	173.4	241.5	8.4	NEB15CD
22.30°	200	55	92	225.5	294.5	12.5	NEB20CD
22.30°	250	65	100	276.8	351.0	22.0	NEB25CD
22.30°	300	75	105	328.8	408.2	28.6	NEB30CD
22.30°	350	78	110	380.8	463.2	57.0	NEB35CD
22.30°	400	92	110	432.0	515.2	71.0	NEB40CD
22.30°	450	100	120	483.0	575.0	92.0	NEB45CD
22.30°	500	110	120	535.0	628.2	118.0	NEB50CD
22.30°	600	140	135	638.6	737.5	166.0	NEB60CD

Weight: fitting alone
Reference: fitting

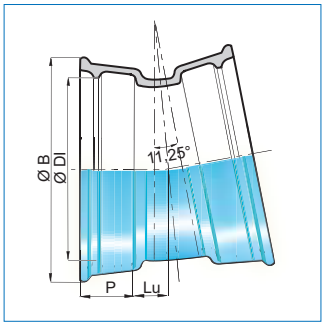




DN 60-200



DN 250-300



DN 350-600

Note :

1 - Fitting reference with EXPRESS joint:

_____.E00

2 - Fitting reference with EXPRESS Vi joint:

_____.E06

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
11.15°	60	35	76	80.3	143.5	5.7	NEA60CE
11.15°	80	40	79	101.4	167.5	7.6	NEA80CE
11.15°	100	30	80	121.4	187.5	5.3	NEB10CE
11.15°	125	35	83	147.4	214.5	6.6	NEB12CE
11.15°	150	35	86	173.4	241.5	8.0	NEB15CE
11.15°	200	40	92	225.5	294.5	11.6	NEB20CE
11.15°	250	50	100	276.8	351.0	20.8	NEB25CE
11.15°	300	55	105	328.8	408.2	26.6	NEB30CE
11.15°	350	53	110	380.8	463.2	48.5	NEB35CE
11.15°	400	58	110	432.0	515.2	64.5	NEB40CE
11.15°	450	67	120	483.0	575.0	84.0	NEB45CE
11.15°	500	71	120	535.0	628.2	106.0	NEB50CE
11.15°	600	94	135	638.6	737.5	148.0	NEB60CE

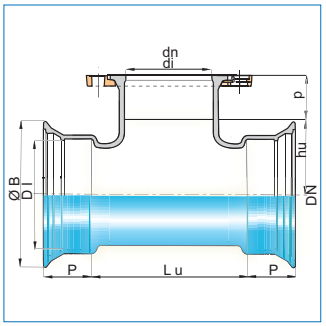
Weight: fitting alone
Reference: fitting

Fittings DN 60 to 600 / NATURAL double socket tee with flanged branch with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN 60 - 200

DN	d	Lu	hu	P	DI	B	Weight / kg				Reference			
		mm					PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	40	154	141	92	80.3	143.5	9.4	9.4	9.4	9.4	NEA60UD1A	NEA60UD1A	NEA60UD1A	NEA60UD1A
60	60	154	161	92	80.3	143.5	10.3	10.3	9.9	9.9	NEA60UD1C	NEA60UD1C	NEA60UD3C	NEA60UD3C
60	65	154	161	92	80.3	143.5	10.8	10.8	10.4	10.4	NEA60UD1D	NEA60UD1D	NEA60UD3D	NEA60UD3D
80	40	145	149	92	101.4	167.5	11.4	11.4	11.4	11.4	NEA80UD1A	NEA80UD1A	NEA80UD1A	NEA80UD1A
80	60	145	169	92	101.4	167.5	12.3	12.3	11.9	11.9	NEA80UD1C	NEA80UD1C	NEA80UD3C	NEA80UD3C
80	65	145	174	92	101.4	167.5	12.8	12.8	12.4	12.4	NEA80UD1D	NEA80UD1D	NEA80UD3D	NEA80UD3D
80	80	183	165	92	101.4	167.5	13.8	13.8	13.8	13.8	NEA80UD1E	NEA80UD1E	NEA80UD1E	NEA80UD1E
100	40	150	161	92	121.4	187.5	13.2	13.2	13.2	13.2	NEB10UD1A	NEB10UD1A	NEB10UD1A	NEB10UD1A
100	60	150	181	76	121.4	187.5	14.1	14.1	13.9	13.9	NEB10UD1C	NEB10UD1C	NEB10UD3C	NEB10UD3C
100	65	150	186	76	121.4	187.5	14.6	14.6	14.4	14.4	NEB10UD1D	NEB10UD1D	NEB10UD3D	NEB10UD3D
100	80	185	177	76	121.4	187.5	15.8	15.8	15.8	15.8	NEB10UD1E	NEB10UD1E	NEB10UD1E	NEB10UD1E
100	100	210	180	79	121.4	187.5	17.2	17.2	17.7	17.7	NEB10UD1F	NEB10UD1F	NEB10UD3F	NEB10UD3F
125	40	150	164	79	147.4	214.5	15.2	15.2	15.2	15.2	NEB12UD1A	NEB12UD1A	NEB12UD1A	NEB12UD1A
125	60	150	184	79	147.4	214.5	16.1	16.1	15.7	15.7	NEB12UD1C	NEB12UD1C	NEB12UD3C	NEB12UD3C
125	65	150	184	79	147.4	214.5	16.6	16.6	16.2	16.2	NEB12UD1D	NEB12UD1D	NEB12UD3D	NEB12UD3D
125	80	165	195	80	147.4	214.5	17.7	17.7	17.7	17.7	NEB12UD1E	NEB12UD1E	NEB12UD1E	NEB12UD1E
125	100	190	200	80	147.4	214.5	19.5	19.5	20.0	20.0	NEB12UD1F	NEB12UD1F	NEB12UD3F	NEB12UD3F
125	125	267	200	80	147.4	214.5	23.0	23.0	23.9	23.9	NEB12UD1G	NEB12UD1G	NEB12UD3G	NEB12UD3G
150	40	154	176	80	173.4	241.5	18.9	18.9	18.9	18.9	NEB15UD1A	NEB15UD1A	NEB15UD1A	NEB15UD1A
150	60	154	196	80	173.4	241.5	20.0	20.0	19.6	19.6	NEB15UD1C	NEB15UD1C	NEB15UD3C	NEB15UD3C
150	65	154	201	83	173.4	241.5	20.5	20.5	20.0	20.0	NEB15UD1D	NEB15UD1D	NEB15UD3D	NEB15UD3D
150	80	165	210	83	173.4	241.5	21.5	21.5	21.5	21.5	NEB15UD1E	NEB15UD1E	NEB15UD1E	NEB15UD1E
150	100	190	219	83	173.4	241.5	24.0	24.0	24.5	24.5	NEB15UD1F	NEB15UD1F	NEB15UD3F	NEB15UD3F
150	125	220	210	83	173.4	241.5	25.5	25.5	26.4	26.4	NEB15UD1G	NEB15UD1G	NEB15UD3G	NEB15UD3G
150	150	305	220	83	173.4	241.5	30.5	30.5	31.5	31.5	NEB15UD1J	NEB15UD1J	NEB15UD3J	NEB15UD3J
200	40	159	209	83	225.5	294.5	25.5	25.5	25.5	25.5	NEB20UD1A	NEB20UD1A	NEB20UD1A	NEB20UD1A
200	60	159	229	86	225.5	294.5	26.5	26.5	26.1	26.1	NEB20UD1C	NEB20UD1C	NEB20UD3C	NEB20UD3C
200	65	159	234	86	225.5	294.5	27.0	27.0	26.6	26.6	NEB20UD1D	NEB20UD1D	NEB20UD3D	NEB20UD3D
200	80	170	240	86	225.5	294.5	28.0	28.0	28.0	28.0	NEB20UD1E	NEB20UD1E	NEB20UD1E	NEB20UD1E
200	100	195	245	86	225.5	294.5	30.0	30.0	30.5	30.5	NEB20UD1F	NEB20UD1F	NEB20UD3F	NEB20UD3F
200	125	220	240	86	225.5	294.5	33.0	33.0	33.9	33.9	NEB20UD1G	NEB20UD1G	NEB20UD3G	NEB20UD3G
200	150	250	245	86	225.5	294.5	36.0	36.0	37.0	37.0	NEB20UD1J	NEB20UD1J	NEB20UD3J	NEB20UD3J
200	200	360	260	86	225.5	294.5	45.5	45.4	46.9	46.9	NEB20UD1K	NEB20UD2K	NEB20UD3K	-

Weight: fitting alone - Reference: fitting

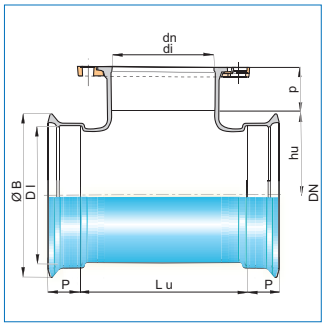
Note :
1 - Fitting reference with EXPRESS joint: _____.E00
2 - Fitting reference with EXPRESS Vi joint: _____.E06

DRINKING WATER SUPPLY

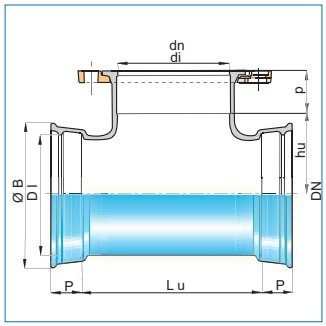
Fittings DN 60 to 600 / NATURAL double socket tee with flanged branch with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



DN 250-300



DN 350-600

DN	d	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
250	60	164	145	100	276.8	351.0	39.2	39.2	38.8	NEB25UD1C	NEB25UD1C	NEB25UD3C
250	65	164	145	100	276.8	351.0	39.7	39.7	39.8	NEB25UD1D	NEB25UD1D	NEB25UD3D
250	80	234	165.5	100	276.8	351.0	45.1	45.1	45.1	NEB25UD1E	NEB25UD1E	NEB25UD1E
250	150	251	145.5	100	276.8	351.0	50.7	50.7	51.7	NEB25UD1J	NEB25UD1J	NEB25UD3J
250	200	344	148	100	276.8	351.0	62.0	61.9	63.4	NEB25UD1K	NEB25UD2K	NEB25UD3K
250	250	404	180	100	276.8	351.0	72.6	72.2	75.1	NEB25UD1L	NEB25UD2L	NEB25UD3L
300	60	237	170	105	328.8	408.2	56.8	56.8	56.4	NEB30UD1C	NEB30UD1C	NEB30UD3C
300	65	237	170	105	328.8	408.2	57.3	57.3	-	NEB30UD1D	NEB30UD1D	NEB30UD1D
300	80	237	170	105	328.8	408.2	58.3	58.3	58.3	NEB30UD1E	NEB30UD1E	NEB30UD1E
300	150	347	175.5	105	328.8	408.2	72.2	72.2	73.2	NEB30UD1J	NEB30UD1J	NEB30UD3J
300	200	347	178	105	328.8	408.2	77.0	76.9	78.4	NEB30UD1K	NEB30UD2K	NEB30UD3K
300	250	467	185	105	328.8	408.2	91.6	91.2	94.5	NEB30UD1L	NEB30UD2L	NEB30UD3L
300	300	467	209.5	105	328.8	408.2	101.0	100.3	103.9	NEB30UD1M	NEB30UD2M	NEB30UD3M
350	60	148	195	110	380.8	463.2	62.0	62.0	62.0	NEB35UD1C	NEB35UD1C	NEB35UD3C
350	65	148	195	110	380.8	463.2	62.0	62.0	-	NEB35UD1D	NEB35UD1D	-
350	80	194	225.5	110	380.8	463.2	70.0	70.0	70.0	NEB35UD1E	NEB35UD1E	NEB35UD1E
350	150	314	205.5	110	380.8	463.2	86.0	86.0	86.0	NEB35UD1J	NEB35UD1J	NEB35UD3J
350	200	314	208	110	380.8	463.2	90.0	90.0	99.0	NEB35UD1K	NEB35UD2K	NEB35UD3K
350	250	369	240	110	380.8	463.2	101.6	101.2	104.1	NEB35UD1L	NEB35UD2L	NEB35UD3L
350	300	485	-	110	380.8	463.2	109.0	110.0	-	NEB35UD1M	NEB35UD2M	-
350	350	485	217.5	110	380.8	463.2	129.1	129.9	136.0	NEB35UD1Y	NEB35UD2Y	NEB35UD3Y
400	80	195	255.5	110	432.0	515.2	83.0	83.0	83.0	NEB40UD1E	NEB40UD1E	NEB40UD1E
400	150	315	235.5	110	432.0	515.2	100.2	100.2	101.2	NEB40UD1J	NEB40UD1J	NEB40UD3J
400	200	315	238	110	432.0	515.2	97.9	97.8	99.3	NEB40UD1K	NEB40UD2K	NEB40UD3K
400	250	429	270	110	432.0	515.2	116.6	116.2	119.1	NEB40UD1L	NEB40UD2L	NEB40UD3L
400	300	429	269.5	110	432.0	515.2	121.3	120.6	124.2	NEB40UD1M	NEB40UD2M	NEB40UD3M
400	400	545	245.5	110	432.0	515.2	164.5	169.0	178.0	NEB40UD1N	NEB40UD2N	NEB40UD3N
450	150	315	265.5	120	483.0	575.0	108.2	108.2	109.2	NEB45UD1J	NEB45UD1J	NEB45UD3J
450	200	315	268	120	483.0	575.0	138.5	138.4	139.9	NEB45UD1K	NEB45UD2K	NEB45UD3K
450	250	600	300	120	483.0	575.0	143.6	143.2	146.1	NEB45UD1L	NEB45UD2L	NEB45UD3L
450	300	600	303	120	483.0	575.0	150.3	149.6	153.2	NEB45UD1M	NEB45UD2M	NEB45UD3M
450	400	600	275.5	120	483.0	575.0	191.7	195.8	205.0	NEB45UD1N	NEB45UD2N	NEB45UD3N
450	450	600	278.5	120	483.0	575.0	200.8	207.2	214.4	NEB45UD1P	NEB45UD2P	NEB45UD3P
500	150	325	295.5	120	535.0	628.2	150.2	150.2	151.2	NEB50UD1J	NEB50UD1J	NEB50UD3J
500	200	325	298	120	535.0	628.2	154.0	154.0	155.0	NEB50UD1K	NEB50UD2K	NEB50UD3K
500	250	443	330	120	535.0	628.2	178.6	178.2	181.1	NEB50UD1L	NEB50UD2L	NEB50UD3L
500	300	443	329.5	120	535.0	628.2	192.3	191.6	195.2	NEB50UD1M	NEB50UD2M	NEB50UD3M
500	400	555	305.5	120	535.0	628.2	221.0	226.0	235.0	NEB50UD1N	NEB50UD2N	NEB50UD3N
500	500	675	307.5	120	535.0	628.2	264.0	277.0	283.0	NEB50UD1Q	NEB50UD2Q	NEB50UD3Q
600	100	340	358	135	638.6	737.5	185.5	185.5	186.0	NEB60UD1F	NEB60UD1F	NEB60UD3F
600	300	452	389.5	135	638.6	737.5	236.0	235.3	238.9	NEB60UD1M	NEB60UDM	NEB60UD3M
600	400	570	365.5	135	638.6	737.5	278.0	283.0	292.0	NEB60UD1N	NEB60UD2N	NEB60UD3N
600	600	800	363.5	135	638.6	737.5	381.0	406.0	409.0	NEB60UD1R	NEB60UD2R	NEB60UD3R

Weight: fitting alone - Reference: fitting

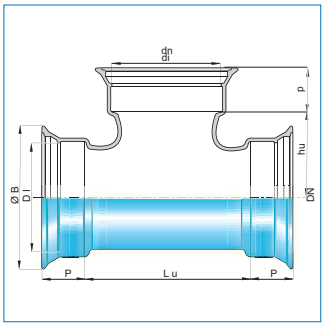
DRINKING WATER SUPPLY

Fittings DN 60 to 200 / NATURAL all socket Tee with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN	dn	Lu	P	DI	B	hu	p	di	Weight	Reference
		mm							kg	
60	60	154	76	80.3	143.5	159	76	80.3	9.5	NEA60TEOC
80	60	145	79	101.4	167.5	167	76	80.3	11.4	NEA80TEOC
80	80	183	79	101.4	167.5	176.5	79	101.4	13	NEA80TEOE
100	60	150	80	121.4	187.5	179	76	80.3	13.3	NEB10TEOC
100	80	185	80	121.4	187.5	189	79	101.4	14.9	NEB10TEOE
100	100	210	80	121.4	187.5	193	80	121.4	16.2	NEB10TEOF
125	125	267	83	147.4	214.5	224.5	83	147.4	21.5	NEB12TEOG
150	60	154	86	173.4	241.5	194	76	80.3	19	NEB15TEOC
150	80	165	86	173.4	241.5	222	79	101.4	20.5	NEB15TEOE
150	100	190	86	173.4	241.5	228	80	121.4	22	NEB15TEOF
150	150	305	86	173.4	241.5	246.5	86	173.4	28.9	NEB15TEOJ
200	60	159	92	225.5	294.5	227.5	76	80.3	25.5	NEB20TEOC
200	80	170	92	225.5	294.5	252	79	101.4	27	NEB20TEOE
200	100	195	92	225.5	294.5	258	80	121.4	29	NEB20TEOF
200	150	250	92	225.5	294.5	271.5	86	173.4	34	NEB20TEOJ
200	200	360	92	225.5	294.5	280	92	225.5	42	NEB20TEOK

Weight: fitting alone - Reference: fitting

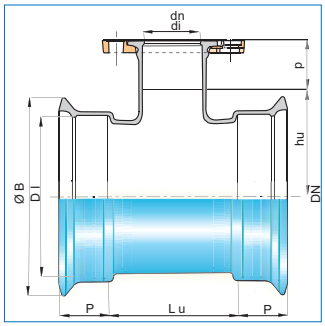
Note :
1 - Fitting reference with EXPRESS joint: _____.E00
2 - Fitting reference with EXPRESS Vi joint: _____.E06

Fittings DN 250 to 600 / NATURAL double socket washout tee with flanged branch with EXPRESS joint

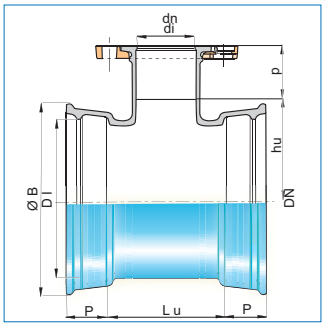
Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN 250-300



DN 350-600

DN	d	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
250	100	204	165.5	100	276.8	351	30.16	30.16	30.66	NEB25UV1F	NEB25UV1F	NEB25UV3F
300	100	210	195.5	105	328.8	408.2	36.7	36.7	36.7	NEB30UV1F	NEB30UV1F	NEB30UV3F
350	100	194	225.5	110	380.8	463.2	71	71	72	NEB35UV1F	NEB35UV1F	NEB35UV3F
400	100	195	255.5	110	432	515.2	83.5	83.5	84	NEB40UV1F	NEB40UV1F	NEB40UV3F
500	100	210	315.5	120	535	628.2	126.5	126.5	127	NEB50UV1F	NEB50UV1F	NEB50UV3F
600	200	340	358	135	638.6	737.5	200	200	200	NEB60UV1K	NEB60UV2K	NEB60UV3K

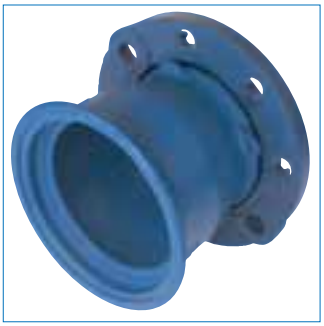
Weight: fitting alone - Reference: fitting

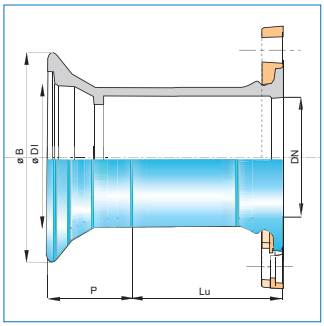
Note :
1 - Fitting reference with EXPRESS joint: _____.E00
2 - Fitting reference with EXPRESS Vi joint: _____.E06

Fittings DN 60 to 600 / NATURAL flanged socket with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531

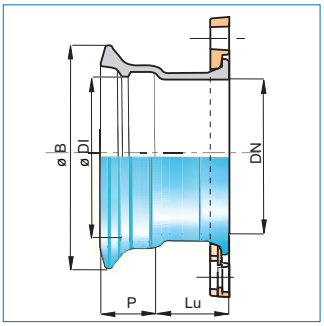




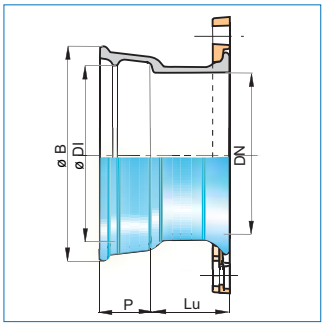
DN	Lu	P	ØDI	ØB	WEIGHT / kg				Reference			
	mm				PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	126	76	80.3	143.5	6.6	6.6	6.2	6.2	NEA60BE1	NEA60BE1	NEA60BE3	NEA60BE3
65	-	-	-	-	7.1	7.1	6.7	6.7	NEA65BE1	NEA65BE1	NEA65BE3	NEA65BE3
80	128	79	101.4	167.5	8.2	8.2	8.2	8.2	NEA80BE1	NEA80BE1	NEA80BE1	NEA80BE1
100	105	80	121.4	187.5	7.15	7.15	5.2	5.2	NEB10BE1	NEB10BE1	NEB10BE3	NEB10BE3
125	110	83	147.4	214.5	9.15	9.15	10.05	10.05	NEB12BE1	NEB12BE1	NEB12BE3	NEB12BE3
150	110	86	173.4	241.5	11.33	11.33	12.33	12.33	NEB15BE1	NEB15BE1	NEB15BE3	NEB15BE3
200	115	92	225.5	294.5	16.25	16.15	17.65	18.04	NEB20BE1	NEB20BE2	NEB20BE3	NEB20BE4

Weight: fitting alone - Reference: fitting

Note :
1 - Fitting reference with EXPRESS joint:
_____.E00
2 - Fitting reference with EXPRESS Vi joint:
_____.E06



DN 250-300



DN 350-600

DN	Lu	P	ØDI	ØB	WEIGHT / kg				Reference			
	mm				PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
250	125	100	276.8	351	25.39	24.99	27.89	46	NEB25BE1	NEB25BE2	NEB25BE3	NEB25BE4
300	130	105	328.8	408.2	32.5	31.8	35.4	66	NEB30BE1	NEB30BE2	NEB30BE3	NEB30BE4
350	145	110	380.8	463.2	57.6	58.4	64.5	-	NEB35BE1	NEB35BE2	NEB35BE3	-
400	150	110	432.0	515.2	65.5	70.0	79.0	-	NEB40BE1	NEB40BE2	NEB40BE3	-
450	155	120	483.0	575.0	82.0	88.0	96.0	-	NEB45BE1	NEB45BE2	NEB45BE3	-
500	180	120	535.0	628.2	93.0	106.0	112.0	-	NEB50BE1	NEB50BE2	NEB50BE3	-
600	190	135	638.6	737.5	124.0	149.0	152.0	-	NEB60BE1	NEB60BE2	NEB60BE3	-

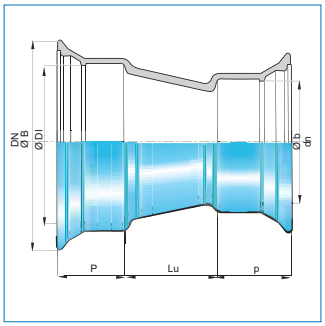
Weight: fitting alone - Reference: fitting

Fittings DN 80 to 600 / NATURAL double socket taper with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531

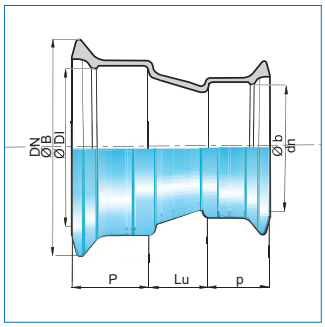




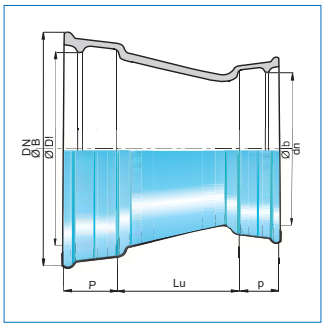
DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
80	60	103.5	79	101.4	167.5	76	80.3	7.0	NEA80VE0C
100	60	100	80	121.4	187.5	76	80.3	7.7	NEB10VE0C
100	80	104.5	80	121.4	187.5	79	101.4	8.7	NEB10VE0E
125	60	150	83	147.4	214.5	76	80.3	9.5	NEB12VE0C
125	80	120	83	147.4	214.5	79	101.4	9.9	NEB12VE0E
125	100	105.5	83	147.4	214.5	80	121.4	10.4	NEB12VE0F
150	60	200	86	173.4	241.5	76	80.3	12.2	NEB15VE0C
150	80	170	86	173.4	241.5	79	101.4	12.6	NEB15VE0E
150	100	130	86	173.4	241.5	80	121.4	12.6	NEB15VE0F
150	125	107	86	173.4	241.5	83	147.4	13.0	NEB15VE0G
200	100	230	92	225.5	294.5	80	121.4	18.3	NEB20VE0F
200	125	180	92	225.5	294.5	83	147.4	18.0	NEB20VE0G
200	150	125	92	225.5	294.5	86	173.4	18.0	NEB20VE0J

Weight: fitting alone - Reference: fitting

Note :
1 - Fitting reference with EXPRESS joint:
_____.E00
2 - Fitting reference with EXPRESS Vi joint:
_____.E06



DN 250-300



DN 350-600

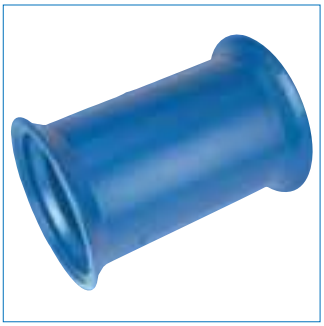
DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
250	125	275	100	276.8	351.0	83	147.4	30	NEB25VE0G
250	150	225	100	276.8	351.0	86	173.4	30	NEB25VE0J
250	200	125	100	276.8	351.0	92	225.5	30.5	NEB25VE0K
300	150	321.5	105	328.8	408.2	86	173.4	40	NEB30VE0J
300	200	222	105	328.8	408.2	92	225.5	40.5	NEB30VE0K
300	250	123	105	328.8	408.2	100	276.8	39	NEB30VE0L
350	200	335	110	380.8	463.2	92	225.5	54.5	NEB35VE0K
350	250	260	110	380.8	463.2	100	276.8	52	NEB35VE0L
350	300	187	110	380.8	463.2	105	328.8	55	NEB35VE0M
400	250	335	110	432.0	515.2	100	276.8	65	NEB40VE0L
400	300	260	110	432.0	515.2	105	328.8	60	NEB40VE0M
400	350	176	110	432.0	515.2	110	380.8	62	NEB40VE0Y
450	300	335	120	483.0	575.0	105	238.8	85	NEB45VE0M
450	350	234	120	483.0	575.0	110	380.8	84	NEB45VE0Y
450	400	166	120	483.0	575.0	110	432.0	84	NEB45VE0N
500	350	378	120	535.0	628.2	110	380.8	97	NEB50VE0Y
500	400	290	120	535.0	628.2	110	432.0	91	NEB50VE0N
500	450	160	120	535.0	628.2	120	483.0	78	NEB50VE0P
600	400	460	135	638.6	737.5	110	432.0	155	NEB60VE0N
600	450	360	135	638.6	737.5	120	483.0	123	NEB60VE0P
600	500	258	135	638.6	737.5	120	535.0	125	NEB60VE0Q

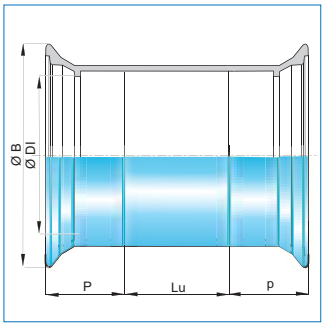
Weight: fitting alone - Reference: fitting

Fittings DN 60 to 600 / NATURAL collar with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531
- Sliding collar



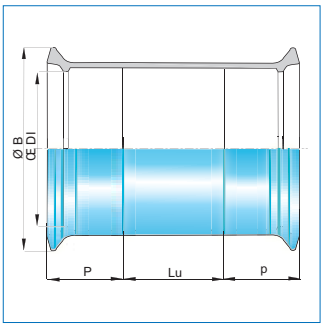


DN 60-200

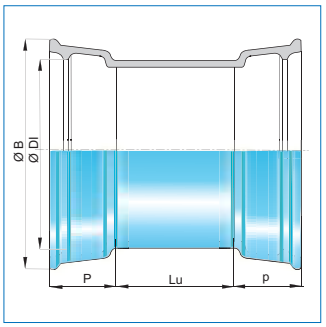
DN	Lu	P	DI	B	Weight	Reference
	mm				kg	
60	156	76	80.3	143.5	6.9	NEA60MN
80	158	79	101.4	167.5	8.8	NEA80MN
100	160	80	121.4	187.5	7.1	NEB10MN
125	165	83	147.4	214.5	8.7	NEB12MN
150	165	86	173.4	241.5	10.4	NEB15MN
200	170	92	225.5	294.5	14.5	NEB20MN

Weight: fitting alone - Reference: fitting

Note :
1 - Fitting reference with EXPRESS joint:
_____.E00
2 - Fitting reference with EXPRESS Vi joint:
_____.E06



DN 250-300



DN 350-600

DN	Lu	P	DI	B	Weight	Reference
	mm				kg	
250	175	100	276.8	351.0	24.3	NEB25MN
300	180	105	328.8	408.2	30.2	NEB30MN
350	185	110	380.8	463.2	55.0	NEB35MN
400	190	110	432.0	515.2	67.0	NEB40MN
450	195	120	483.0	575.0	76.0	NEB45MN
500	200	120	535.0	628.2	100.0	NEB50MN
600	210	135	638.6	737.5	131.0	NEB60MN

Weight: fitting alone - Reference: fitting

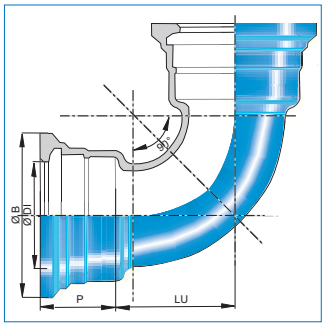
Fittings DN 60 to 600 / NATURAL bend with STANDARD joint

Field of use:
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges

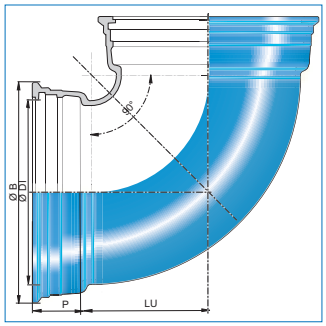
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:
- Available also on request with blue cataphoresis





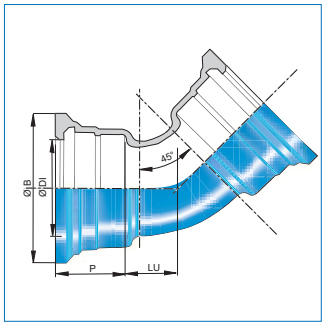
DN 60-300



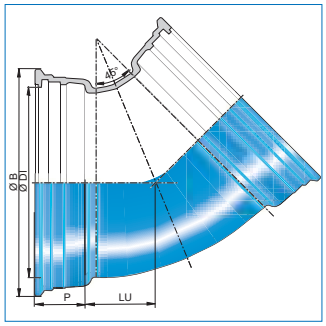
DN 350-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
90°	60	75	82	80.2	143.5	6.2	SSA60CA00TT
90°	80	91.5	85	101.4	167.5	7.6	SSA80CA00TT
90°	100	105	88	121.4	187.5	10.0	SSB10CA00TT
90°	125	133.5	91	147.4	214.5	13.9	SSB12CA00TT
90°	150	152.5	94	173.4	241.0	18.1	SSB15CA00TT
90°	200	200	100	225.5	294.0	29.2	SSB20CA00TT
90°	250	252	105	277.3	351.0	49.6	SSB25CA00TT
90°	300	304	110	329.3	408.3	72.7	SSB30CA00TT
90°	350	390	110	381.4	464.3	115.0	SSB35CA00TT
90°	400	436	112	432.4	515.3	141.0	SSB40CA00TT
90°	450	482	115.5	483.5	573.0	144.0	SSB45CA00TT
90°	500	525	117.5	535.5	628.0	216.0	SSB50CA00TT
90°	600	624	132.5	638.6	737.0	311.0	SSB60CA00TT

Weight: fitting alone
Reference: fitting



DN 60-300



DN 350-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
45°	60	76	82	80.2	143.5	6.5	SSA60CB00TT
45°	80	56.5	85	101.4	167.5	7.0	SSA80CB00TT
45°	100	65	88	121.4	187.5	8.9	SSB10CB00TT
45°	125	83.5	91	147.4	214.5	12.3	SSB12CB00TT
45°	150	92.5	94	173.4	241.0	15.6	SSB15CB00TT
45°	200	100	100	225.5	294.0	23.7	SSB20CB00TT
45°	250	136	105	277.3	351.0	40.5	SSB25CB00TT
45°	300	167.5	110	329.3	408.3	59.0	SSB30CB00TT
45°	350	168	110	381.4	464.3	68.7	SSB35CB00TT
45°	400	189	112	432.4	515.3	88.5	SSB40CB00TT
45°	450	216	115.5	483.5	573.0	118.3	SSB45CB00TT
45°	500	220	117.5	535.5	628.0	146.0	SSB50CB00TT
45°	600	283	132.5	638.6	737.0	208.4	SSB60CB00TT

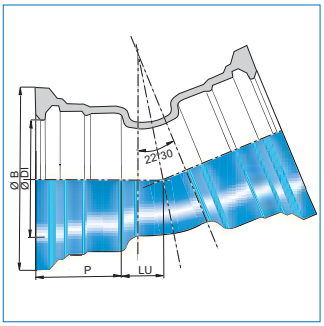
Weight: fitting alone
Reference: fitting

Fittings DN 60 to 600 / NATURAL bend with STANDARD joint

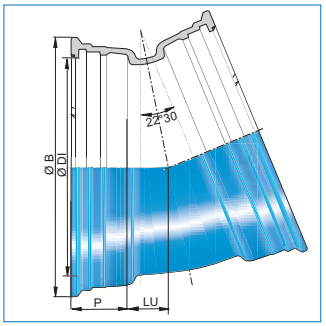
Field of use:
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:
- Available also on request with blue cataphoresis



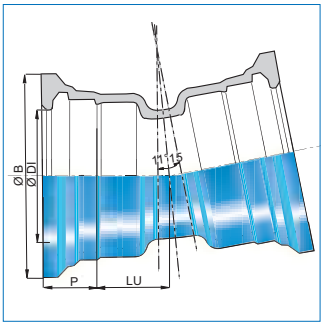
DN 60-300



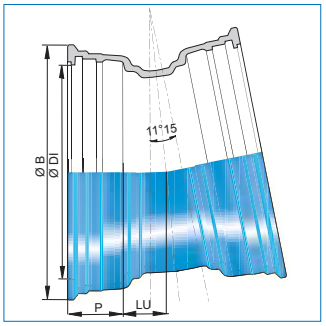
DN 350-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
22°30	60	30	82	80.2	143.5	4.9	SSA60CD00TT
22°30	80	32	85	101.4	167.5	6.2	SSA80CD00TT
22°30	100	35	88	121.4	187.5	7.8	SSB10CD00TT
22°30	125	38	91	147.4	214.5	9.9	SSB12CD00TT
22°30	150	42	94	173.4	241.0	12.2	SSB15CD00TT
22°30	200	51	100	225.5	294.0	18.9	SSB20CD00TT
22°30	250	70	105	277.3	351.0	32.2	SSB25CB00TT
22°30	300	70	110	329.3	408.3	42.2	SSB30CD00TT
22°30	350	78	110	381.4	464.3	53.2	SSB35CD00TT
22°30	400	92	112	432.4	515.3	68.7	SSB40CD00TT
22°30	450	100	115.5	483.5	573.0	88.15	SSB45CD00TT
22°30	500	110	117.5	535.5	628.0	108.0	SSB50CD00TT
22°30	600	140	132.5	638.6	737.0	143.9	SSB60CD00TT

Weight: fitting alone
Reference: fitting



DN 60-300



DN 350-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
11.15°	60	35	82	80.2	143.5	5.1	SSA60CE00TT
11.15°	80	40	85	101.4	167.5	6.5	SSA80CE00TT
11.15°	100	40	88	121.4	187.5	7.9	SSB10CE00TT
11.15°	125	45	91	147.4	214.5	10.3	SSB12CE00TT
11.15°	150	46	94	173.4	241.0	12.6	SSB15CE00TT
11.15°	200	52	100	225.5	294.0	19.2	SSB20CE00TT
11.15°	250	55	105	277.3	351.0	30.5	SSB25CE00TT
11.15°	300	50	110	329.3	408.3	39.7	SSB30CE00TT
11.15°	350	53	110	381.4	464.3	49.0	SSB35CE00TT
11.15°	400	58	112	432.4	515.3	61.5	SSB40CE00TT
11.15°	450	67	115.5	483.5	573.0	79.6	SSB45CE00TT
11.15°	500	71	117.5	535.5	628.0	96.0	SSB50CE00TT
11.15°	600	94	132.5	638.6	737.0	128.0	SSB60CE00TT

Weight: fitting alone
Reference: fitting

DRINKING WATER SUPPLY

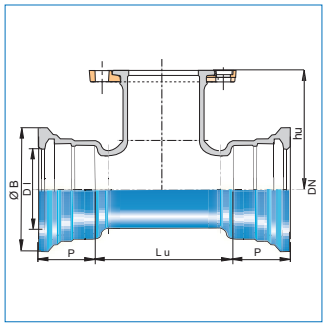
Fittings DN 60 to 600 / STANDARD double socket tee with flanged branch with STANDARD joint

Field of use:
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:
- Available also on request with blue cataphoresis





DN 60 - 300

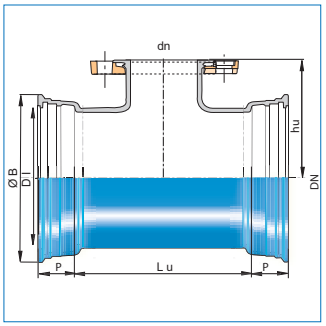
DN	dn	Lu	hu	P	DI	B	Weight / kg				Reference			
		mm					PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	40	154	141	82	80.2	143.5	8.8	8.8	8.8	8.8	SSA60UD1ATT	SSA60UD1ATT	SSA60UD1ATT	SSA60UD1ATT
60	60	154	161	82	80.2	143.5	9.7	9.7	9.3	9.3	SSA60UD1CTT	SSA60UD1CTT	SSA60UD3CTT	SSA60UD3CTT
80	40	145	149	85	101.4	167.5	10.2	10.2	10.2	10.2	SSA80UD1ATT	SSA80UD1ATT	SSA80UD1ATT	SSA80UD1ATT
80	60	145	169	85	101.4	167.5	11.1	11.1	10.7	10.7	SSA80UD1CTT	SSA80UD1CTT	SSA80UD3CTT	SSA80UD3CTT
80	65	145	174	85	101.4	167.5	11.5	11.5	-	-	SSA80UD1DTT	SSA80UD1DTT	SSA80UD3DTT	SSA80UD3DTT
80	80	183	165	85	101.4	167.5	12.5	12.5	12.5	12.5	SSA80UD1ETT	SSA80UD1ETT	SSA80UD1ETT	SSA80UD1ETT
100	40	150	161	88	121.4	187.5	12.0	12.0	12.0	12.0	SSB10UD1ATT	SSB10UD1ATT	SSB10UD1ATT	SSB10UD1ATT
100	60	150	181	88	121.4	187.5	12.9	12.9	12.5	12.5	SSB10UD1CTT	SSB10UD1CTT	SSB10UD3CTT	SSB10UD3CTT
100	65	150	186	88	121.4	187.5	13.3	13.3	-	-	SSB10UD1DTT	SSB10UD1DTT	SSB10UD3DTT	SSB10UD3DTT
100	80	185	177	88	121.4	187.5	14.6	14.6	14.6	14.6	SSB10UD1ETT	SSB10UD1ETT	SSB10UD1ETT	SSB10UD1ETT
100	100	210	180	88	121.4	187.5	16.4	16.4	17.0	17.0	SSB10UD1FTT	SSB10UD1FTT	SSB10UD3FTT	SSB10UD3FTT
125	40	150	164	91	147.4	214.5	14.3	14.3	14.3	14.3	SSB12UD1ATT	SSB12UD1ATT	SSB12UD1ATT	SSB12UD1ATT
125	60	150	184	91	147.4	214.5	15.2	15.2	14.8	14.8	SSB12UD1CTT	SSB12UD1CTT	SSB12UD3CTT	SSB12UD3CTT
125	65	150	189	91	147.4	214.5	15.6	15.6	15.8	15.8	SSB12UD1DTT	SSB12UD1DTT	SSB12UD3DTT	SSB12UD3DTT
125	80	165	195	91	147.4	214.5	16.8	16.8	16.8	16.8	SSB12UD1ETT	SSB12UD1ETT	SSB12UD1ETT	SSB12UD1ETT
125	100	190	200	91	147.4	214.5	18.5	18.5	19.0	19.0	SSB12UD1FTT	SSB12UD1FTT	SSB12UD3FTT	SSB12UD3FTT
125	125	267	200	91	147.4	214.5	23.0	23.0	23.9	23.9	SSB12UD1GTT	SSB12UD1GTT	SSB12UD3GTT	SSB12UD3GTT
150	40	154	176	94	173.4	241	17.1	17.1	17.1	17.1	SSB15UD1ATT	SSB15UD1ATT	SSB15UD1ATT	SSB15UD1ATT
150	60	154	196	94	173.4	241	18.0	18.0	17.6	17.6	SSB15UD1CTT	SSB15UD1CTT	SSB15UD3CTT	SSB15UD3CTT
150	65	154	201	94	173.4	241	18.5	18.5	18.6	18.6	SSB15UD1DTT	SSB15UD1DTT	SSB15UD3DTT	SSB15UD3DTT
150	80	165	210	94	173.4	241	19.6	19.6	19.6	19.6	SSB15UD1ETT	SSB15UD1ETT	SSB15UD1ETT	SSB15UD1ETT
150	100	190	215	94	173.4	241	21.4	21.4	21.9	21.9	SSB15UD1FTT	SSB15UD1FTT	SSB15UD3FTT	SSB15UD3FTT
150	125	220	210	94	173.4	241	23.8	23.8	24.7	24.7	SSB15UD1GTT	SSB15UD1GTT	SSB15UD3GTT	SSB15UD3GTT
150	150	305	220	94	173.4	241	29.5	29.5	30.5	30.5	SSB15UD1JTT	SSB15UD1JTT	SSB15UD3JTT	SSB15UD3JTT
200	40	159	209.5	100	225.5	294	25.1	25.1	25.1	25.1	SSB20UD1ATT	SSB20UD1ATT	SSB20UD1ATT	SSB20UD1ATT
200	60	159	229.5	100	225.5	294	26.0	26.0	25.6	25.6	SSB20UD1CTT	SSB20UD1CTT	SSB20UD3CTT	SSB20UD3CTT
200	65	159	234.5	100	225.5	294	26.5	26.5	26.6	26.6	SSB20UD1DTT	SSB20UD1DTT	SSB20UD3DTT	SSB20UD3DTT
200	80	170	240	100	225.5	294	27.0	27.0	27.0	27.0	SSB20UD1ETT	SSB20UD1ETT	SSB20UD1ETT	SSB20UD1ETT
200	100	195	245	100	225.5	294	29.1	29.1	29.6	29.6	SSB20UD1FTT	SSB20UD1FTT	SSB20UD3FTT	SSB20UD3FTT
200	125	220	240	100	225.5	294	31.6	31.6	32.5	32.5	SSB20UD1GTT	SSB20UD1GTT	SSB20UD3GTT	SSB20UD3GTT
200	150	250	245	100	225.5	294	34.9	34.9	35.9	35.9	SSB20UD1JTT	SSB20UD1JTT	SSB20UD3JTT	SSB20UD3JTT
200	200	360	260	100	225.5	294	44.7	44.6	47.0	-	SSB20UD1KTT	SSB20UD2KTT	SSB20UD3KTT	-
250	60	164	272	105	277.3	351	38.9	38.9	38.5	38.5	SSB25UD1CTT	SSB25UD1CTT	SSB25UD3CTT	SSB25UD3CTT
250	65	164	272	105	277.3	351	39.3	39.3	39.4	39.4	SSB25UD1DTT	SSB25UD1DTT	SSB25UD3DTT	SSB25UD3DTT
250	80	234	250	105	277.3	351	43.6	43.6	43.6	43.6	SSB25UD1ETT	SSB25UD1ETT	SSB25UD1ETT	SSB25UD1ETT
250	100	234	270	105	277.3	351	43.4	43.4	43.9	43.9	SSB25UD1FTT	SSB25UD1FTT	SSB25UD3FTT	SSB25UD3FTT
250	150	251	280	105	277.3	351	49.5	49.5	50.5	50.5	SSB25UD1JTT	SSB25UD1JTT	SSB25UD3JTT	SSB25UD3JTT
250	200	344	290	105	277.3	351	60.3	59.9	61.4	-	SSB25UD1KTT	SSB25UD2KTT	SSB25UD3KTT	-
250	250	404	300	105	277.3	351	69.6	69.1	72.1	-	SSB25UD1LTT	SSB25UD2LTT	SSB25UD3LTT	-
300	60	237	297	110	329.3	408.3	56.3	56.3	55.9	55.9	SSB30UD1CTT	SSB30UD1CTT	SSB30UD3DTT	SSB30UD3DTT
300	65	237	297	110	329.3	408.3	56.7	56.7	-	-	SSB30UD1DTT	SSB30UD1DTT	SSB30UD3DTT	SSB30UD3DTT
300	80	237	298	110	329.3	408.3	57.4	57.4	57.4	57.4	SSB30UD1ETT	SSB30UD1ETT	SSB30UD1ETT	SSB30UD1ETT
300	100	237	300	110	329.3	408.3	58.1	58.1	58.6	58.6	SSB30UV1FTT	SSB30UV1FTT	SSB30UV3FTT	SSB30UV3FTT
300	150	347	310	110	329.3	408.3	71.2	71.2	72.2	72.2	SSB30UD1JTT	SSB30UD1JTT	SSB30UD3JTT	SSB30UD3JTT
300	200	347	320	110	329.3	408.3	75.7	75.4	77.1	-	SSB30UD1KTT	SSB30UD2KTT	SSB30UD3KTT	-
300	250	467	305	110	329.3	408.3	89.4	89.0	91.9	-	SSB30UD1LTT	SSB30UD2LTT	SSB30UD3LTT	-
300	300	467	340	110	329.3	408.3	97.9	97.2	100.8	-	SSB30UD1MTT	SSB30UD2MTT	SSB30UD3MTT	-

Weight: fitting alone - Reference: fitting

Fittings DN 60 to 600 / STANDARD double socket tee with flanged branch with STANDARD joint

Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges



DN 350-600

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:

- Available also on request with blue cataphoresis

DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
350	60	148	322	110	381.4	464.3	63.0	63.0	-	SSB35UD1CTT	SSB35UD1CTT	-
350	80	194	310	110	381.4	464.3	72.0	72.0	72.0	SSB35UD1FTT	SSB35UD1FTT	SSB35UD1FTT
350	150	314	340	110	381.4	464.3	87.0	87.0	-	SSB35UD1JTT	SSB35UD1JTT	-
350	200	314	350	110	381.4	464.3	91.0	90.9	-	SSB35UD1KTT	SSB35UD2KTT	-
350	250	369	360	110	381.4	464.3	103.6	103.6	-	SSB35UD1LTT	SSB35UD2LTT	-
350	300	485	370	110	381.4	464.3	-	119.3	-	-	SSB35UD2MTT	-
350	350	485	380	110	381.4	464.3	131.1	131.8	-	SSB35UD1YTT	SSB35UD2YTT	-
400	80	195	340	112	432.4	515.3	80.0	80.0	80.0	SSB40UD1ETT	SSB40UD1ETT	SSB40UD1ETT
400	150	315	370	112	432.4	515.3	100.0	100.0	101.0	SSB40UD1JTT	SSB40UD1JTT	SSB40UD3JTT
400	200	315	380	112	432.4	515.3	105.0	104.9	106.4	SSB40UD1KTT	SSB40UD2KTT	SSB40UD3KTT
400	250	429	390	112	432.4	515.3	125.0	124.6	127.5	SSB40UD1LTT	SSB40UD2LTT	SSB40UD3LTT
400	300	429	400	112	432.4	515.3	133.0	133.7	137.3	SSB40UD1MTT	SSB40UD2MTT	SSB40UD3MTT
400	400	545	420	112	432.4	515.3	162.0	166.0	175.0	SSB40UD1NTT	SSB40UD2NTT	SSB40UD3NTT
450	150	315	400	115.5	483.5	573	102.0	102.0	103.0	SSB45UD1JTT	SSB45UD1JTT	SSB45UD3JTT
450	200	315	410	115.5	483.5	573	115.0	114.9	116.4	SSB45UD1KTT	SSB45UD2KTT	SSB45UD3KTT
450	250	600	420	115.5	483.5	573	129.7	129.3	-	SSB45UD1LTT	SSB45UD2LTT	-
450	300	600	430	115.5	483.5	573	156.3	155.6	-	SSB45UD1MTT	SSB45UD2MTT	-
450	400	600	450	115.5	483.5	573	175.0	188.3	188.3	SSB45UD1NTT	SSB45UD2NTT	SSB45UD3NTT
450	450	600	460	115.5	483.5	573	172.0	178.4	185.6	SSB45UD1PTT	SSB45UD2PTT	SSB45UD3PTT
500	150	325	430	117.5	535.5	628	143.0	143.0	144.0	SSB50UD1JTT	SSB50UD1JTT	SSB50UD3JTT
500	200	325	440	117.5	535.5	628	147.0	146.9	148.4	SSB50UD1KTT	SSB50UD2KTT	SSB50UD3KTT
500	250	443	450	117.5	535.5	628	173.0	172.6	-	SSB50UD1LTT	SSB50UD2LTT	-
500	300	443	460	117.5	535.5	628	181.0	180.3	183.9	SSB50UD1MTT	SSB50UD2MTT	SSB50UD3MTT
500	400	555	480	117.5	535.5	628	215.0	219.0	228.2	SSB50UD1NTT	SSB50UD2NTT	SSB50UD3NTT
500	500	675	500	117.5	535.5	628	258.0	271.0	-	SSB50UD1QTT	SSB50UD2QTT	-
600	300	452	520	132.5	638.6	737	228.0	228.0	231.0	SSB60UD1MTT	SSB60UD2MTT	SSB60UD3MTT
600	400	570	540	132.5	638.6	737	271.0	275.0	284.0	SSB60UD1NTT	SSB60UD2NTT	SSB60UD3NTT
600	600	800	580	132.5	638.6	737	373.0	398.0	-	SSB60UD1RTT	SSB60UD2RTT	-

Weight: fitting alone - Reference: fitting

Fittings DN 60 to 600 / STANDARD all socket tee with STANDARD joint

Field of use:

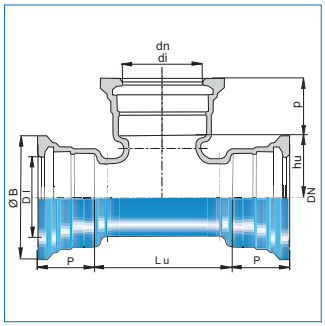
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges

Main characteristics:

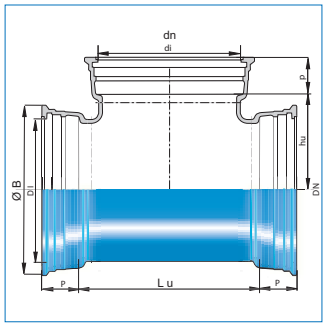
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:

- Available also on request with blue cataphoresis



DN 60-300



DN 350-600

DN	dn	Lu	P	DI	B	hu	p	di	Weight	Reference
		mm							kg	
60	60	154	82	80.2	143.5	77	82	80.2	8.7	SSA60TE0CTT
80	60	145	85	101.4	167.5	85	82	80.2	10.0	SSA80TE0CTT
80	80	183	85	101.4	167.5	91.5	85	101.4	11.2	SSA80TE0ETT
100	60	150	88	121.4	187.5	97	82	80.2	11.9	SSB10TE0CTT
100	80	185	88	121.4	187.5	103.5	85	101.4	13.3	SSB10TE0ETT
100	100	210	88	121.4	187.5	105	88	121.4	14.9	SSB10TE0FTT
125	60	150	91	147.4	214.5	100	82	80.2	14.2	SSB12TE0CTT
125	80	165	91	147.4	214.5	121.5	85	101.4	15.5	SSB12TE0ETT
125	100	190	91	147.4	214.5	125	88	121.4	16.9	SSB12TE0FTT
125	125	267	91	147.4	214.5	133.5	91	147.4	21.0	SSB12TE0GTT
150	60	154	94	173.4	241.0	112	82	80.2	16.9	SSB15TE0CTT
150	80	165	94	173.4	241.0	136.5	85	101.4	18.2	SSB15TE0ETT
150	100	190	94	173.4	241.0	140	88	121.4	19.8	SSB15TE0FTT
150	125	220	94	173.4	241.0	143.5	91	147.4	21.8	SSB15TE0GTT
150	150	305	94	173.4	241.0	152.5	94	173.4	27.0	SSB15TE0JTT
200	60	159	100	225.5	294.0	145.5	82	80.2	24.9	SSB20TE0CTT
200	80	170	100	225.5	294.0	166.5	85	101.4	25.7	SSB20TE0ETT
200	100	195	100	225.5	294.0	170	88	121.4	27.5	SSB20TE0FTT
200	125	220	100	225.5	294.0	173.5	91	147.4	29.7	SSB20TE0GTT
200	150	250	100	225.5	294.0	177.5	94	173.4	32.3	SSB20TE0JTT
200	200	360	100	225.5	294.0	180	100	225.5	40.7	SSB20TE0KTT
250	80	234	105	277.3	351.0	182.5	85	101.4	42.0	SSB25TE0ETT
250	100	234	105	277.3	351.0	183	88	121.4	41.3	SSB25TE0FTT
250	150	251	105	277.3	351.0	164.5	94	173.4	44.6	SSB25TE0JTT
250	200	344	105	277.3	351.0	168	100	225.5	53.0	SSB25TE0KTT
250	250	404	105	277.3	351.0	202	105	277.3	63.6	SSB25TE0LTT
300	100	237	110	329.3	408.3	213	88	121.4	56.0	SSB30TE0FTT
300	150	347	110	329.3	408.3	194.5	94	173.4	66.3	SSB30TE0JTT
300	200	347	110	329.3	408.3	198	100	225.5	68.4	SSB30TE0KTT
300	250	467	110	329.3	408.3	207	105	277.3	83.4	SSB30TE0LTT
300	300	467	110	329.3	408.3	233.5	110	329.3	89.9	SSB30TE0MTT
350	350	495	110	381.4	464.3	250	110	381.0	110.0	SSB35TE0YTT
400	400	560	112	432.4	515.3	280	112	432.0	128.0	SSB40TE0NTT
450	450	635	115.5	483.5	573.0	317.5	115.5	483.0	171.0	SSB45TE0PTT
500	500	680	117.5	535.5	628.0	340	117.5	535.0	204.0	SSB50TE0QTT
600	600	800	132.5	638.6	737.0	400	132.5	638.0	292.0	SSB60TE0RTT

Weight: fitting alone - Reference: fitting

Fittings DN 250 to 600 / STANDARD double socket washout tee with flanged branch (rotatable flange) with STANDARD joint

Field of use:

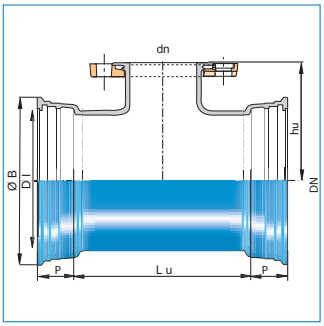
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges

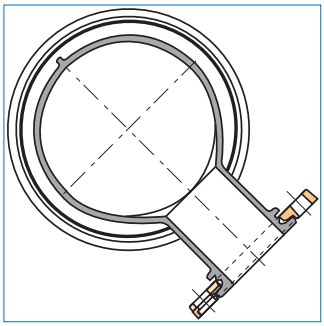
Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:

- Available also on request with blue cataphoresis





DN 250-600

DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
250	100	234	270	105	277.3	351.0	43.4	43.4	43.9	SSB25UV1FTT	SSB25UV1FTT	SSB25UV3FTT
300	100	237	300	110	329.3	408.3	58.1	58.1	58.6	SSB30UV1FTT	SSB30UV1FTT	SSB30UV3FTT
350	100	194	330	110	381.4	464.3	73.0	73.0	-	SSB35UV1FTT	SSB35UV1FTT	-
400	100	195	360	112	432.4	515.3	84.0	84.0	84.5	SSB40UV1FTT	SSB40UV1FTT	SSB40UV3FTT
450	100	315	395	115.5	483.5	573.0	89.0	89.0	89.5	SSB45UV1FTT	SSB45UV1FTT	SSB45UV3FTT
500	100	210	420	117.5	535.5	628.0	119.0	119.0	119.5	SSB50UV1FTT	SSB50UV1FTT	SSB50UV3FTT
600	100	340	475	132.5	638.6	737.0	182.0	182.0	183.0	SSB60UV1FTT	SSB60UV1FTT	SSB60UV3FTT
600	200	335	500	132.5	638.6	737.0	192.0	192.0	193.0	SSB60UV1KTT	SSB60UV2KTT	SSB60UV3KTT

Weight: fitting alone - Reference: fitting

Fittings DN 150 to 600 / STANDARD double socket level invert tee with flanged branch (rotatable flange) with STANDARD joint

Field of use:

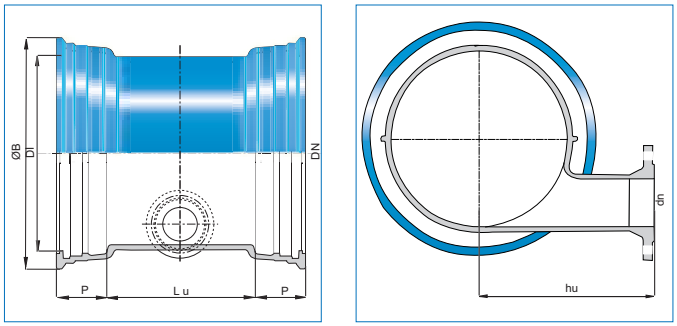
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:

- Available also on request with blue cataphoresis



DN 150-600

DN	dn	Lu	hu	P	DI	B	Weight / kg				Reference			
		mm					PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
150	80	188	220	94	173.4	241	18.7	18.7	18.7	18.7	SSB15UT1ETT	SSB15UT1ETT	SSB15UT1ETT	SSB15UT1ETT
200	80	191	250	100	225.5	294	25.2	25.2	25.2	25.2	SSB20UT1ETT	SSB20UT1ETT	SSB20UT1ETT	SSB20UT1ETT
250	80	217	275	105	277.3	351	37.5	37.5	37.5	37.5	SSB25UT1ETT	SSB25UT1ETT	SSB25UT1ETT	SSB25UT1ETT
300	80	220	305	110	329.3	408.3	50.0	50.0	50.0	50.0	SSB30UT1ETT	SSB30UT1ETT	SSB30UT1ETT	SSB30UT1ETT
300	100	220	305	110	329.3	408.3	-	-	-	-	-	-	-	-
300	150	336	305	110	329.3	408.3	-	-	-	-	-	-	-	-
350	150	339	340	110	381.4	464.3	60.5	60.5	-	-	SSB35UT1JTT	SSB35UT1JTT	-	-
400	100	226	365	112	432.4	515.3	76.0	76.0	76.5	76.5	SSB40UT1FTT	SSB40UT1FTT	SSB40UT3FTT	SSB40UT3FTT
450	100	229	380	115.5	483.5	573	-	-	-	-	-	-	-	-
450	150	345	380	115.5	483.5	573	115.0	115.0	-	-	SSB45UT1JTT	SSB45UT1JTT	-	-
500	150	348	400	117.5	535.5	628	132.8	132.8	-	-	SSB50UT1JTT	SSB50UT1JTT	-	-
600	150	354	450	132.5	638.6	737	175.8	175.8	-	-	SSB60UT1JTT	SSB60UT1JTT	-	-
600	200	452	450	132.5	638.6	737	214.0	214.0	330.0	-	SSB60UT1KTT	SSB60UT2KTT	SSB60UT3KTT	-

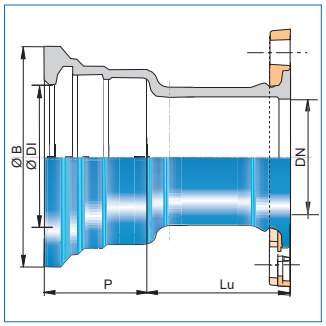
Weight: fitting alone - Reference: fitting
For more information, please contact us

Fittings DN 60 to 600 / STANDARD flanged socket with STANDARD joint

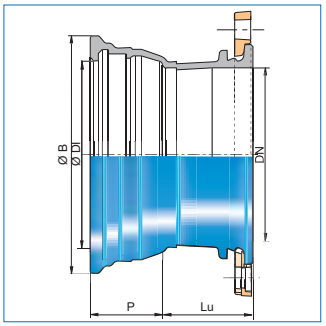
Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges





DN 60-200



DN 250-300

Main characteristics:

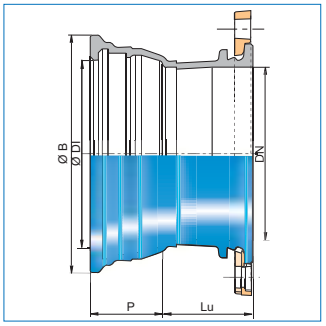
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:

- Available also on request with blue cataphoresis

DN	Lu	P	DI	B	WEIGHT / kg				Reference			
	mm				PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	142	82	80.2	143.5	5.9	5.9	-	-	SSA60BE10TT	SSA60BE10TT	-	-
80	110	85	101.4	167.5	7.2	7.2	7.2	7.2	SSA80BE10TT	SSA80BE10TT	SSA80BE10TT	SSA80BE10TT
100	110	88	121.4	187.5	8.7	8.7	10	10	SSB10BE10TT	SSB10BE10TT	SSB10BE30TT	SSB10BE30TT
125	110	91	147.4	214.5	11.0	11.0	11.9	11.9	SSB12BE10TT	SSB12BE10TT	SSB12BE30TT	SSB12BE30TT
150	115	94	173.4	241	13.8	13.8	14.8	14.8	SSB15BE10TT	SSB15BE10TT	SSB15BE30TT	SSB15BE30TT
200	120	100	225.5	294	20.4	20.3	23.5	22.5	SSB20BE10TT	SSB20BE20TT	SSB20BE30TT	SSB20BE40TT
250	135	105	277.3	351	31.3	30.9	33.9	43.2	SSB25BE10TT	SSB25BE20TT	SSB25BE30TT	SSB25BE40TT
300	130	110	329.3	408.3	42	41.3	44.9	56.7	SSB30BE10TT	SSB30BE20TT	SSB30BE30TT	SSB30BE40TT

Weight: fitting alone - Reference: fitting



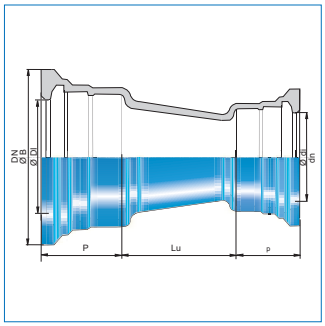
DN 350-600

DN	Lu	P	DI	B	WEIGHT / kg			Reference		
	mm				PN10	PN16	PN25	PN10	PN16	PN25
350	135	110	381.4	464.3	59	59	66	SSB35BE10TT	SSB35BE20TT	SSB35BE30TT
400	140	112	432.4	515.3	65	69	78	SSB40BE10TT	SSB40BE20TT	SSB40BE30TT
450	145	115.5	483.5	573	82	88	96	SSB45BE10TT	SSB45BE20TT	SSB45BE30TT
500	170	117.5	535.5	628	85	98	104	SSB50BE10TT	SSB50BE20TT	SSB50BE30TT
600	170	132.5	638.6	737	124	149	152	SSB60BE10TT	SSB60BE20TT	SSB60BE30TT

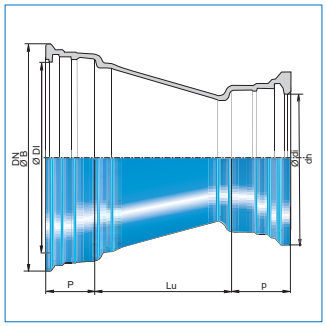
Weight: fitting alone - Reference: fitting

Fittings DN 80 to 600 / STANDARD taper with STANDARD joint

Field of use:
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents), or soft or aggressive waters
- Fittings for TT and PUR ranges



DN 80-300



DN 350-600

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Note:
- Available also on request with blue cataphoresis

DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
80	60	103.5	85	101.4	167.5	82	80.2	6.1	SSA80VE0CTT
100	60	100	88	121.4	187.5	82	80.2	6.8	SSB10VE0CTT
100	80	104.5	88	121.4	187.5	85	101.4	7.5	SSB10VE0ETT
125	60	150	91	147.4	214.5	82	80.2	8.9	SSB12VE0CTT
125	80	120	91	147.4	214.5	85	101.4	8.9	SSB12VE0ETT
125	100	105.5	91	147.4	214.5	88	121.4	9.4	SSB12VE0FTT
150	60	200	94	173.4	241.0	82	80.2	11.2	SSB15VE0CTT
150	80	170	94	173.4	241.0	85	101.4	10.3	SSB15VE0ETT
150	100	130	94	173.4	241.0	88	121.4	11.1	SSB15VE0FTT
150	125	107	94	173.4	241.0	91	147.4	11.7	SSB15VE0GTT
200	100	230	100	225.5	294.0	88	121.4	17.3	SSB20VE0FTT
200	125	180	100	225.5	294.0	91	147.4	16.8	SSB20VE0GTT
200	150	125	100	225.5	294.0	94	173.4	16.7	SSB20VE0JTT
250	125	275	105	277.3	351.0	91	147.4	26.2	SSB25VE0GTT
250	150	225	105	277.3	351.0	94	173.4	26.0	SSB25VE0JTT
250	200	125	105	277.3	351.0	100	225.5	25.3	SSB25VE0KTT
300	150	321.5	110	329.3	408.3	94	173.4	36.5	SSB30VE0JTT
300	200	222	110	329.3	408.3	100	225.5	35.7	SSB30VE0KTT
300	250	123	110	329.3	408.3	105	277.3	35.9	SSB30VE0LTT
350	200	335	110	381.4	464.3	100	225.5	54.5	SSB35VE0KTT
350	250	260	110	381.4	464.3	105	277.3	52.0	SSB35VE0LTT
350	300	187	110	381.4	464.3	110	329.3	55.0	SSB35VE0MTT
400	250	335	112	432.4	515.3	105	277.3	65.0	SSB40VE0LTT
400	300	260	112	432.4	515.3	110	329.3	60.0	SSB40VE0MTT
400	350	176	112	432.4	515.3	110	381.4	62.0	SSB40VE0YTT
450	300	335	115.5	483.5	573.0	110	329.3	77.8	SSB45VE0MTT
450	350	234	115.5	483.5	573.0	110	381.4	71.3	SSB45VE0YTT
450	400	166	115.5	483.5	573.0	112	432.4	69.2	SSB45VE0NTT
500	350	378	117.5	535.5	628.0	110	381.4	88.6	SSB50VE0YTT
500	400	290	117.5	535.5	628.0	112	432.4	86.5	SSB50VE0NTT
500	450	160	117.5	535.5	628.0	115.5	483.5	80.0	SSB50VE0PTT
600	400	460	132.5	638.6	737.0	112	432.4	155.0	SSB60VE0NTT
600	450	360	132.5	638.6	737.0	115.5	483.5	125.0	SSB60VE0PTT
600	500	258	132.5	638.6	737.0	117.5	535.5	120.0	SSB60VE0QTT

Weight: fitting alone - Reference: fitting

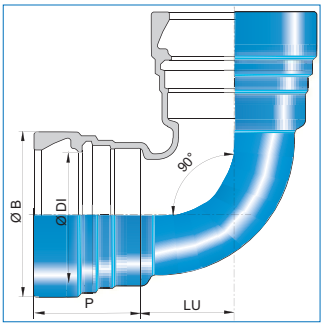
Fittings DN 80 to 600 / NATURAL bend with UNIVERSAL joint

Field of use:

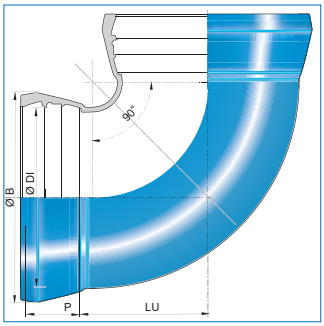
- For high or very high pressures

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



DN 80-300



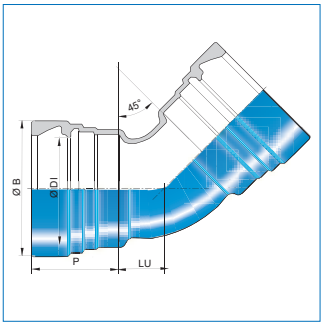
DN 400-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
90°	80	102.4	120	101	149	11.3	SFA80CA00TT
90°	100	123.0	142	121	177	17.0	SFB10CA00TT
90°	150	171.5	150	173	230	27.6	SFB15CA00TT
90°	200	226.0	158	225	290	45.0	SFB20CA00TT
90°	250	277.5	166	277	347	64.8	SFB25CA00TT
90°	300	329.0	178	329	406	94.1	SFB30CA00TT
90°	400	430.0	176	432	512	140.9	SFB40CA00TT
90°	500	550.0	200	535	626	234.7	SFB50CA00TT
90°	600	645.0	209	638	742	350.3	SFB60CA00TT

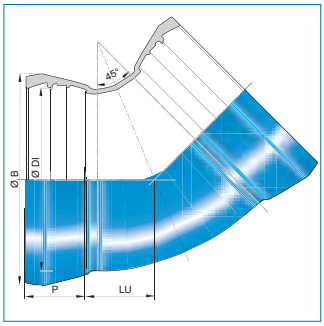
Weight: fitting alone
Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings



DN 80-300



DN 400-600

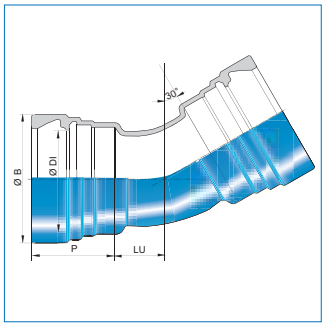
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
45°	80	55.5	120	101	149	10.4	SFA80CB00TT
45°	100	64.4	142	121	177	15.6	SFB10CB00TT
45°	150	86.6	150	173	230	24.5	SFB15CB00TT
45°	200	108.8	158	225	290	38.8	SFB20CB00TT
45°	250	131.1	166	277	347	54.4	SFB25CB00TT
45°	300	153.3	178	329	406	78.2	SFB30CB00TT
45°	400	195.0	176	432	512	109.0	SFB40CB00TT
45°	500	240.0	200	535	626	175.8	SFB50CB00TT
45°	600	285.0	209	638	742	262.0	SFB60CB00TT

Weight: fitting alone
Reference: fitting

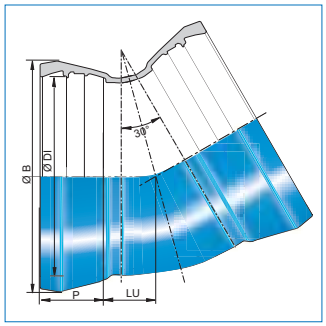
Fittings DN 80 to 600 / NATURAL bend with UNIVERSAL joint

Field of use:
- For high or very high pressures

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



DN 80-300



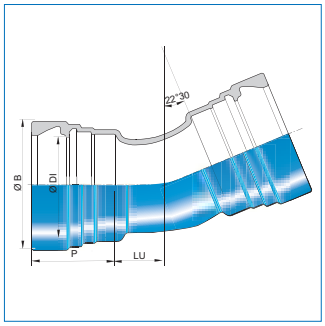
DN 400-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
30°	80	43.8	120	101	149	10.1	
30°	100	49.8	142	121	177	15.1	SFB10CC00TT
30°	150	64.7	150	173	230	23.4	SFB15CC00TT
30°	200	79.6	158	225	290	36.7	SFB20CC00TT
30°	250	94.5	166	277	347	50.9	SFB25CC00TT
30°	300	109.4	178	329	406	72.6	SFB30CC00TT
30°	400	140	176	432	512	99.1	SFB40CC00TT
30°	500	170	200	535	626	158.6	SFB50CC00TT
30°	600	200	209	638	742	234.3	SFB60CC00TT

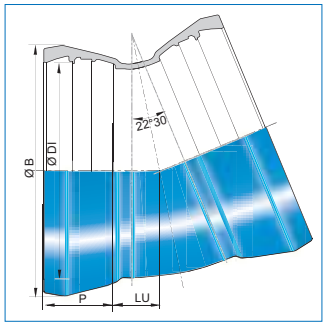
Weight: fitting alone
Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings



DN 80-300



DN 400-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
22°30	80	38.3	120	101	149	9.9	SFA80CD00TT
22°30	100	49.2	142	121	177	14.9	SFB10CD00TT
22°30	150	54.3	150	173	230	22.8	SFB15CD00TT
22°30	200	65.8	158	225	290	35.6	SFB20CD00TT
22°30	250	77.2	166	277	347	49.2	SFB25CD00TT
22°30	300	88.7	178	329	406	70.3	SFB30CD00TT
22°30	400	110	176	432	512	93.4	SFB40CD00TT
22°30	500	130	200	535	626	148.0	SFB50CD00TT
22°30	600	150	209	638	742	217.0	SFB60CD00TT

Weight: fitting alone
Reference: fitting

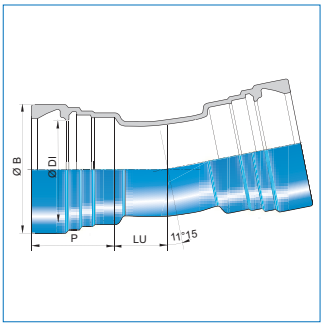
Fittings DN 80 to 600 / NATURAL bend with UNIVERSAL joint

Field of use:

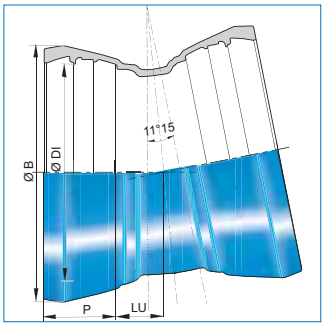
- For high or very high pressures

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



DN 80-300



DN 400-600

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
11°15	80	30.3	120	101	149	9.7	SFA80CE00TT
11°15	100	32.9	142	121	177	14.5	SFB10CE00TT
11°15	150	39.3	150	173	230	22.0	SFB15CE00TT
11°15	200	45.7	158	225	290	34.1	SFB20CE00TT
11°15	250	52.1	166	277	347	46.6	SFB25CE00TT
11°15	300	58.6	178	329	406	66.4	SFB30CE00TT
11°15	400	65	176	432	512	84.6	SFB40CE00TT
11°15	500	75	200	535	626	133.1	SFB50CE00TT
11°15	600	85	209	638	742	193.8	SFB60CE00TT

Weight: fitting alone
Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings

Fittings DN 100 to 600 / NATURAL double socket flanged branch tee with UNIVERSAL joint

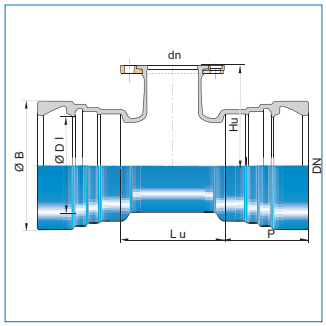
Field of use:

- For high or very high pressures

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531





DN 100-300

DN	dn	Lu	hu	P	DI	B	Weight / kg				Reference			
		mm					PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
100	80	170	175	142	121	177	21.2	21.2	21.2	21.2	SFB10UD1ETT	SFB10UD1ETT	SFB10UD1ETT	SFB10UD1ETT
100	100	190	180	142	121	177	22.5	22.5	23.0	23.0	SFB10UD1FTT	SFB10UD1FTT	SFB10UD3FTT	SFB10UD3FTT
150	80	170	205	150	173	230	30.0	30.0	30.0	30.0	SFB15UD1ETT	SFB15UD1ETT	SFB15UD1ETT	SFB15UD1ETT
150	100	195	210	150	173	230	31.4	31.4	31.9	31.9	SFB15UD1FTT	SFB15UD1FTT	SFB15UD3FTT	SFB15UD3FTT
150	150	255	220	150	173	230	36.4	36.4	37.4	37.4	SFB15UD1JTT	SFB15UD1JTT	SFB15UD3JTT	SFB15UD3JTT
200	80	175	235	158	225	290	42.9	42.9	42.9	42.9	SFB20UD1ETT	SFB20UD1ETT	SFB20UD1ETT	SFB20UD1ETT
200	100	200	240	158	225	290	45.0	45.0	45.5	45.5	SFB20UD1FTT	SFB20UD1FTT	SFB20UD3FTT	SFB20UD3FTT
200	150	255	250	158	225	290	50.6	50.6	51.6	51.6	SFB20UD1JTT	SFB20UD1JTT	SFB20UD3JTT	SFB20UD3JTT
200	200	315	260	158	225	290	58.9	57.0	58.6	58.9	SFB20UD1KTT	SFB20UD2KTT	SFB20UD3KTT	SFB20UD4KTT
250	80	180	265	166	277	347	56.6	56.6	56.6	56.6	SFB25UD1ETT	SFB25UD1ETT	SFB25UD1ETT	SFB25UD1ETT
250	100	200	270	166	277	347	58.7	58.7	59.2	59.2	SFB25UD1FTT	SFB25UD1FTT	SFB25UD3FTT	SFB25UD3FTT
250	150	260	280	166	277	347	64.9	64.9	65.9	65.9	SFB25UD1JTT	SFB25UD1JTT	SFB25UD3JTT	SFB25UD3JTT
250	200	315	290	166	277	347	72.4	72.3	73.9	74.2	SFB25UD1KTT	SFB25UD2KTT	SFB25UD3KTT	SFB25UD4KTT
250	250	375	300	166	277	347	80.6	80.2	83.0	89.9	SFB25UD1LTT	SFB25UD2LTT	SFB25UD3LTT	SFB25UD4LTT
300	80	180	295	178	329	406	77.0	77.0	77.0	77.0	SFB30UD1ETT	SFB30UD1ETT	SFB30UD1ETT	SFB30UD1ETT
300	100	205	300	178	329	406	79.9	79.9	80.4	80.4	SFB30UD1FTT	SFB30UD1FTT	SFB30UD3FTT	SFB30UD3FTT
300	150	260	310	178	329	406	87.3	87.3	88.3	88.3	SFB30UD1JTT	SFB30UD1JTT	SFB30UD3JTT	SFB30UD3JTT
300	200	320	320	178	329	406	95.5	95.4	97.0	97.3	SFB30UD1KTT	SFB30UD2KTT	SFB30UD3KTT	SFB30UD4KTT
300	250	435	330	178	329	406	108.9	108.5	111.3	118.2	SFB30UD1LTT	SFB30UD2LTT	SFB30UD3LTT	SFB30UD4LTT
300	300	435	340	178	329	406	137	136.3	139.9	149.2	SFB30UD1MTT	SFB30UD2MTT	SFB30UD3MTT	SFB30UD4MTT

Weight: fitting alone - Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings

Fittings DN 100 to 600 / NATURAL double socket flanged branch tee with UNIVERSAL joint

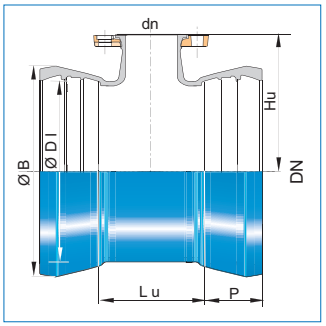
Field of use:

- For high or very high pressures

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531





DN 400-600

DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
400	80	185	355	176	432	512	85.4	85.4	85.4	SFB40UD1ETT	SFB40UD1ETT	SFB40UD1ETT
400	100	210	360	176	432	512	97.8	97.8	98.3	SFB40UD1FTT	SFB40UD1FTT	SFB40UD3FTT
400	150	270	370	176	432	512	106.7	106.7	107.7	SFB40UD1JTT	SFB40UD1JTT	SFB40UD3JTT
400	200	325	380	176	432	512	115.9	115.5	117.4	SFB40UD1KTT	SFB40UD2KTT	SFB40UD3KTT
400	300	440	400	176	432	512	138.3	138.1	141.7	SFB40UD1MTT	SFB40UD2MTT	SFB40UD3MTT
400	400	560	420	176	432	512	165.8	170.1	179.1	SFB40UD1NTT	SFB40UD2NTT	SFB40UD3NTT
500	80	215	415	200	535	626	146.6	146.6	146.6	SFB50UD1ETT	SFB50UD1ETT	SFB50UD1ETT
500	100	215	420	200	535	626	147.3	147.3	147.8	SFB50UD1FTT	SFB50UD1FTT	SFB50UD3FTT
500	150	330	430	200	535	626	166.1	166.1	167.1	SFB50UD1JTT	SFB50UD1JTT	SFB50UD3JTT
500	200	330	440	200	535	626	169.7	169.6	171.2	SFB50UD1KTT	SFB50UD2KTT	SFB50UD3KTT
500	250	450	450	200	535	626	190.3	190.3	181.9	SFB50UD1LTT	SFB50UD2LTT	SFB50UD3LTT
500	300	450	470	200	535	626	197.4	196.7	200.3	SFB50UD1MTT	SFB50UD2MTT	SFB50UD3MTT
500	400	565	480	200	535	626	227.1	231.5	240.5	SFB50UD1NTT	SFB50UD2NTT	SFB50UD3NTT
500	500	680	500	200	535	626	254.6	267.6	273.6	SFB50UD1QTT	SFB50UD2QTT	SFB50UD3QTT
600	80	340	475	209	638	742	229.6	229.6	229.6	SFB60UD1ETT	SFB60UD1ETT	SFB60UD1ETT
600	100	340	480	209	638	742	228.8	228.8	230.0	SFB60UD1FTT	SFB60UD1FTT	SFB60UD3FTT
600	150	340	490	209	638	742	231.9	231.9	233.9	SFB60UD1JTT	SFB60UD1JTT	SFB60UD3JTT
600	200	340	500	209	638	742	236.5	236.4	237.9	SFB60UD1KTT	SFB60UD2KTT	SFB60UD3KTT
600	250	570	510	209	638	742	246.2	246.2	244.8	SFB60UD1LTT	SFB60UD2LTT	SFB60UD3LTT
600	300	570	520	209	638	742	288.2	287.8	291.6	SFB60UD1MTT	SFB60UD2MTT	SFB60UD3MTT
600	400	570	540	209	638	742	302.4	306.8	315.8	SFB60UD1NTT	SFB60UD2NTT	SFB60UD3NTT
600	600	800	580	209	638	742	379.6	404.6	407.0	SFB60UD1RTT	SFB60UD2RTT	SFB60UD3RTT

Weight: fitting alone - Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings

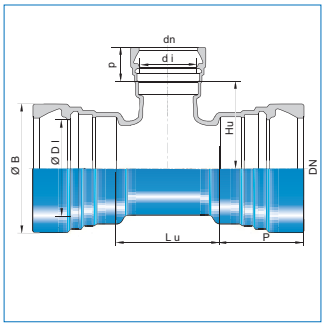
Fittings DN 100 to 300 / NATURAL all socket tee with UNIVERSAL joint

Field of use:

- For high or very high pressures

Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



DN 100-300

DN	dn	Lu	P	DI	B	hu	p	di	Weight	Reference
		mm							kg	
100	80	170	142	121	177	95	120	101	21.4	SFB10TE0ETT
100	100	190	142	121	177	95	142	121	26.7	SFB10TE0FTT
150	80	170	150	173	230	120	120	101	29.7	SFB15TE0ETT
150	100	195	150	173	230	120	142	121	32.8	SFB15TE0FTT
150	150	255	150	173	230	125	150	173	38.2	SFB15TE0JTT
200	80	175	158	225	290	145	120	101	42.7	SFB20TE0ETT
200	100	200	158	225	290	145	142	121	46.1	SFB20TE0FTT
200	150	255	158	225	290	150	150	173	52.0	SFB20TE0JTT
200	200	315	158	225	290	155	158	225	60.4	SFB20TE0KTT
250	80	180	166	277	347	170	120	101	56.2	SFB25TE0ETT
250	100	200	166	277	347	170	142	121	59.6	SFB25TE0FTT
250	150	260	166	277	347	175	150	173	66.4	SFB25TE0JTT
250	200	315	166	277	347	180	158	225	75.2	SFB25TE0KTT
250	250	375	166	277	347	190	166	277	85.0	SFB25TE0LTT
300	80	180	178	329	406	195	120	101	74.8	SFB30TE0ETT
300	100	205	178	329	406	195	142	121	78.6	SFB30TE0FTT
300	150	260	178	329	406	200	150	173	85.4	SFB30TE0JTT
300	200	320	178	329	406	205	158	225	94.8	SFB30TE0KTT
300	250	435	178	329	406	215	166	277	108.1	SFB30TE0LTT
300	300	435	178	329	406	220	178	329	150.6	SFB30TE0MTT

Weight: fitting alone - Reference: fitting

Note:

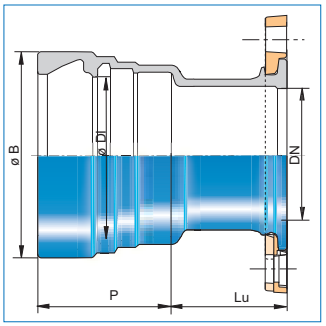
1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings

Fittings DN 80 to 600 / NATURAL flanged socket with UNIVERSAL joint

Field of use:
- For high or very high pressures

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531





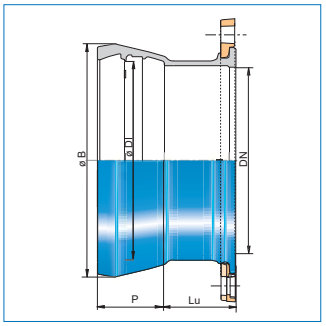
DN 80-300

DN	Lu	P	DI	B	WEIGHT / kg				Reference			
	mm				PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
80	130	120	101	149	8.6	8.6	8.6	8.6	SFA80BE10TT	SFA80BE10TT	SFA80BE10TT	SFA80BE10TT
100	130	142	121	177	11.8	11.8	12.3	12.3	SFB10BE10TT	SFB10BE10TT	SFB10BE30TT	SFB10BE30TT
150	135	150	173	230	14.1	14.1	16.8	16.8	SFB15BE10TT	SFB15BE10TT	SFB15BE30TT	SFB15BE30TT
200	140	158	225	290	27.1	27.0	28.6	29.9	SFB20BE10TT	SFB20BE20TT	SFB20BE30TT	SFB20BE40TT
250	145	166	277	347	37.5	37.1	39.8	46.7	SFB25BE10TT	SFB25BE20TT	SFB25BE30TT	SFB25BE40TT
300	150	178	329	406	52.3	51.6	55.2	64.5	SFB30BE10TT	SFB30BE20TT	SFB30BE30TT	SFB30BE40TT

Weight: fitting alone - Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings



DN 400-600

DN	Lu	P	DI	B	WEIGHT / kg			Reference		
	mm				PN10	PN16	PN25	PN10	PN16	PN25
400	160	176	432	512	57.42	60.74	70.74	SFB40BE10TT	SFB40BE20TT	SFB40BE30TT
500	170	200	535	626	74.54	85.74	93.74	SFB50BE10TT	SFB50BE20TT	SFB50BE30TT
600	180	209	638	742	99.86	114.86	127.86	SFB60BE10TT	SFB60BE20TT	SFB60BE30TT

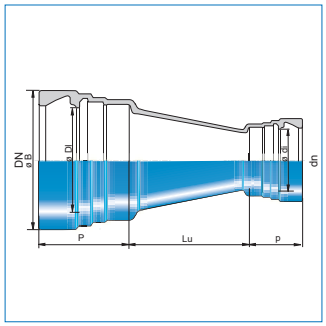
Weight: fitting alone - Reference: fitting

Fittings DN 100 to 600 / NATURAL taper with UNIVERSAL joint

Field of use:
- For high or very high pressures

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531





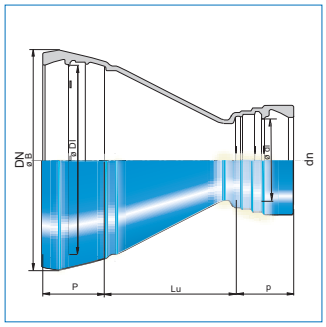
DN 100-300

DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
100	80	90	142	121	177	120	101	12.5	SFB10VE0ETT
150	80	190	150	173	230	120	101	18.3	SFB15VE0ETT
150	100	150	150	173	230	142	121	20.0	SFB15VE0FTT
200	100	250	158	225	290	142	121	29.0	SFB20VE0FTT
200	150	150	158	225	290	150	173	30.2	SFB20VE0JTT
250	100	350	166	277	347	142	121	39.3	SFB25VE0FTT
250	150	250	166	277	347	150	173	40.5	SFB25VE0JTT
250	200	150	166	277	347	158	225	42.7	SFB25VE0KTT
300	150	350	178	329	406	150	173	55.5	SFB30VE0JTT
300	200	250	178	329	406	158	225	57.8	SFB30VE0KTT
300	250	150	178	329	406	166	277	57.8	SFB30VE0LTT

Weight: fitting alone - Reference: fitting

Note:

1 - UNI Ve not available in DN 80
2 - For DN 350 and 450 use STD Ve with STANDARD fittings



DN 400-600

DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
400	300	260	176	432	512	178	329	86.3	SFB40VE0MTT
500	400	260	200	535	626	176	432	234.7	SFB50VE0NTT
500	300	360	200	535	626	178	329	124.8	SFB50VE0MTT
600	400	460	209	638	742	176	432	188.2	SFB60VE0NTT

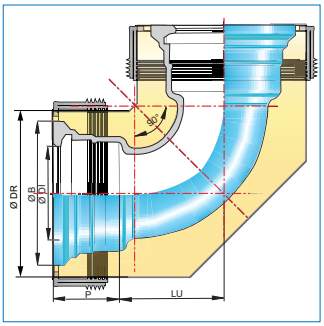
Weight: fitting alone - Reference: fitting

Fittings DN 100 to 300 / ISOPAM bend with STANDARD joint

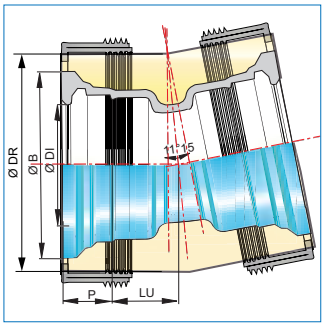
Field of use:
Pre-insulated pipes against frost

Main characteristics:
- Internal and external coating: black cataphoresis
- Fitting protected by an external insulated coating (PEhd sheath, Polyurethane foam, foam spacer, elastomeric sleeve) for protecting water supply network prone to freezing risks
- EN 545, ISO 2531
- Conform to ISO 9394

Note:
- Other DN: Please, contact us.



DN 100-300



DN 100-300

Angle Degree	DN	Lu	Weight	DI	B	DR	Weight	Reference
		mm					kg	
90°	100	105	88	121.4	187.5	200	15.3	YSB10CA
90°	125	133.5	91	147.4	214.5	225	23.6	YSB12CA
90°	150	152.5	94	173.4	241.0	250	29.5	YSB15CA
90°	200	200	100	225.5	294.0	315	47.5	YSB20CA
90°	250	252	105	277.3	351.0	400	64.8	YSB25CA
90°	300	304	110	329.3	408.3	450	94.6	YSB30CA

Weight: fitting alone - Reference: fitting

Angle Degree	DN	Lu	Weight	DI	B	DR	Weight	Reference
		mm					kg	
45°	100	65	88	121.4	187.5	200	15.0	YSB10CB
45°	125	83.5	91	147.4	214.5	225	20.5	YSB12CB
45°	150	92.5	94	173.4	241.0	250	25.9	YSB15CB
45°	200	100	100	225.5	294.0	315	38.1	YSB20CB
45°	250	136	105	277.3	351.0	400	53.0	YSB25CB
45°	300	167.5	110	329.3	408.3	450	75.9	YSB30CB

Weight: fitting alone - Reference: fitting

Angle Degree	DN	Lu	Weight	DI	B	DR	Weight	Reference
		mm					kg	
22°30	100	35	88	121.4	187.5	200	11.6	YSB10CD
22°30	125	38	91	147.4	214.5	225	14.7	YSB12CD
22°30	150	42	94	173.4	241.0	250	17.6	YSB15CD
22°30	200	51	100	225.5	294.0	315	31.6	YSB20CD
22°30	250	70	105	277.3	351.0	400	42.1	YSB25CD
22°30	300	70	110	329.3	408.3	450	55.1	YSB30CD

Weight: fitting alone - Reference: fitting

Angle Degree	DN	Lu	Weight	DI	B	DR	Weight	Reference
		mm					kg	
11°15	100	40	88	121.4	187.5	200	11.7	YSB10CE
11°15	125	45	91	147.4	214.5	225	15.1	YSB12CE
11°15	150	46	94	173.4	241.0	250	17.9	YSB15CE
11°15	200	52	100	225.5	294.0	315	32.7	YSB20CE
11°15	250	55	105	277.3	351.0	400	41.0	YSB25CE
11°15	300	50	110	329.3	408.3	450	59.9	YSB25CE

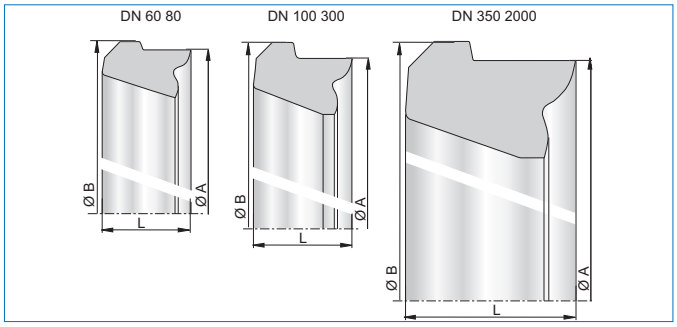
Weight: fitting alone - Reference: fitting

DRINKING WATER SUPPLY

Joints DN 60 to 600 / STANDARD gasket for STANDARD and UNIVERSAL STANDARD pipes and fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- Easy and quick assembling
- Gap accepted
- Important safety factor above PFA
- High angular deflection
- EN 681.1



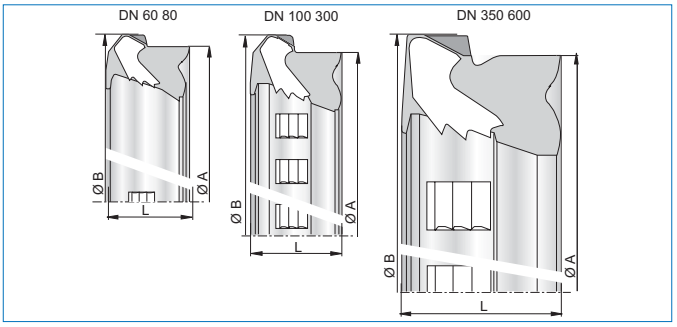
DN	L	A	B	Weight	Reference
	mm			kg	
60	28.7	105.6	110.6	0.106	JSA60BA
80	29.8	127.5	135.7	0.148	JSA80BA
100	29.8	148.6	158.6	0.196	JSB10BA
125	30.6	175.7	185.7	0.244	JSB12BA
150	30.6	202.1	212.1	0.285	JSB15BA
200	31.7	250.5	260.5	0.384	JSB20BA
250	32.6	303.5	313.5	0.497	JSB25BA
300	35.9	359.5	369.5	0.712	JSB30BA
350	37.8	414.0	422.0	0.898	JSB35BA
400	38.8	466.5	474.5	1.077	JSB40BA
450	40.7	519.8	527.8	1.323	JSB45BA
500	41.8	573.4	581.4	1.544	JSB50BA
600	45.0	680.2	690.2	2.162	JSB60BA



Joints DN 60 to 600 / STANDARD Vi gasket for STANDARD pipes and fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- Easy and quick assembling
- Gap accepted
- Important safety factor above PFA
- High angular deflection
- EN 681.1



DN	L	A	B	Weight	Reference
	mm			kg	
60	27.3	105.6	113.8	0.155	JSA60CA
80	27.2	122.9	131.7	0.210	JSA80CA
100	27.1	143.8	154.8	0.280	JSB10CA
125	28.0	170.7	181.7	0.331	JSB12CA
150	28.8	197.7	208.5	0.407	JSB15CA
200	28.4	250.5	261.9	0.611	JSB20CA
250	31.0	303.5	314.9	0.858	JSB25CA
300	35.0	359.5	371.1	1.308	JSB30CA
350	34.5	414.0	424.0	1.570	JSB35CA
400	35.8	466.5	476.5	1.840	JSB40CA
450	37.5	519.8	529.8	2.350	JSB45CA
500	38.5	573.4	583.4	2.710	JSB50CA
600	41.0	680.2	691.0	3.780	JSB60CA

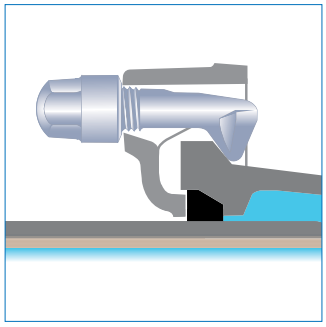


Joints DN 60 to 600 / NATURAL EXPRESS joint for NATURAL EXPRESS pipes and fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- Counterflange coating: blue cataphoresis
- Parkerised and black cataphoresis coated bolts and nuts
- High angular deflection
- EN 545
- EN 681.1





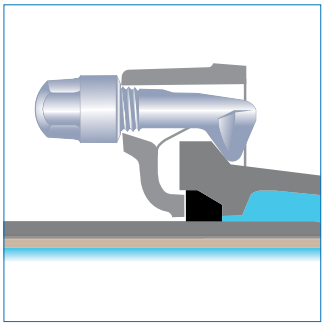
DN	Counterflange		Gasket		Bolt		Complete kit
	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference	
60	2.1	JEA60A	0.037	JEA60BA	0.74	JXM22DR70 (X2)	JEA60A-E00
125	3.2	JEB12A	0.117	JEB12BA	1.11	JXM22DR70 (X3)	JEB12A-E00
200	5.0	JEB20A	0.202	JEB20BA	1.85	JXM22DR70 (X5)	JEB20A-E00
250	6.2	JEB25A	0.252	JEB25BA	2.22	JXM22DR70 (X6)	JEB25A-E00
300	8.0	JEB30A	0.346	JEB30BA	2.59	JXM22DR70 (X7)	JEB30A-E00
350	9.0	JEB35AN	0.461	JEB35BA	2.96	JXM22DR70 (X8)	JEB35AN-E00
400	11.0	JEB40AN	0.520	JEB40BA	3.33	JXM22DR70 (X9)	JEB40AN-E00
450	16.5	JEB45AN	0.660	JEB45BA	5.88	JXM27DN102V (X8)	JEB45AN-E00
500	19.5	JEB50AN	0.725	JEB50BA	7.35	JXM27DN102V (X10)	JEB50AN-E00
600	26.0	JEB60AN	1.048	JEB60BA	8.82	JXM27DN102V (X12)	JEB60AN-E00

**** for DN 80 , 100 and 150, see EXPRESS New joint*



Joints DN 60 to 300 / NATURAL EXPRESS kit for NATURAL EXPRESS pipes and fittings

Field of use:
For drinking water mains



Main characteristics:
- Material: EPDM
- Counterflange coating: blue cataphoresis
- Parkerised and black cataphoresis coated bolts and nuts
- High angular deflection
- EN 545
- EN 681.1

DN	Weight	Reference
	kg	
60	2.85	JEA60K
125	4.43	JEB12K
200	7.05	JEB20K
250	8.67	JEB25K
300	10.94	JEB30K

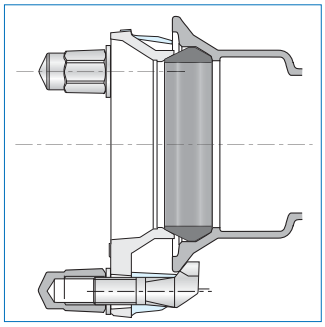
**** for DN 80, 100 and 150, see EXPRESS New kit*

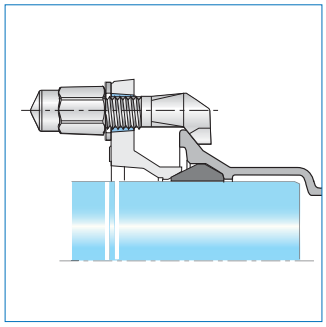


Joints DN 80, 100 and 150 / EXPRESS NEW kit for NATURAL EXPRESS pipes and fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- Counterflange coating: blue cataphoresis
- Parkerised and black cataphoresis coated bolts and nuts
- High angular deflection
- EN 545
- The counterflange and the gasket may be assembled outside the trench
- EN 681.1





Reference				
DN	PFA (*)	Angular deflection	Weight	Reference Kit
	bar	°	kg	
80	40	5	2.930	JTA80K
100	40	5	3.400	JTB10K
150	40	5	4.780	JTB15K

(*) for C40 pipes

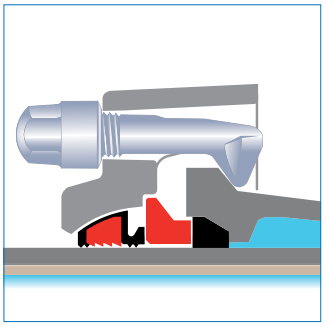


Joints DN 60, 125, 200, 250 and 300 / NATURAL EXPRESS Vi kit for NATURAL EXPRESS pipes and fittings

Field of use:
For drinking water anchored mains

Main characteristics:
- Material: EPDM
- Counterflange coating: blue cataphoresis
- Parkerised and black cataphoresis coated bolts and nuts
- High angular deflection
- EN 545
- EN 681.1





DN	Weight	Reference
	kg	
60	5.50	JEA60L
125	10.36	JEB12L
200	15.77	JEB20L
250	27.07	JEB25L
300	36.76	JEB30L

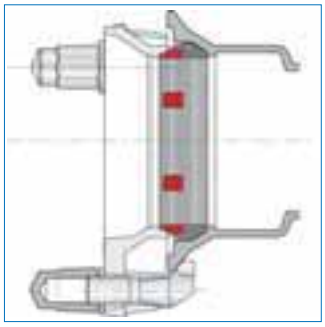
**** For DN80, 100 et 150, see EXPRESS New Vi kit*

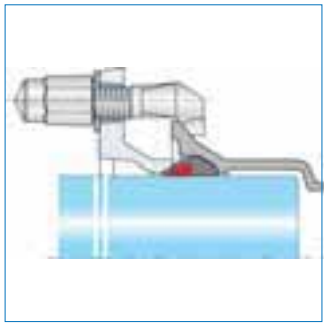
DRINKING WATER SUPPLY

Joints DN 80, 100 and 150 / EXPRESS New Vi kit for NATURAL EXPRESS pipes and fittings

Field of use:
For drinking water anchored mains

Main characteristics:
- Material: EPDM (EN 681-1)
- Counterflange coating: blue cataphoresis
- Parkerised and black cataphoresis coated bolts and nuts
- EN 545
- The counterflange and the gasket may be assembled outside the trench





Reference				
DN	PFA (*)	Angular deflection	Weight	Reference Kit
	bar	°	kg	
80	23	5	2.930	JTA80L
100	23	5	3.400	JTB10L
150	18	5	4.780	JTB15L

(*) with C40 pipes



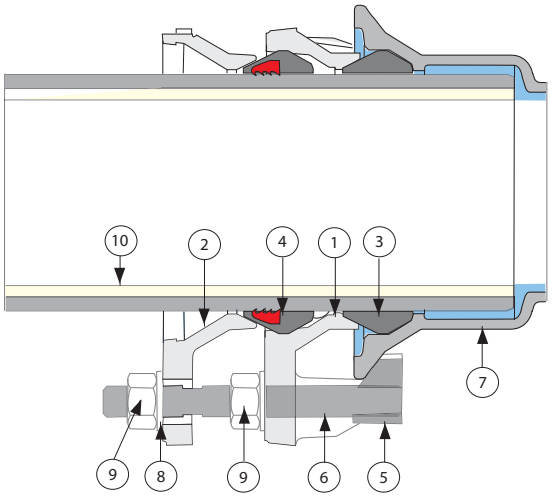
EXPRESS New Vi "Special Insertion" kit for NATURAL EXPRESS pipes and fittings

Field of use:
For drinking water anchored mains

Main characteristics:
- Material: EPDM (EN 681-1)
- Counterflange coating: blue cataphoresis
- Parkerised and black cataphoresis coated bolts and nuts
- The counterflange and the gasket may be assembled outside the trench
- EN 545

The EXPRESS New Vi "Special Insertion" kit provides a solution to intervene on anchored mains. Watertightness is ensured by the compression of the EXPRESS New joint pressing the leaktightness counterflange. Anchoring system is activated by the tightening of the locking counterflange.

DN	Weight kg	Reference
80	4.61	JTA80M
100	5.35	JTB10M
150	7.53	JTB15M



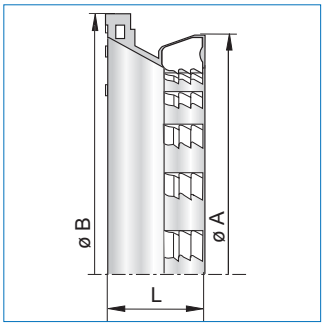


Marking	Designation	Material	Coating
1	EXPRESS New counterflange	Ductile iron	Blue cataphoresis
2	Counterflange special insertion	Ductile iron	Blue cataphoresis
3	EXPRESS New joint	EPDM	-
4	EXPRESS New Vi joint	EPDM	-
5	Sabot	Ductile iron	Blue cataphoresis
6	Spindle M16	Steel class 6-8	Galvanized
7	EXPRESS socket	Ductile iron	Blue cataphoresis
8	Washer	Soft steel	Galvanized
9	Hexagonal nuts	Steel class 6-8	Galvanized
10	Pipe	Ductile iron	-

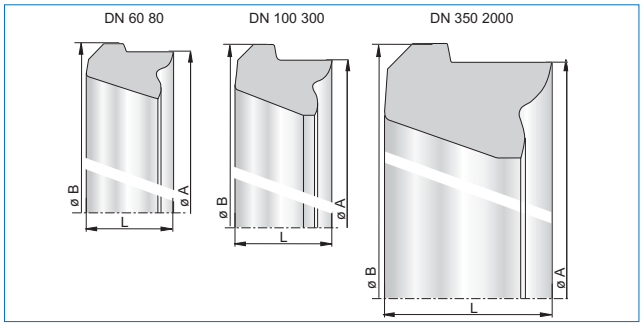
Joints DN 80 to 600 / UNIVERSAL STANDARD Vi joint for UNIVERSAL STANDARD pipes and fittings

Field of use:
For drinking water anchored mains

Main characteristics:
- Material: EPDM
- Locking ring for UNIVERSAL Vi metallic inserts
- EN 545. ISO 2531
- High angular deflection



UNIVERSAL Vi locking ring



STANDARD gasket

DN	UNIVERSAL Vi locking ring		STANDARD gasket	
	Weight (kg)	Reference	Weight (kg)	Reference
80	0.15	ANA80CA6	0.148	JSA80BA
100	0.20	ANB10CA6	0.196	JSB10BA
125	0.26	ANB12CA6	0.244	JSB12BA
150	0.31	ANB15CA5	0.285	JSB15BA
200	0.49	ANB20CA4	0.384	JSB20BA
250	0.61	ANB25CA4	0.497	JSB25BA
300	0.78	ANB30CA4	0.712	JSB30BA
350	1.47	JNB35CA	0.898	JSB35BA
400	1.70	JNB40CA	1.077	JSB40BA
450	1.87	JNB45CA	1.323	JSB45BA
500	2.54	JNB50CA	1.544	JSB50BA
600	3.00	JNB60CA	2.162	JSB60BA

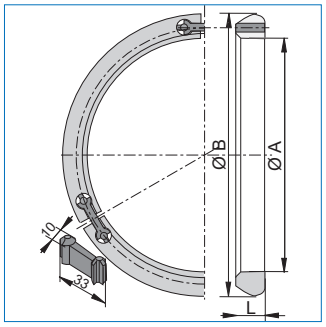


Joints DN 100 to 600 / UNIVERSAL STANDARD Ve joint for UNIVERSAL STANDARD Ve pipes and fittings

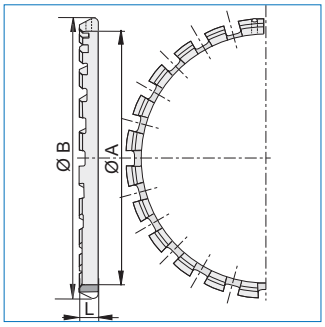
Field of use:
For drinking water mains used in extreme conditions

Main characteristics:
- Material: EPDM (EN 681-1)
- Locking ring with external spheric profile made in one or several pieces
- EN 545. ISO 2531

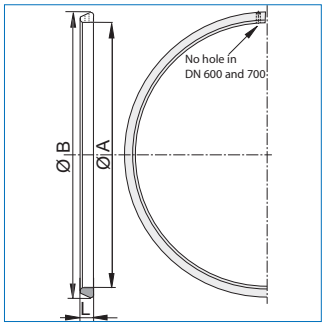
UNIVERSAL STANDARD locking ring



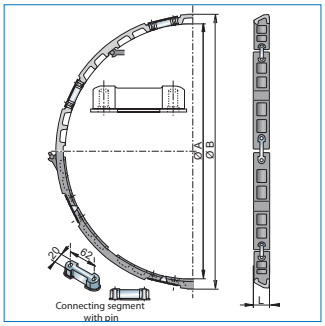
DN 100-200



DN 250-350

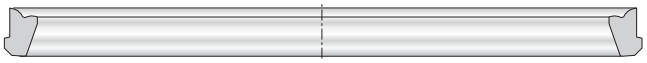


DN 400-700



DN 800-1200

STANDARD gasket



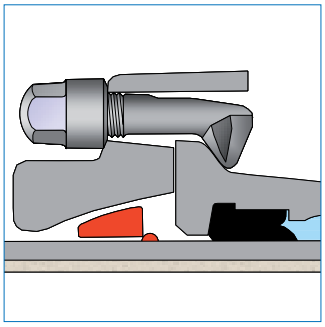
DN	Locking ring			STANDARD gasket	
	Weight (kg)	Reference	Number of pieces	Weight (kg)	Reference
100	0.5	110259	3	0.198	JSB10BA
125	0.7	124151		0.244	JSB12BA
150	0.9	AKB15E	4	0.285	JSB15BA
200	1.3	AKB20E	4	0.384	JSB20BA
250	1.3	AKB25E	1	0.497	JSB25BA
300	1.8	AKB30E	1	0.712	JSB30BA
350	2.3	JKB35E	1	0.898	JSB35BA
400	3.6	JKB40E	1	1.077	JSB40BA
450	4.05	JKB45E	1	1.323	JSB45BA
500	4.6	JKB50E	1	1.544	JSB50BA
600	8.6	JKB60E	1	2.162	JSB60BA

Joints DN 80 to 600 / STANDARD Ve joint for K9 STANDARD Ve pipes and STANDARD Ve fittings

Field of use:
For drinking water anchored mains

Main characteristics:
- Material: EPDM
- EN 545. ISO 2531
- Counterflange coating: bituminous
- Bolts in cast iron
- High angular deflection

Note:
- To use with NATURAL PUR pipes with STANDARD Ve joint
- To use with STANDARD fittings for UNIVERSAL mains when UNIVERSAL fittings do not exist (DN 125, 350, and 450)
- For black or blue STANDARD Ve K9 pipes, please contact us.



DN	Counterflange		Locking ring		Gasket		Bolts in cast iron	
	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference
80	3.5	JSA80V	0.564	JSA80S	0.148	JSA80BA	1.48	JXM22DR70 (X4)
100	4.8	JSB10V	0.489	JSB10S	0.196	JSB10BA	1.48	JXM22DR70 (X4)
125	5.9	JSB12V	0.692	JSB12S	0.244	JSB12BA	2.22	JXM22DR70 (X6)
150	7.5	JSB15V	0.952	JSB15S	0.285	JSB15BA	2.22	JXM22DR70 (X6)
200	9.5	JSB20V	1.512	JSB20S	0.384	JSB20BA	2.96	JXM22DR70 (X8)
250	21.0	JSB25V	2.8	JSB25E	0.497	JSB25BA	4.41	JXM27DR102V (X6)
300	28	JSB30V	3.7	JSB30E	0.712	JSB30BA	5.88	JXM27DR102V (X8)
350	30.5	JSB35V	4.5	JSB35E	0.898	JSB35BA	5.88	JXM27DR102V (X8)
400	37.7	JSB40V	4.5	JSB40E	1.077	JSB40BA	7.35	JXM27DR102V (X10)
450	43.0	JSB45V	6.0	JSB45E	1.323	JSB45BA	10.29	JXM27DR102V (X14)
500	61.7	JSB50V	6.7	JSB50E	1.544	JSB50BA	11.76	JXM27DR102V (X16)
600	63.5	JSB60V	9.6	JSB60E	2.162	JSB60BA	14.70	JXM27DR102V (X20)

Joints DN 350 to 600 / STANDARD V+i joint for K9 STANDARD pipes and STANDARD fittings

Field of use:
For drinking water anchored mains

Main characteristics:
- Material: EPDM
- EN 681.1
- Ductile iron bolts and nuts
- EN 545
- High angular deflection

Note:
To use only on class K9 pipe (STANDARD joint or UNIVERSAL joint)

DN	Counteflange (**)		STANDARD V+i anchored gasket (*)		STANDARD gasket		Ductile iron bolts	
	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference
350	30.5	JSB35V	1.47	JNB35CA	0.898	JSB35BA	5.88	JXM27DR102V (X8)
400	37.7	JSB40V	1.70	JNB40CA	1.077	JSB40BA	7.35	JXM27DR102V (X10)
450	43.0	JSB45V	1.87	JNB45CA	1.323	JSB45BA	10.29	JXM27DR102V (X14)
500	61.7	JSB50V	2.54	JNB50CA	1.544	JSB50BA	11.76	JXM27DR102V (X16)
600	63.5	JSB60V	3.00	JNB60CA	2.162	JSB60BA	14.70	JXM27DR102V (X20)

(*)The STANDARD V+i anchored gasket is the same that the one used in UNIVERSAL STANDARD Vi joint.
(**) The counterflange is the same that the one used in STANDARD Ve joint

DN 700 to 2000

CLASSIC range

Pipes – Fittings – Joints – Accessories

DRINKING WATER SUPPLY

Pipes DN 700 to 2000 Non anchored

DN	Field of use					
	Current situations		Highly aggressive soils		Soft or aggressive waters	
	CLASSIC		TT		PUR	
	STD	UNI / PAMLOCK	STD	UNI / PAMLOCK	STD	UNI / PAMLOCK
700			PE / PUX	PE / PUX		
800			PUX	PUX		
900						
1000						
1100						
1200			PUX	PUX		
1400						
1500						
1600						
1800						
2000		NC	NC	NC		NC

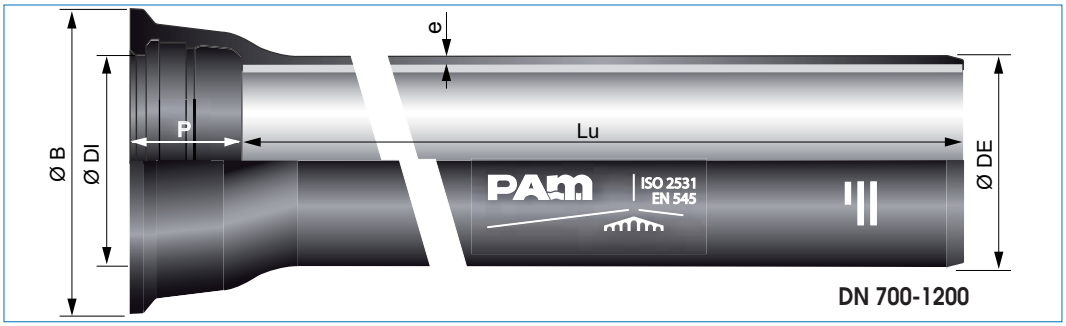
Abbreviations:
STD: Pipe with STANDARD joint
UNI: Pipe with UNIVERSAL joint
NC: Please, contact us

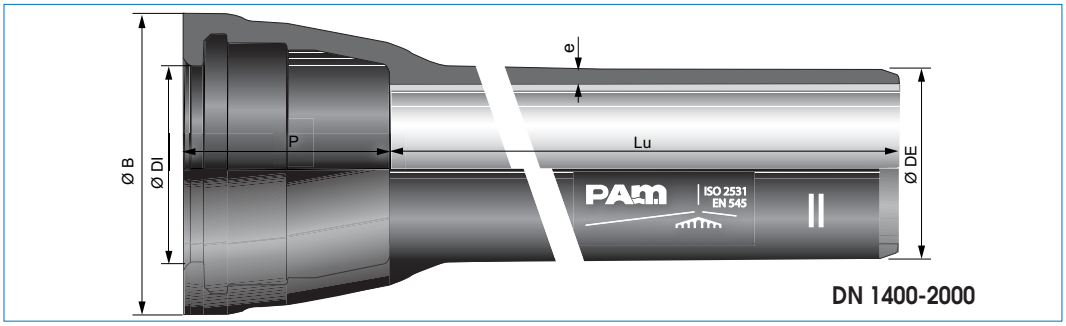
Pipes DN 700 to 2000 Anchored

DN	Field of use					
	Current situations		Highly aggressive soils		Soft or aggressive waters	
	CLASSIC		TT		PUR	
	STD Ve	UNI Ve / PAMLOCK	STD Ve	UNI Ve / PAMLOCK	STD Ve	UNI Ve / PAMLOCK
700			PE / PUX	PE / PUX		
800			PUX	PUX		
900						
1000						
1100						
1200				PUX		
1400						
1500						
1600						
1800						
2000		NC		NC		NC

Abbreviations:
STD Ve: Pipe with STANDARD Ve anchored joint
UNI Ve: Pipe with UNIVERSAL Ve anchored joint
NC: Please, contact us

Pipes DN 700 to 2000 / CLASSIC Pipe with STANDARD joint



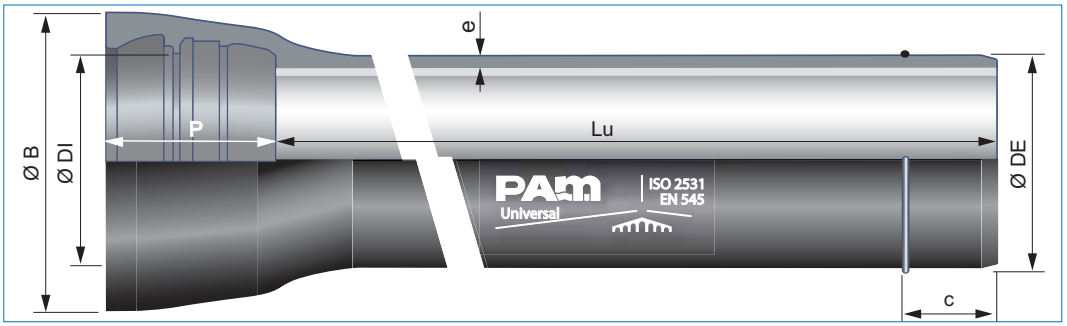


Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining : Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
700	6.95	K9	10.8	738	741.7	192	863.0	217.9	SSB70N69
800	6.95	K9	11.7	842	845.8	197	974.0	267.0	SSB80N69
900	6.95	K9	12.6	945	948.9	200	1082.0	319.8	SSB90N69
1000	6.95	K9	13.5	1048	1052	203	1191.0	376.9	SSC10N69
1100	8.19	K9	14.4	1152	1155.1	225	1300.0	433.6	SSC11N79
1200	8.18	K9	15.3	1255	1260	235	1412.5	507.3	SSC12N79
1400	8.17	K9	17.1	1462	1467.9	245	1592.1	678.5	SSC14N80
1500	8.16	K9	18.0	1565	1571.1	265	1709.8	764.2	SSC15N80
1600	8.16	K9	18.9	1668	1674.2	265	1815.9	850.7	SSC16N80
1800	8.15	K9	20.7	1875	1881.5	275	2032.2	1035.6	SSC18N80
2000	8.13	K9	22.5	2082	2088.8	290	2259.0	1241.5	SSC20N80

Pipes DN 700 to 1200 / CLASSIC Pipe with UNIVERSAL Ve joint (With weld bead)

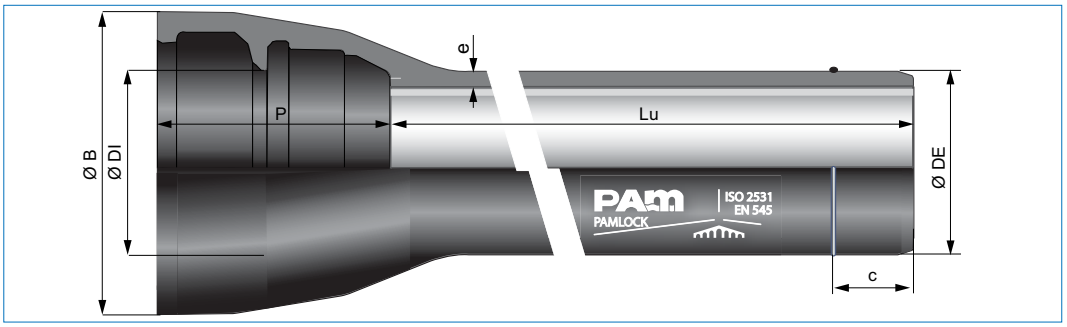


Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
700	5.97	K9	10.8	738	741.7	256	855	158	227.0	SFB70N60
800	6.89	K9	11.7	842	845.8	261	980	150	278.0	SFB80N70
900	6.87	K9	12.6	945	948.9	280	1087	155	348.7	SFB90N70
1000	6.88	K9	13.5	1048	1052.0	279.5	1191	165	403.2	SFC10N70
1200	8.15	K9	15.3	1255	1260.0	279.5	1415	170	521.4	SFC12N80

Pipes DN 1400 to 2000 / CLASSIC Pipe with PAMLOCK joint (With weld bead)

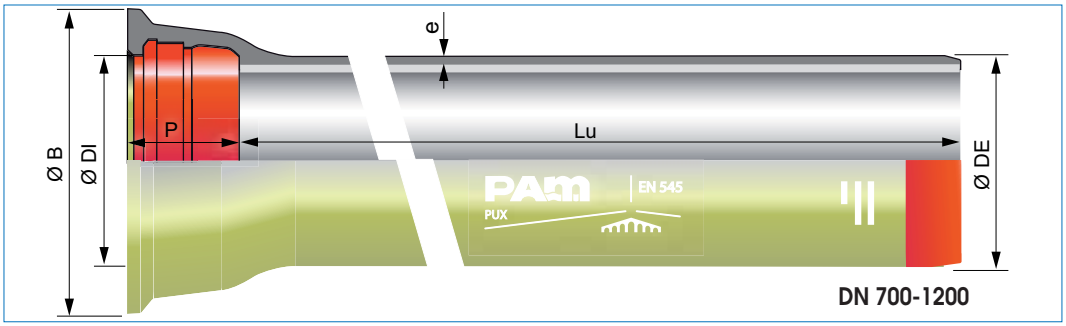


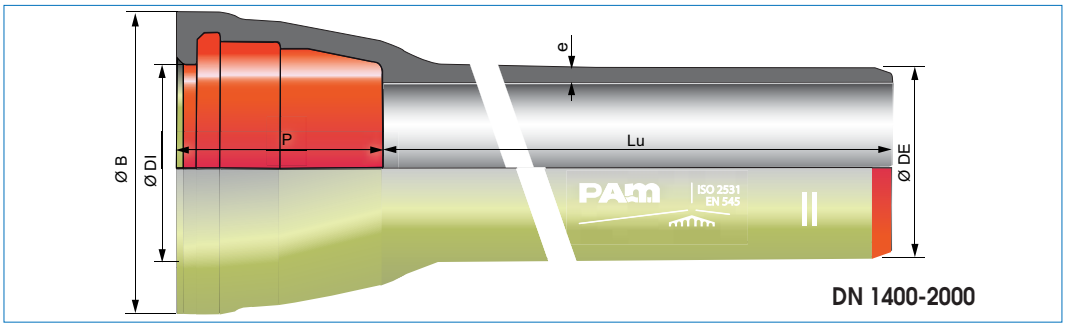
Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining : Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
1400	8.12	K9	17.1	1462	1467.9	300	1620.1	170	678.5	SPC14N80
1500	8.11	K9	18.0	1565	1571.1	315	1757.3	180	764.2	SPC15N80
1600	8.11	K9	18.9	1668	1674.2	325	1868.0	195	850.7	SPC16N80
1800	8.08	K9	20.7	1875	1881.5	350	2075.3	222	1035.6	SPC18N80
2000	Please contact us									

Pipes DN 700 to 2000 / TT PUX Pipe with STANDARD joint





Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

Main characteristics:

- External coating: Barrel coated with thick sprayed sandy colour polyurethane (900 microns), spigot and socket coated with brown-red epoxy (300 microns)
- In compliance with EN 15189
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

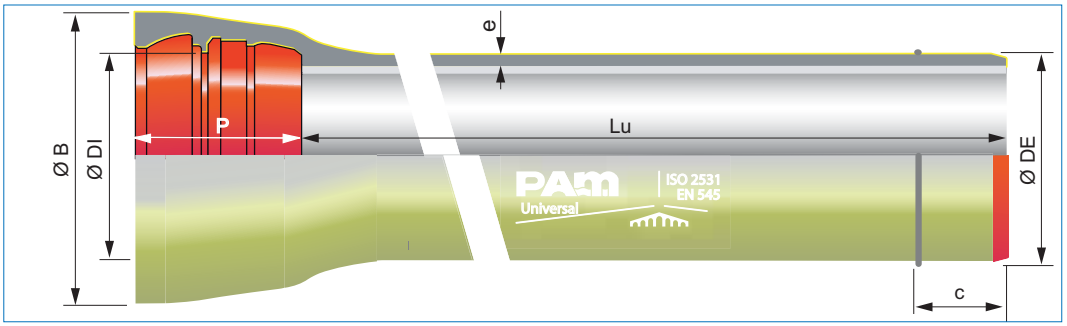
DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
700	6.95	K9	10.8	738	741.7	192	863.0	216.7	SSB70N69AH
800	6.95	K9	11.7	842	845.8	197	974.0	266.0	SSB80N69AH
900	6.95	K9	12.6	945	948.9	200	1082.0	319.8	SSB90N69AH
1000	6.95	K9	13.5	1048	1052.0	203	1191.0	377.3	SSC10N69AH
1100	8.19	K9	14.4	1152	1155.1	225	1300.0	438.9	SSC11N79AH
1200	8.18	K9	15.3	1255	1260.0	235	1412.5	513.2	SSC12N79AH
1400	8.17	K9	17.1	1462	1467.9	245	1592.1	685.3	SSC14N80AH
1500	8.16	K9	18.0	1565	1571.1	265	1709.8	771.5	SSC15N80AH
1600	8.16	K9	18.9	1668	1674.2	265	1815.9	858.5	SSC16N80AH
1800	8.15	K9	20.7	1875	1881.5	275	2032.2	1044.4	SSC18N80AH
2000	8.13	K9	22.5	2082	2088.8	290	2259.0	1251.3	SSC20N80AH

Note: Pipes DN 700 / Pipes TT PE

	DN mm	Lu m	Class	e mm	e1 mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Mass Kg/m	Reference
Std TT PE	**700**	6.00	K9	10.8	2.5	738	741.7	192.0	830.0	-	222.8	207734
Uni Ve TT PE	**700**	5.97	K9	10.8	2.5	738	741.7	256.0	855.0	158	239.0	SFB70N60AG

See drawings pages 386 and 387.

Pipes DN 800 to 1200 / TT PUX Pipe with UNIVERSAL Ve joint (With weld bead)



Field of use:

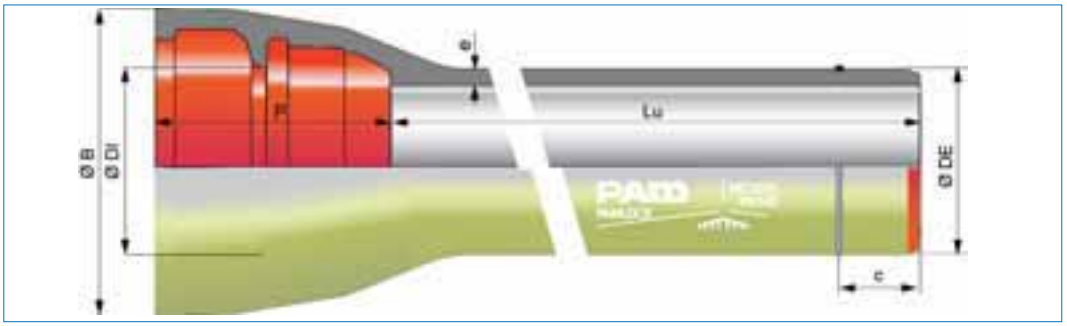
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
800	6.89	K9	11.7	842	845.8	261	980	150	281.9	SFB80N70AH
900	6.87	K9	12.6	945	948.9	280	1087	155	348.7	SFB90N70AH
1000	6.88	K9	13.5	1048	1052.0	279.5	1191	165	403.2	SFC10N70AH
1200	8.15	K9	15.3	1255	1260.0	279.5	1415	170	521.4	SFC12N80AH

Main characteristics:

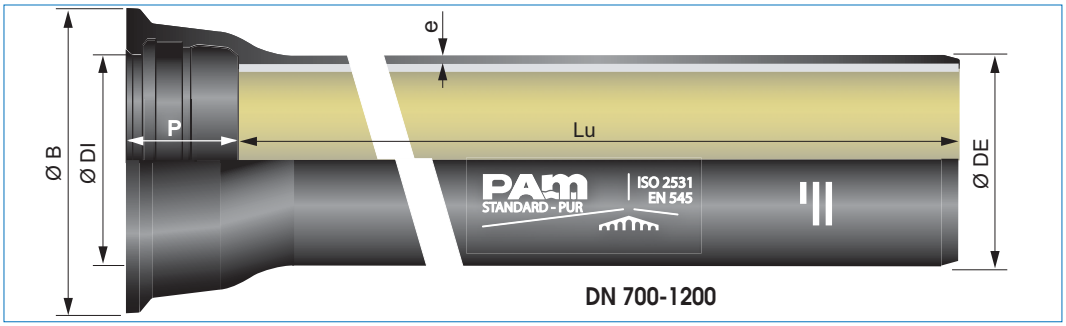
- External coating: Barrel coated with thick sprayed sandy colour polyurethane (900 microns), spigot and socket coated with brown-red epoxy (300 microns)
- In compliance with EN 15189
- Internal lining : Centrifuged cement mortar lining
- EN 545, ISO 2531

Pipes DN 1400 to 2000 / TT PUX Pipe with PAMLOCK joint (With weld bead)

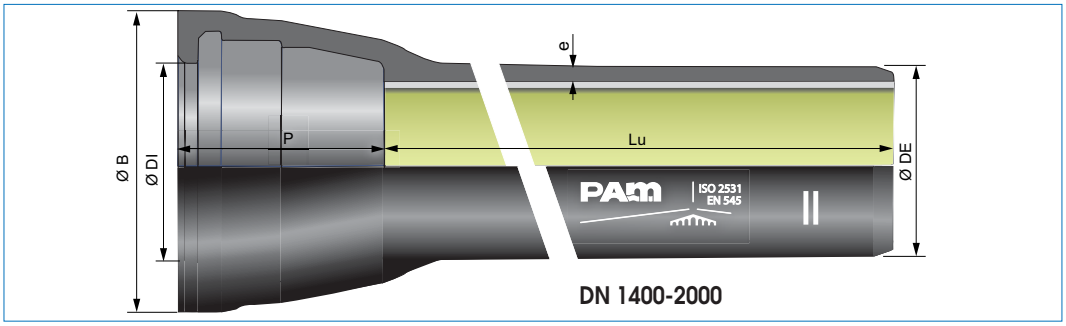


DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
1400	8.12	K9	17.1	1462	1467.9	300	1620.1	170	689.7	SPC14N80AH
1500	8.11	K9	18	1565	1571.1	315	1757.3	180	780.4	SPC15N80AH
1600	8.11	K9	18.9	1668	1674.2	325	1868.0	195	872.6	SPC16N80AH
1800	8.08	K9	20.7	1875	1881.5	350	2075.3	222	1064.5	SPC18N80AH
2000	Please contact us									

Pipes DN 700 to 2000 / PUR Pipe with STANDARD joint



DN 700-1200



DN 1400-2000

Field of use:
For soft or aggressive waters

Main characteristics:

- Material: EPDM
- EN 545
- External coating:
  - Pipe barrel: metallic zinc (200 g/m² mini) + black epoxy (80 microns mini)
  - Spigot and socket: epoxy zinc paint + black epoxy (150 microns mini)
- Internal lining :
  - Pipe barrel : with thick sprayed sandy colour polyurethane (mean thickness 1000 microns)
- In compliance with EN 15655
- ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
700	6.95	K9	10.8	738	741.7	192	863	190.2	SSB70N69WZ
800	6.95	K9	11.7	842	845.8	197	974	235.4	SSB80N69WZ
900	6.95	K9	12.6	945	948.9	200	1082	284.3	SSB90N69WZ
1000	6.95	K9	13.5	1048	1052	203	1191	337.4	SSC10N69WZ
1100	8.19	K9	14.4	1152	1155.1	225	1300	391.4	SSC11N79WZ
1200	8.18	K9	15.3	1255	1260	235	1412.5	507.3	SSC12N79WZ
1400	8.17	K9	17.1	1462	1467.9	245	1592.1	593.5	SSC14N80WZ
1500	8.16	K9	18	1565	1571.1	265	1709.8	673.2	SSC15N80WZ
1600	8.16	K9	18.9	1668	1674.2	265	1815.9	755.5	SSC16N80WZ
1800	8.15	K9	20.7	1875	1881.5	275	2032.2	928.5	SSC18N80WZ
2000	8.13	K9	22.5	2082	2088.8	290	2259	1.122.4	SSC20N80WZ

Pipes DN 700 to 1200 / PUR Pipe with UNIVERSAL Ve joint (With weld bead)



Field of use:
For soft or aggressive waters

Main characteristics:

- External coating :
  - Pipe barrel: metallic zinc (200 g/m² mini) + black epoxy (80 microns mini)
  - Spigot and socket: epoxy zinc paint + black epoxy (150 microns mini)
- Internal lining :
  - Pipe barrel : with thick sprayed sandy colour polyurethane (mean thickness 1000 microns)
- In compliance with EN 15655
- EN 545, ISO 2531

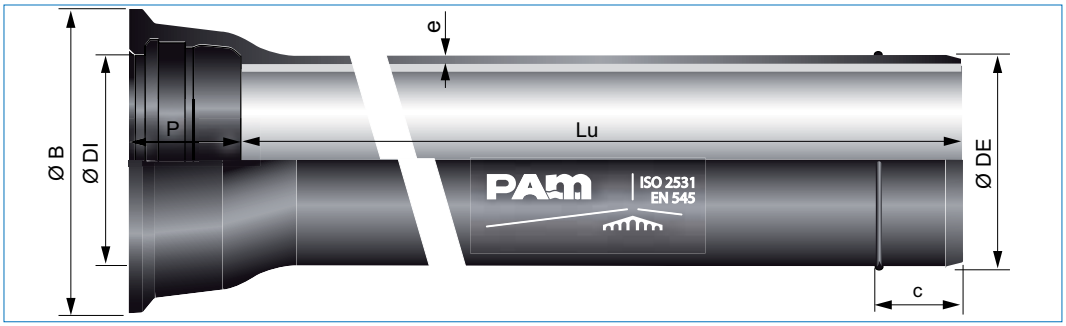
DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
700	5.97	K9	10.8	738	741.7	256	855	158	227.0	SFB70N60WZ
800	6.89	K9	11.7	842	845.8	261	980	150	278.0	SFB80N70WZ
900	6.87	K9	12.6	945	948.9	280	1087	155	348.7	SFB90N70WZ
1000	6.88	K9	13.5	1048	1052.0	279.5	1191	165	403.2	SFC10N70WZ
1200	8.15	K9	15.3	1255	1260.0	279.5	1415	170	521.4	SFC12N80WZ

Pipes DN 1400 to 2000 / PUR Pipe with PAMLOCK joint (With weld bead)



DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
1400	8.12	K9	17.1	1462	1467.9	300	1620.1	170	689.7	SPC14N80WZ
1500	8.11	K9	18	1565	1571.1	315	1757.3	180	780.4	SPC15N80WZ
1600	8.11	K9	18.9	1668	1674.2	325	1868.0	195	872.6	SPC16N80WZ
1800	8.08	K9	20.7	1875	1881.5	350	2075.3	222	1064.5	SPC18N80WZ
2000	Please contact us									

Pipes DN 700 to 1200 / CLASSIC Pipe with STANDARD Ve joint

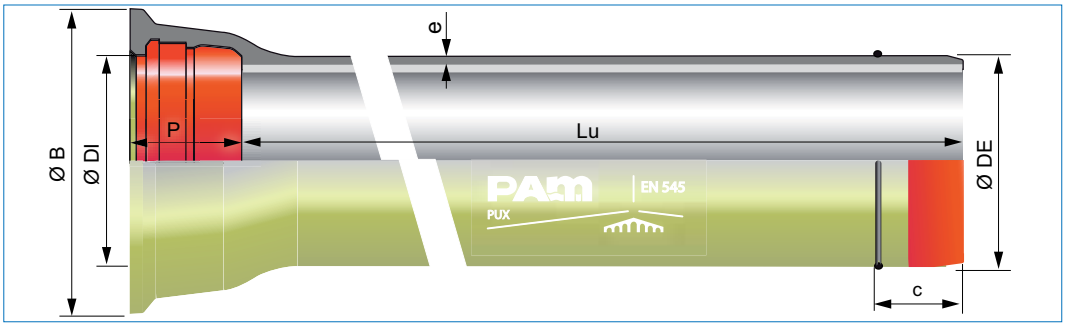


Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining : Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
700	6.95	K9	10.8	738	741.7	192	863	158	217.9	SQB70N69
800	6.95	K9	11.7	842	845.8	197	974	150	267.0	SQB80N69
900	6.95	K9	12.6	945	948.9	200	1082	155	319.8	SQB90N69
1000	6.95	K9	13.5	1048	1052	203	1191	165	376.9	SQC10N69
1100	8.19	K9	14.4	1152	1155.1	225	1300	165	433.6	SQC11N79
1200	8.18	K9	15.3	1255	1260	235	1412.5	170	507.3	SQC12N79

Pipes DN 700 to 1200 / TT PUX Pipe with STANDARD Ve joint



Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

DN mm	Lu mm	Class mm	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
700	6.96	K9	10.8	738	741.7	192	863	158	221.3	SQB70N69AH
800	6.95	K9	11.7	842	845.8	197	974	150	270.9	SQB80N69AH
900	6.95	K9	12.6	945	948.9	200	1082	155	324.2	SQB90N69AH
1000	6.96	K9	13.5	1048	1052.0	203	1191	165	381.8	SQC10N69AH
1100	8.19	K9	14.4	1152	1155.1	225	1300	165	-	-
1200	8.18	K9	15.3	1255	1260.0	235	1412.5	170	513.2	SQC12N79AH

Main characteristics:

- External coating: Barrel coated with thick sprayed sandy colour polyurethane (900 microns), spigot and socket coated with brown-red epoxy (300 microns)
- In compliance with EN 15189
- Internal lining : Centrifuged cement mortar lining
- EN 545, ISO 2531

Fittings DN 700 to 2000 Non anchored

DN	Field of use						
	Current situations			Highly aggressive soils		Soft or aggressive waters	
	CLASSIC			TT		NATURAL PUR	
	EXP	STD	UNI / PAMLOCK	STD	UNI / PAMLOCK	STD	UNI / PAMLOCK
700							
800							
900							
1000							
1100							
1200							
1400							
1500							
1600							
1800							
2000							

Abbreviations:
STD: Fitting with STANDARD joint
EXP: Fitting with EXPRESS joint
UNI: Fitting with UNIVERSAL joint

Fittings DN 700 to 2000 Anchored

DN	Field of use					
	Current situations		Highly aggressive soils		Soft or aggressive waters	
	CLASSIC		TT		PUR	
	STD Ve	UNI Ve / PAMLOCK	STD Ve	UNI Ve / PAMLOCK	STD Ve	UNI Ve / PAMLOCK
700						
800						
900						
1000						
1100						
1200						
1400						
1500						
1600						
1800						
2000						

Abbreviations:
STD Ve: Pipe with STANDARD Ve anchored joint
UNI Ve: Pipe with UNIVERSAL Ve anchored joint

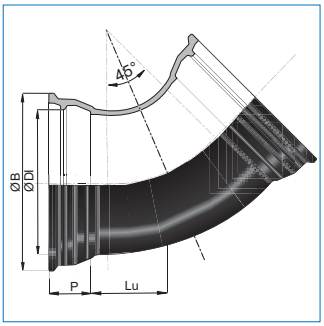
PAMLOCK DN 2000 : Please contact us

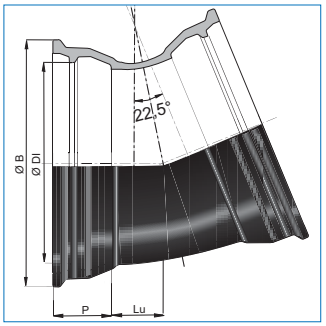
DRINKING WATER SUPPLY

Fittings DN 700 to 1200 / Bend with EXPRESS joint

Field of use:
For drinking water mains

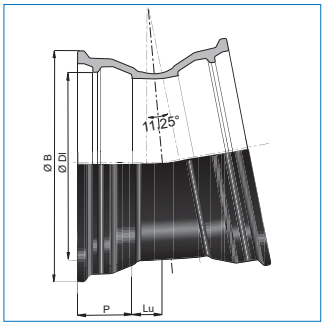
Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531





Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
90°	800	735	160	846	972	750	SEB80CA
45°	700	335.5	150	742	861	312	SEB70CB
45°	800	364.5	160	846	972	417	SEB80CB
45°	900	403.5	175	949	1080	551	SEB90CB
45°	1000	439.5	145	1052	1189	649	SEC10CB
45°	1100	540	153	1155	1298	993	SEC11CB
45°	1200	537.5	162	1259	1411	1033	SEC12CB
22.30°	700	157.5	150	742	861	232	SEB70CD
22.30°	800	170.5	160	846	972	305	SEB80CD
22.30°	900	197.5	175	949	1080	406	SEB90CD
22.30°	1000	217.5	145	1052	1189	459	SEC10CD
22.30°	1100	275	150	1155	1298	663	SEC11CD
22.30°	1200	258.5	150	1259	1411	675	SEC12CD

Weight: fitting alone
Reference: fitting

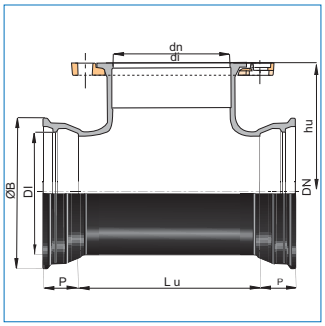


Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
11.15°	700	87	150	742	861	197	SEB70CE
11.15°	800	90.5	160	846	972	255	SEB80CE
11.15°	900	102.5	175	949	1080	332	SEB90CE
11.15°	1000	117.5	145	1052	1189	360	SEC10CE
11.15°	1100	140	150	1155	1298	589	SEC11CE
11.15°	1200	137.5	150	1259	1411	509	SEC12CE

Weight: fitting alone
Reference: fitting

Fittings DN 700 to 1200 / Double socket tee with flanged branch (rotatable flange) with EXPRESS joint

Field of use:
For drinking water mains



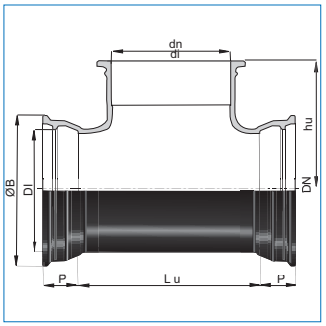
Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531

DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	150	365	520	150	742	861	262	262	263	SEB70UD1J	SEB70UD1J	SEB70UD3J
700	200	365	525	150	742	861	266	266	267	SEB70UD1K	SEB70UD2K	SEB70UD3K
700	400	585	555	150	742	861	347	351	360	SEB70UD1N	SEB70UD2N	SEB70UD3N
700	600	915	585	150	742	861	474	499	502	SEB70UD1R	SEB70UD2R	SEB70UD3R
800	150	355	580	160	846	972	330	330	331	SEB80UD1J	SEB80UD1J	SEB80UD3J
800	200	355	585	160	846	972	321	321	322	SEB80UD1K	SEB80UD2K	SEB80UD3K
800	400	575	615	160	846	972	429	433	442	SEB80UD1N	SEB80UD2N	SEB80UD3N
800	600	1015	645	160	846	972	614	639	642	SEB80UD1R	SEB80UD2R	SEB80UD3R
900	200	375	645	175	949	1080	419	419	420	SEB90UD1K	SEB90UD2K	SEB90UD3K
900	400	595	675	175	949	1080	530	535	544	SEB90UD1N	SEB90UD2N	SEB90UD3N
900	600	1145	705	175	949	1080	797	822	825	SEB90UD1R	SEB90UD2R	SEB90UD3R
1000	150	400	705	145	1052	1189	451	451	452	SEC10UD1J	SEC10UD1J	SEC10UD3J
1000	200	400	705	145	1052	1189	453	453	454	SEC10UD1K	SEC10UD2K	SEC10UD3K
1000	300	598.5	720	145	1052	1189	574	-	579	SEC10UD1M	-	SEC10UD3M
1000	400	598.5	735	145	1052	1189	582	586	595	SEC10UD1N	SEC10UD2N	SEC10UD3N
1000	600	1259	765	145	1052	1189	950	975	978	SEC10UD1R	SEC10UD2R	SEC10UD3R
1100	200	822.5	880	150	1155	1298	873	873	-	SEC11UD1K	SEC11UD2K	-
1100	300	822.5	838	150	1155	1298	886	-	-	SEC11UD1M	-	-
1100	400	822.5	835	150	1155	1298	894	899	-	SEC11UD1N	SEC11UD2N	-
1100	600	822.5	885	150	1155	1298	915	940	-	SEC11UD1R	SEC11UD2R	-
1200	200	855	880	150	1259	1411	-	948.9	-	-	SEC12UD2K	-
1200	300	855	838	150	1259	1411	952	948	-	SEC12UD1M	SEC12UD2M	-
1200	400	855	835	150	1259	1411	942	947	-	SEC12UD1N	SEC12UD2N	-
1200	600	855	885	150	1259	1411	971	996	-	SEC12UD1R	SEC12UD2R	-

Weight: fitting alone - Reference: fitting

Fittings DN 700 to 1200 / Double socket tee with flanged branch (fixed flange) with EXPRESS joint

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531

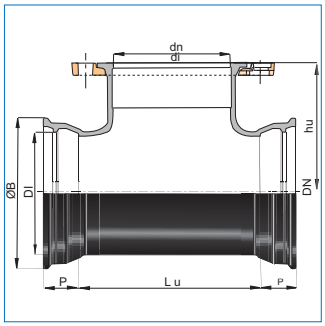
DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	700	915	600	150	742	861	491	499	527	SEB70TD1S	SEB70TD2S	SEB70TD3S
800	800	1015	675	160	846	972	661	672	713	SEB80TD1T	SEB80TD2T	SEB80TD3T
900	900	1145	750	175	949	1080	865	876	924	SEB90TD1U	SEB90TD2U	SEB90TD3U
1000	1000	1259	830	145	1052	1189	1058	1080	1143	SEC10TD1V	SEC10TD2V	SEC10TD3V
1100	700	1245	900	150	1155	1298	-	-	-			
1100	800	1245	915	150	1155	1298	1341	-	-	SEC11TD1T	-	-
1100	900	1245	930	150	1155	1298	-	-	-			
1100	1000	1245	920	150	1155	1298	1351	1373	-	SEC11TD1V	SEC11TD2V	-
1100	1100	1245	907	150	1155	1298	1621	1651	-	SEC11TD1A	SEC11TD2A	-
1200	700	1245	900	150	1259	1411	-	-	-			
1200	800	1245	915	150	1259	1411	-	-	-			
1200	900	1245	930	150	1259	1411	-	-	-			
1200	1000	1245	920	150	1259	1411	1357	1380	-	SEC12TD1V	SEC12TD2V	-
1200	1100	1480	907	150	1259	1411	-	-	-			
1200	1200	1480	950	150	1259	1411	1703	1760	-	SEC12TD1B	SEC12TD2B	-

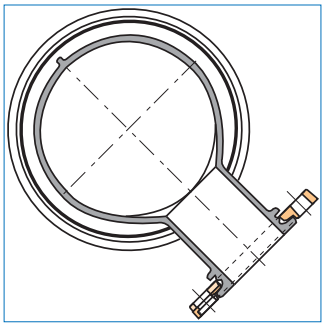
Weight: fitting alone - Reference: fitting

Fittings DN 700 to 1200 / Double socket washout tee (rotatable flange) with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531





DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	250	365	535	150	742	861	272	271	274	SEB70UV1L	SEB70UV2L	SEB70UV3L
800	250	355	585	160	846	972	343	343	346	SEB80UV1L	SEB80UV2L	SEB80UV3L
900	250	375	640	175	949	1080	464	464	466	SEB90UV1L	SEB90UV2L	SEB90UV3L
1000	250	400	705	145	1052	1189	454	453	456	SEC10UIV1L	SEC10UV2L	SEC10UV3L
1100	250	822.5	873	150	1155	1298	-	-	-	-	-	-
1200	250	855	873	150	1259	1411	937	937	-	SEC12UV1L	SEC12UV2L	-

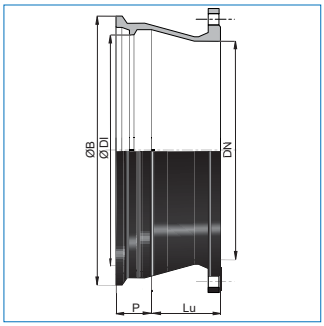
Weight: fitting alone - Reference: fitting

DRINKING WATER SUPPLY

Fittings DN 700 to 1200 / Flanged socket with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531



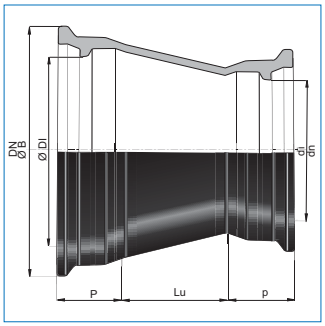
DN	Lu	P	ØDI	ØB	WEIGHT / kg			*Reference*		
	mm				PN10	PN16	PN25	PN10	PN16	PN25
700	190	140	742	861	159	167	197	SEB70BE1	SEB70BE2	SEB70BE3
800	200	140	846	972	205	213	256	SEB80BE1	SEB80BE2	SEB80BE3
900	210	140	949	1080	248	258	309	SEB90BE1	SEB90BE2	SEB90BE3
1000	220	140	1052	1189	310	327	393	SEC10BE1	SEC10BE2	SEC10BE3
1100	220	200	1155	1298	363	399	-	SEC11BE1	SEC11BE2	-
1200	240	162	1259	1411	451	496	576	SEC12BE1	SEC12BE2	SEC12BE3

Weight: fitting alone - Reference: fitting

Fittings DN 700 to 1200 / Concentric taper with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531



DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
700	500	480	140	742	861	120	535	189	SEB70VE0Q
700	600	267.5	140	742	861	135	638	166	SEB70VE0R
800	600	467.5	140	846	972	135	638	237	SEB80VE0R
800	700	280	140	846	972	140	742	220	SEB80VE0S
900	700	480	140	949	1080	140	742	304	SEB90VE0S
900	800	280	140	949	1080	140	846	265	SEB90VE0T
1000	800	480	140	1052	1189	140	846	363	SEC10VE0T
1000	900	280	140	1052	1189	140	949	313	SEC10VE0U
1100	1000	330	200	1155	1298	140	1052	419	SEC11VE0V
1200	1000	480	150	1259	1411	140	1052	517	SEC12VE0V

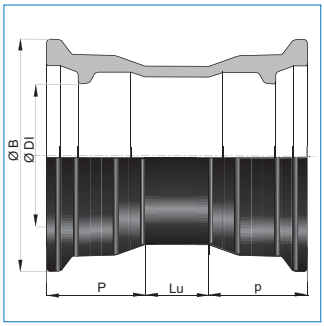
Weight: fitting alone - Reference: fitting

Fittings DN 700 to 2000 / Collar with EXPRESS joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531

- Available in 2010 for DN 1400, DN 1500, DN 1600, DN 1800 and DN 2000 in blue epoxy coating in compliance with EN 14901



DN	Lu	P	DI	B	Weight	Reference
	mm				kg	
700	220	140	742	861	183	SEB70MN
800	230	140	846	972	226	SEB80MN
900	240	140	949	1080	274	SEB90MN
1000	250	140	1052	1189	325	SEC10MN
1100	260	200	1155	1298	500	SEC11MN
1200	270	162	1259	1411	470	SEC12MN
1400	Please contact us					
1500	Please contact us					
1600	Please contact us					
1800	Please contact us					
2000	Please contact us					

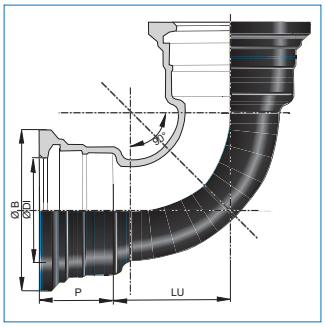
Weight: fitting alone - Reference: fitting

Fittings DN 700 to 2000 / Bend with STANDARD joint

90° bend

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531



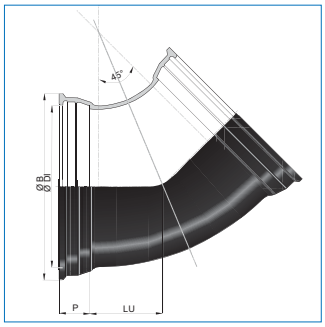
Also available:
blue epoxy coating in compliance with EN 14901

Weight: fitting alone
Reference: fitting

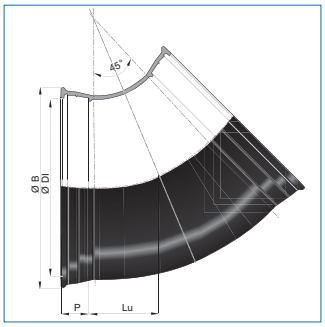
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
90°	700	670	150	742.2	861	584	SSB70CA
90°	800	735	160	846.3	972	696	SSB80CA
90°	900	880	175	949.4	1080	800	SSB90CA
90°	1000	1000	185	1052.5	1189	1461	SSC10CA

45° bend

Main characteristics:
- Internal and external coating : black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531



DN 700-1000



DN 1100-2000

Also available:
blue epoxy coating in compliance with EN 14901

Weight: fitting alone
Reference: fitting

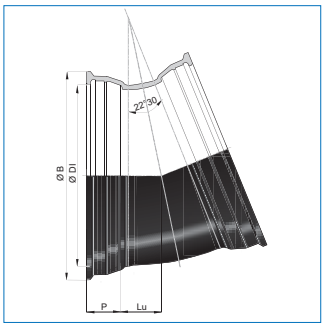
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
45°	700	335.5	150	742.2	861	310	SSB70CB
45°	800	364.5	160	846.3	972	414	SSB80CB
45°	900	403.5	175	949.4	1080	545	SSB90CB
45°	1000	439.5	185	1052.5	1189	703	SSC10CB
45°	1100	540	150	1155	1298	980	SSC11CB
45°	1200	537.5	195	1263	1412	1015	SSC12CB
45°	1400	522	255	1467	1600	1555	SSC14CB
45°	1500	572	280	1570	1742	1815	SSC15CB
45°	1600	563	275	1673	1820	2089	SSC16CB
45°	1800	642	258	1881.7	2038	3126	SSC18CB
45°	2000	685	290	2089	2269	3702	SSC20CB

Fittings DN 700 to 2000 / Bend with STANDARD joint

22°30 bend

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531

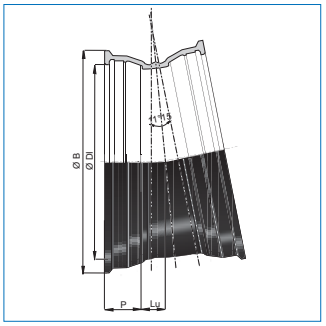


Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
22°30	700	157.5	150	742.2	861	230	SSB70CD
22°30	800	170.5	160	846.3	972	303	SSB80CD
22°30	900	197.5	175	949.4	1080	405	SSB90CD
22°30	1000	217.5	185	1052.5	1189	507	SSC10CD
22°30	1100	275	150	1155.0	1298	650	SSC11CD
22°30	1200	258.5	195	1263.0	1412	644	SSC12CD
22°30	1400	264	255	1467.0	1600	1107	SSC14CD
22°30	1500	314	280	1570.0	1742	1367	SSC15CD
22°30	1600	284	275	1673.0	1820	1479	SSC16CD
22°30	1800	337	258	1881.7	2038	2070	SSC18CD
22°30	2000	355	290	2089.0	2269	2668	SSC20CD

Weight: fitting alone
Reference: fitting

11.15° bend

Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655



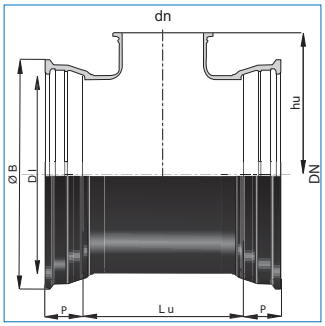
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
11.15°	700	87	150	742.2	861	195.8	SSB70CE
11.15°	800	90.5	160	846.3	972	253.4	SSB80CE
11.15°	900	102.5	175	949.4	1080	325.6	SSB90CE
11.15°	1000	117.5	185	1052.5	1189	414.4	SSC10CE
11.15°	1100	140	150	1155.0	1298	490	SSC11CE
11.15°	1200	137.5	195	1263.0	1412	478	SSC12CE
11.15°	1400	143	255	1467.0	1600	884	SSC14CE
11.15°	1500	193	280	1570.0	1742	1143	SSC15CE
11.15°	1600	153	275	1673.0	1820	1173	SSC16CE
11.15°	1800	200	258	1881.7	2038	1542	SSC18CE
11.15°	2000	200	290	2089.0	2269	2151	SSC20CE

Weight: fitting alone
Reference: fitting

Fittings DN 700 to 2000 / STANDARD double socket tee with flanged branch (fixed flange) with STANDARD joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531



DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	700	915	600	150	742	861	491	499	527	SSB70TD1S	SSB70TD2S	SSB70TD3S
800	800	1015	675	160	846	972	663	674	715	SSB80TD1T	SSB80TD2T	SSB80TD3T
900	900	1145	750	175	949	1080	867	878	926	SSB90TD1U	SSB90TD2U	SSB90TD3U
1000	1000	1258	830	185	1052	1189	1115	1137	1200	SSC10TD1V	SSC10TD2V	SSC10TD3V
1200	800	1245	915	195	1263	1412	1329	1353	-	SSC12TD1T	SSC12TD2T	-
1200	900	1245	930	195	1263	1412	-	1397	-	-	SSC12TD2U	-
1200	1000	1245	920	195	1263	1412	1359	1380	1532	SSC12TD1V	SSC12TD2V	SSC12TD3V
1200	1100	1480	907	195	1263	1412	1616	-	-	SSC12TD1A	-	-
1200	1200	1480	950	195	1263	1412	1587	1732	-	SSC12TD1B	SSC12TD2B	-
1400	800	1950	1010	255	1467	1600	-	-	-	-	-	-
1400	900	1950	1010	255	1467	1600	-	-	-	-	-	-
1400	1000	1950	1040	255	1467	1600	-	-	-	-	-	-
1400	1200	1950	1070	255	1467	1600	2320	2346	-	SSC14TD1B	SSC14TD2B	-
1400	1400	1950	1100	255	1467	1600	2564	2612	2745	SSC14TD1C	SSC14TD2C	SSC14TD3C
1500	800	2050	1010	280	1570	1742	-	-	-	-	-	-
1500	900	2050	1010	280	1570	1742	-	-	-	-	-	-
1500	1000	2050	1040	280	1570	1742	-	-	-	-	-	-
1500	1200	2050	1070	280	1570	1742	-	-	-	-	-	-
1500	1400	2050	1100	280	1570	1742	-	-	-	-	-	-
1500	1500	2050	1100	280	1570	1742	3111	3210	-	SSC15TD1D	SSC15TD2D	-
1600	800	1505	1120	275	1673	1820	-	-	-	-	-	-
1600	1000	1505	1150	275	1673	1820	2282	2458	-	SSC16TD1V`	SSC16TD2V	-
1600	1200	2170	1180	275	1673	1820	-	-	-	-	-	-
1600	1400	2170	1210	275	1673	1820	-	-	-	-	-	-
1600	1600	2170	1240	275	1673	1820	3769	3859	-	SSC16TD1E	SSC16TD2E	-
1800	800	1360	1230	258	1881.7	2038	2704	2721	-	SSC18TD1T	SSC18TD2T	-
1800	900	1360	1245	258	1881.7	2038	2800	2810	-	SSC18TD1U	SSC18TD2U	-
1800	1000	2485	1260	258	1881.7	2038	-	-	-	-	-	-
1800	1400	2485	1320	258	1881.7	2038	-	-	-	-	-	-
1800	1800	2485	1380	258	1881.7	2038	5525	5600	-	SSC18TD1F	SSC18TD2F	-
2000	1000	1580	1370	290	2089	2269	4564	4600	-	SSC20TD1V	SSC20TD2V	-
2000	1400	2045	1430	290	2089	2269	5700	5750	-	SSC20TD1C	SSC20TD2C	-

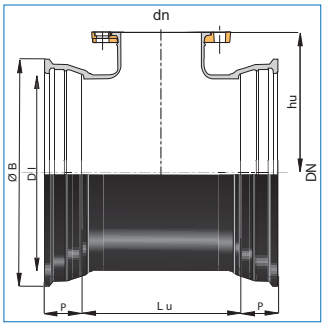
Weight: fitting alone - Reference: fitting. For more information, please contact us

Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

DRINKING WATER SUPPLY

Fittings DN 700 to 2000 / STANDARD double socket tee with flanged branch (rotatable flange) with STANDARD joint

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531

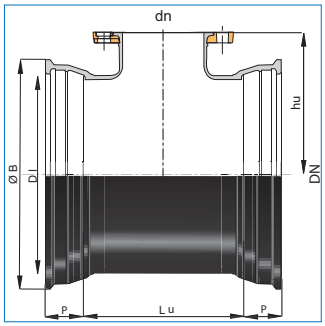
Note:
Also available: - Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

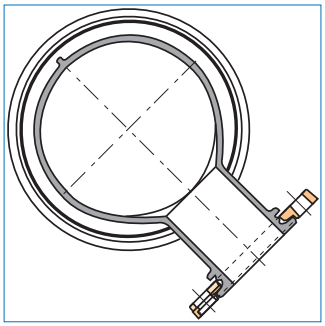
DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	150	365	520	150	742.2	861	262	262	263	SSB70UD1J	SSB70UD1J	SSB70UD3J
700	200	365	525	150	742.2	861	265	265	266	SSB70UD1K	SSB70UD2K	SSB70UD3K
700	400	585	555	150	742.2	861	347	351	360	SSB70UD1N	SSB70UD2N	SSB70UD3N
700	600	915	585	150	742.2	861	474	499	502	SSB70UD1R	SSB70UD2R	SSB70UD3R
800	150	355	580	160	846.3	972	332	332	333	SSB80UD1J	SSB80UD1J	SSB80UD3J
800	200	355	585	160	846.3	972	335	335	336	SSB80UD1K	SSB80UD2K	SSB80UD3K
800	400	575	615	160	846.3	972	430	435	444	SSB80UD1N	SSB80UD2N	SSB80UD3N
800	600	1015	645	160	846.3	972	617	642	645	SSB80UD1R	SSB80UD2R	SSB80UD3R
900	200	375	645	175	949.4	1080	420	419	422	SSB90UD1K	SSB90UD2K	SSB90UD3K
900	400	595	675	175	949.4	1080	532	536	545	SSB90UD1N	SSB90UD2N	SSB90UD3N
900	600	1145	705	175	949.4	1080	798	823	826	SSB90UD1R	SSB90UD2R	SSB90UD3R
1000	150	379	705	185	1052.5	1189	447	447	447	SSC10UD1J	SSC10UD1J	SSC10UD3J
1000	200	379	705	185	1052.5	1189	510	510	512	SSC10UD1K	SSC10UD2K	SSC10UD3K
1000	300	598.5	720	185	1052.5	1189	570	569	574	SSC10UD1M	SSC10UD2M	SSC10UD3M
1000	400	598.5	735	185	1052.5	1189	639	644	653	SSC10UD1N	SSC10UD2N	SSC10UD3N
1000	600	1258.5	765	185	1052.5	1189	1007	1032	1035	SSC10UD1R	SSC10UD2R	SSC10UD3R
1100	200	822.5	880	150	1155.0	1298	911	910	-	SSC11UD1K	SSC11UD2K	-
1100	300	822.5	838	150	1155.0	1298	909	909	-	SSC11UD1M	SSC11UD2M	-
1100	400	822.5	835	150	1155.0	1298	999	-	-	SSC11UD1N	-	-
1100	600	822.5	885	150	1155.0	1298	907	-	-	SSC11UD1R	-	-
1200	200	855	880	195	1263.0	1412	949	949	950	SSC12UD1K	SSC12UD2K	SSC12UD3K
1200	300	855	838	195	1263.0	1412	927	927	931	SSC12UD1M	SSC12UD2M	SSC12UD3M
1200	400	855	835	195	1263.0	1412	938	943	-	SSC12UD1N	SSC12UD2N	-
1200	600	855	885	195	1263.0	1412	952	977	980	SSC12UD1R	SSC12UD2R	SSC12UD3R
1400	400	1010	960	255	1467.0	1600	-	-	-	-	-	-
1400	600	1010	980	255	1467.0	1600	1542	1567	-	SSC14UD1R	SSC14UD2R	-
1500	400	1110	960	280	1570.0	1742	-	-	-	-	-	-
1500	600	1110	980	280	1570.0	1742	1790	1815	-	SSC15UD1R	SSC15UD2R	-
1600	200	1050	1040	275	1673.0	1820	-	-	-	-	-	-
1600	300	1050	1050	275	1673.0	1820	1977	1967	-	SSC16UD1M	SSC16UD2M	-
1600	400	1050	1100	275	1673.0	1820	-	-	-	-	-	-
1600	500	1050	1075	275	1673.0	1820	1989	-	-	SSC16UD1Q	-	-
1600	600	1050	1090	275	1673.0	1820	1997	2022	-	SSC16UD1R	SSC16UD2R	-
1800	200	1125	1140	258	1881.7	2038	-	-	-	-	-	-
1800	300	1125	1155	258	1881.7	2038	2320	-	-	SSC18UD1M	-	-
1800	400	1125	1300	258	1881.7	2038	-	-	-	-	-	-
1800	600	1125	1200	258	1881.7	2038	-	-	-	-	-	-
2000	300	1110	1265	290	2089.0	2269	3201	3201	-	SSC20UD1M	SSC20UD2M	-
2000	400	1110	1280	290	2089.0	2269	-	-	-	-	-	-
2000	500	1110	1295	290	2089.0	2269	3221	3235	-	SSC20UD1Q	SSC20UD2Q	-
2000	600	1110	1315	290	2089.0	2269	-	-	-	-	-	-

Weight: fitting alone - Reference: fitting

Fittings DN 700 to 2000 / STANDARD double socket washout tee with flanged branch (rotatable flange)

Field of use:
For drinking water mains





Main characteristics:
- Internal and external coating: black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531

DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	250	365	535	150	742.2	861	272	271	274	SSB70UV1L	SSB70UV2L	SSB70UV3L
800	250	355	585	160	846.3	972	350	349	352	SSB80UV1L	SSB80UV2L	SSB80UV3L
900	250	375	640	175	949.4	1080	474	474	477	SSB90UV1L	SSB90UV2L	SSB90UV3L
1000	250	379	705	185	1052.5	1189	520	519	522	SSC10UV1L	SSC10UV2L	SSC10UV3L
1100	250	822.5	873	150	1155.0	1298	-	950	953	-	SSC11UV2L	SSC11UV3L
1200	250	855	873	195	1263.0	1412	951	950	953	SSC12UV1L	SSC12UV2L	SSC12UV3L
1400	400	1010	960	255	1467.0	1600	1520	1524	1533	SSC14UV1N	SSC14UV2N	SSC14UV3N
1500	400	1110	960	280	1570.0	1742	1766	1771	-	SSC15UV1N	SSC15UV2N	-
1600	400	1050	1100	275	1673.0	1820	1977	1980	-	SSC16UV1N	SSC16UV2N	-
1800	400	1300	1300	258	1881.7	2038	2340	2345	-	SSC18UV1N	SSC18UV2N	-
1800	600	1300	1200	258	1881.7	2038	2360	2385	-	SSC18UV1R	SSC18UV2R	-
2000	600	1115	1310	290	2089.0	2269	3236	3261	-	SSC20UV1R	SSC20UV2R	-

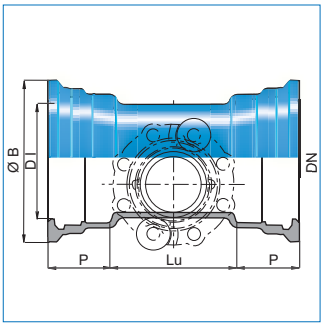
Weight: fitting alone - Reference: fitting

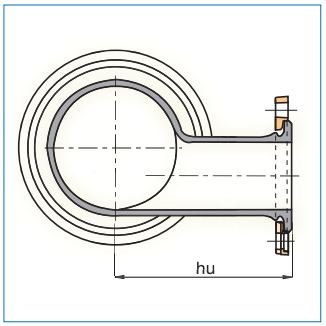
Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

Fittings DN 700 to 1600 / STANDARD double socket level invert tee with flanged branch (rotatable flange)

Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)





Main characteristics:

- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

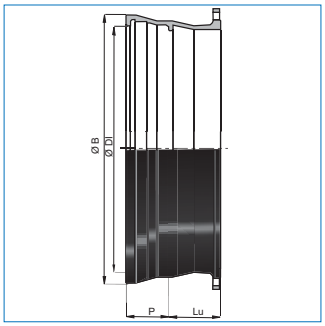
DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	200	585	500	150	742.2	861	298	346	300	SSB70UT1KTT	SSB70UT2KTT	SSB70UT3KTT
800	200	575	540	160	846.3	972	426	426	490	SSB80UT1KTT	SSB80UT2KTT	SSB80UT3KTT
900	200	595	580	175	949.4	1080	542	542	471	SSB90UT1KTT	SSB90UT2KTT	SSB90UT3KTT
1000	200	598.5	630	185	1052.5	1189	520	520	520	SSC10UT1KTT	SSC10UT2KTT	SSC10UT3KTT
1200	200	855	700	195	1263.0	1412	1083	1084	1085	SSC12UT1KTT	SSC12UT2KTT	SSC12UT3KTT
1200	300	855	720	195	1263.0	1412	964	964	964	SSC12UT1MTT	SSC12UT2MTT	SSC12UT3MTT
1400	250	1010	800	255	1467.0	1600	-	-	-	-	-	-
1400	300	1110	850	255	1467.0	1600	-	-	1990	-	-	SSC14UT3MTT
1500	250	1110	800	280	1570.0	1742	-	-	-	-	-	-
1500	300	1110	850	280	1570.0	1742	-	-	-	-	-	-
1600	300	1050	950	275	1673.0	1820	-	-	2170	-	-	SSC16UT3MTT
1600	400	1050	1005	275	1673.0	1820	-	-	-	-	-	-

Weight: fitting alone - Reference: fitting

Fittings DN 700 to 2000 / STANDARD flanged socket with STANDARD joint

Field of use:

- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)



Main characteristics:

- Internal and external coating: black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531

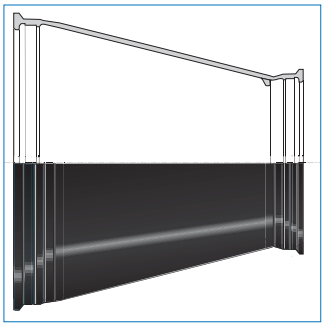
DN	Lu	P	DI	B	Weight / kg			Reference		
	mm				PN10	PN16	PN25	PN10	PN16	PN25
700	190	150	742.2	861	158	166	196	SSB70BE1	SSB70BE2	SSB70BE3
800	200	160	846.3	972	211	220	262	SSB80BE1	SSB80BE2	SSB80BE3
900	210	175	949.4	1080	258	268	319	SSB90BE1	SSB90BE2	SSB90BE3
1000	220	185	1052.5	1189	342	359	425	SSC10BE1	SSC10BE2	SSC10BE3
1100	220	150	1155.0	1298	350	386	575	SSC11BE1	SSC11BE2	SSC11BE3
1200	240	195	1263.0	1412	440	484	565	SSC12BE1	SSC12BE2	SSC12BE3
1400	310	255	1467.0	1600	716	768	897	SSC14BE1	SSC14BE2	SSC14BE3
1500	360	280	1570.0	1742	898	986	-	SSC15BE1	SSC15BE2	-
1600	330	275	1673.0	1820	963	1046	-	SSC16BE1	SSC16BE2	-
1800	387	258	1881.7	2038	1212	1305	-	SSC18BE1	SSC18BE2	-
2000	395	290	2089.0	2269	1659	1789	-	SSC20BE1	SSC20BE2	-

Weight: fitting alone - Reference: fitting

Note:
Also available:
- Blue epoxy coating conform to EN 14901 or
- Polyurethane coating conform to EN 15655

Fittings DN 700 to 2000 / STANDARD taper with STANDARD joint

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: black cataphoresis (DN 700 to 1200) - Bituminous coating (DN 1400 to 2000)
- EN 545, ISO 2531

DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
700	500	480	150	742.2	861	120	535.0	198	SSB70VE0Q
700	600	267.5	150	742.2	861	120	638.0	176	SSB70VE0R
800	600	467.5	160	846.3	972	120	638.0	255	SSB80VE0R
800	700	280	160	846.3	972	150	742.2	243	SSB80VE0S
900	700	480	175	949.4	1080	150	742.2	338	SSB90VE0S
900	800	280	175	949.4	1080	160	846.3	307	SSB90VE0T
1000	800	480	185	1052.5	1189	160	846.3	417	SSC10VE0T
1000	900	280	185	1052.5	1189	175	949.4	378	SSC10VE0U
1200	1000	480	195	1263.0	1412	185	1052.5	543	SSC12VE0V
1400	1000	665	255	1467.0	1600	185	1052.5	-	-
1400	1200	360	255	1467.0	1600	195	1263.0	714	SSC14VE0B
1500	1000	715	280	1570.0	1742	185	1052.5	-	-
1500	1200	410	280	1570.0	1742	195	1263.0	824	SSC15VE0B
1500	1400	100	280	1570.0	1742	255	1467.0	795	SSC15VE0C
1600	1200	645	275	1673.0	1820	195	1263.0	1065	SSC16VE0B
1600	1400	350	275	1673.0	1820	255	1467.0	1009	SSC16VE0C
1600	1500	400	275	1673.0	1820	280	1570.0	1187	SSC16VE0D
1800	1200	997	258	1881.7	2038	195	1263.0	-	-
1800	1400	727	258	1881.7	2038	255	1467.0	-	-
1800	1500	777	258	1881.7	2038	280	1570.0	-	-
1800	1600	427	258	1881.7	2038	275	1673.0	1267	SSC18VE0E
2000	1200	1370	290	2089.0	2269	195	1263.0	-	-
2000	1400	1075	290	2089.0	2269	255	1467.0	-	-
2000	1500	1125	290	2089.0	2269	280	1570.0	-	-
2000	1600	775	290	2089.0	2269	275	1673.0	-	-
2000	1800	472	290	2089.0	2269	258	1881.7	1776	SSC20VE0F

Weight: fitting alone - Reference: fitting

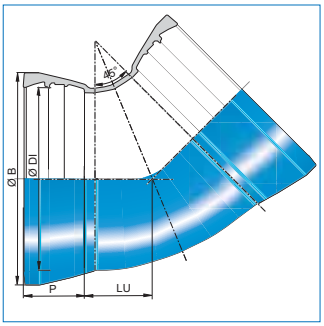
Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

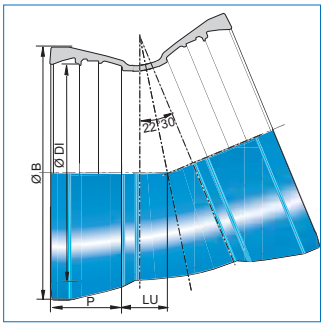
DRINKING WATER SUPPLY

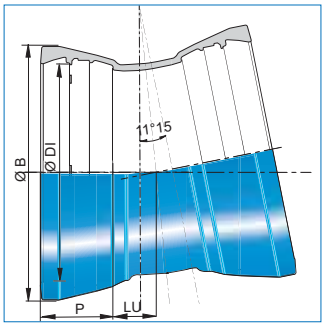
Fittings DN 700 to 1200 / UNIVERSAL bend with UNIVERSAL joint

Field of use:
- For drinking water mains
- For highly aggressive soils (Below the marine water table, acidic peaty, polluted soils, stray currents)

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531







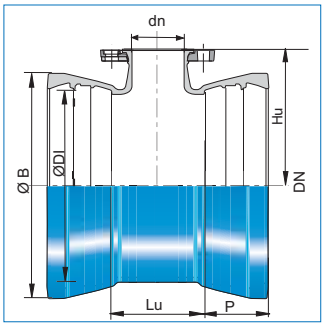
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
45°	700	335.5	256	740.5	857.0	490	SFB70CB00TT
45°	800	364	261	845.8	983.8	700	SFB80CB00TT
45°	900	415	275	948.9	1093.0	916	SFB90CB00TT
45°	1000	460	272.5	1052.0	1216.0	1085	SFC10CB00TT
45°	1200	550	279.5	1260.0	1419.6	1487	SFC12CB00TT
22°30	700	157.5	256	740.5	857.0	400	SFB70CD00TT
22°30	800	170	261	845.8	983.8	550	SFB80CD00TT
22°30	900	220	275	948.9	1093.0	770	SFB90CD00TT
22°30	1000	240	272.5	1052.0	1216.0	899	SFC10CD00TT
22°30	1200	285	279.5	1260.0	1419.6	1116	SFC12CD00TT
11°15	700	87	256	740.5	857.0	350	SFB70CE00TT
11°15	800	90	261	845.8	983.8	470	SFB80CE00TT
11°15	900	120	275	948.9	1093.0	696	SFB90CE00TT
11°15	1000	130	272.5	1052.0	1216.0	800	SFC10CE00TT
11°15	1200	150	279.5	1260.0	1419.6	950	SFC12CE00TT

Weight: fitting alone - Reference: fitting

Fittings DN 700 to 1200 / UNIVERSAL double socket tee with flanged branch (rotatable flange) with UNIVERSAL joint

Field of use:
For high or very high pressures

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



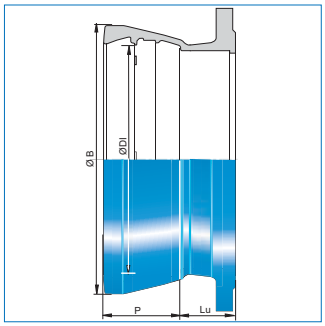
DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
		mm					PN10	PN16	PN25	PN10	PN16	PN25
700	150	365	520	256	740.5	857.0	403	403	405	SFB70UD1JTT	SFB70UD1JTT	SFB70UD3JTT
700	200	365	525	256	740.5	857.0	427	428	429	SFB70UD1KTT	SFB70UD2KTT	SFB70UD3KTT
700	300	585	530	256	740.5	857.0	511	510	512	SFB70UD1MTT	SFB70UD2MTT	SFB70UD3MTT
700	400	585	555	256	740.5	857.0	566	570	579	SFB70UD1NTT	SFB70UD2NTT	SFB70UD3NTT
800	200	355	585	261	845.8	983.8	530	530	531	SFB80UD1KTT	SFB80UD2KTT	SFB80UD3KTT
800	600	1015	645	261	845.8	983.8	820	845	848	SFB80UD1RTT	SFB80UD2RTT	SFB80UD3RTT
900	600	1145	705	275	948.9	1093.0	1180	1205	1208	SFB90UD1RTT	SFB90UD2RTT	SFB90UD3RTT
1000	600	1265	765	272.5	1052.0	1216.0	1389	1404	1407	SFC10UD1RTT	SFC10UD2RTT	SFC10UD3RTT
1200	200	822.5	880	279.5	1260.0	1419.6	1421	1421	1422	SFC12UD1KTT	SFC12UD2KTT	SFC12UD3KTT
1200	250	822.5	873	279.5	1260.0	1419.6	1423	1423	1426	SFC12UD1LTT	SFC12UD2LTT	SFC12UD3LTT
1200	300	822.5	838	279.5	1260.0	1419.6	1428	1428	1431	SFC12UD1MTT	SFC12UD2MTT	SFC12UD3MTT
1200	400	822.5	835	279.5	1260.0	1419.6	1453	1457	1466	SFC12UD1NTT	SFC12UD2NTT	SFC12UD3NTT
1200	600	840	885	279.5	1260.0	1419.6	1485	1510	1513	SFC12UD1RTT	SFC12UD2RTT	SFC12UD3RTT

Weight: fitting alone - Reference: fitting

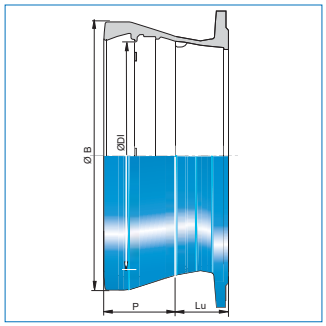
Fittings DN 700 to 1200 / UNIVERSAL flanged socket (fixed flange) with UNIVERSAL joint

Field of use:
For high or very high pressures

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



DN 700-800



DN 900-1200

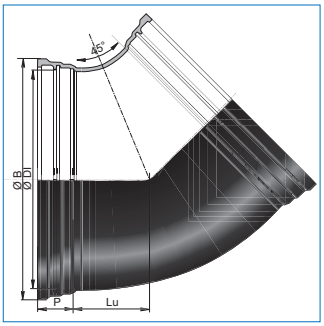
DN	Lu	P	DI	B	Weight / kg			Reference		
					PN10	PN16	PN25	PN10	PN16	PN25
700	190	256	740.5	857.0	251	259	289	SFB70BE10TT	SFB70BE20TT	SFB70BE30TT
800	200	261	845.8	983.8	330	385	450	SFB80BE10TT	SFB80BE20TT	SFB80BE30TT
900	210	275	948.9	1093.0	440	450	501	SFB90BE10TT	SFB90BE20TT	SFB90BE30TT
1000	220	272.5	1052.0	1216.0	533	550	616	SFC10BE10TT	SFC10BE20TT	SFC10BE30TT
1200	240	279.5	1260.0	1419.6	679	720	801	SFC12BE10TT	SFC12BE20TT	SFC12BE30TT

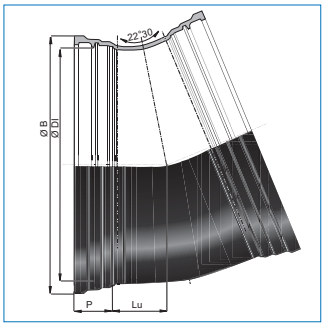
Weight: fitting alone - Reference: fitting

Fittings DN 1400 to 2000 / PAMLOCK bend with PAMLOCK anchored joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: Bituminous coating
- EN 545, ISO 2531





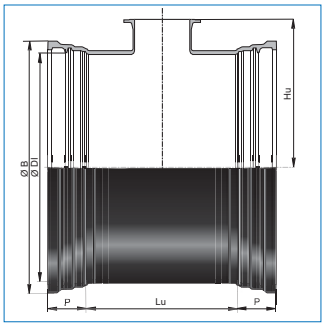
Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
		mm					
45°	1400	522	300	1467.1	1632.0	1603	SPC14CB
45°	1500	655	322	1570.3	1759.3	2240	SPC15CB
45°	1600	563	325	1809.0	1870.4	2390	SPC16CB
45°	1800	730	350	1880.7	2075.3	3672	SPC18CB
45°	2000	748	394	2088.0	2313.0	-	-
22°30	1400	264	300	1467.1	1632.0	1155	SPC14CD
22°30	1500	397	322	1570.3	1759.3	1630	SPC15CD
22°30	1600	284	325	1809.0	1870.4	1705	SPC16CD
22°30	1800	425	350	1880.7	2075.3	2616	SPC18CD
22°30	2000	418.5	394	2088.0	2313.0	-	-
11°15	1400	143	300	1467.1	1632.0	932	SPC14CE
11°15	1500	276	322	1570.3	1759.3	1400	SPC15CE
11°15	1600	153	325	1809.0	1870.4	1399	SPC16CE
11°15	1800	288	350	1880.7	2075.3	2088	SPC18CE
11°15	2000	265	394	2088.0	2313.0	-	-

Fittings DN 1400 to 1800 / PAMLOCK double socket tee with flanged branch with PAMLOCK anchored joint

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: Bituminous coating
- EN 545, ISO 2531



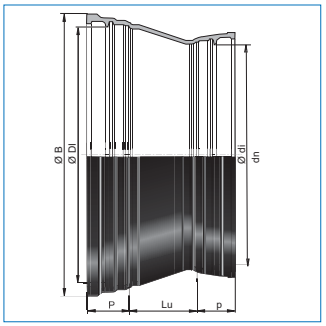
DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
	mm						PN10	PN16	PN25	PN10	PN16	PN25
(*)1400	400	1010	960	300	1467.1	1632.0	1553	-	-	SPC14TV1N	-	-
1400	600	1010	980	300	1467.1	1632.0	1662	-	-	SPC14UD1R	-	-
1400	1400	1950	1100	300	1467.1	1632.0	2612	2660	-	SPC14TD1C	SPC14TD2C	-
(*)1500	400	1110	960	322	1570.3	1759.3	1986	1991	-	SPC15UV1N	SPC15UV2N	-
1500	600	1110	980	322	1570.3	1759.3	-	2038	-	-	SPC15UD2R	-
1600	300	1050	1050	325	1809.0	1870.4	-	2268	-	-	SPC16UD2M	-
1600	600	1050	1090	325	1809.0	1870.4	-	2323	-	-	SPC16UD2R	-
(*)1800	600	1255	1200	350	1880.7	2075.3	2935	-	-	SPC18UV1R	-	-
1800	800	1360	1230	350	1880.7	2075.3	3329	3346	-	SPC18TD1T	SPC18TD2T	-

(*)Washout tee

Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

Fittings DN 1400 to 1800 / PAMLOCK taper with PAMLOCK anchored joint

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: Bituminous coating
- EN 545, ISO 2531

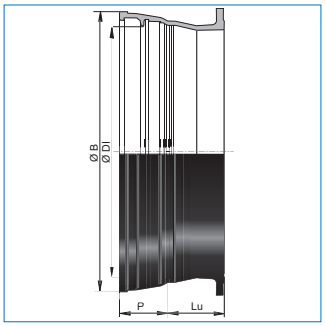
DN	dn	Lu	P	DI	B	p	di	Weight	Reference
		mm						kg	
1400	1200	360	300	1467.1	1632.0	195	1263.0	NC	NC
1500	1200	493	322	1573.3	1759.3	195	1263.0	NC	NC
1500	1400	183	322	1570.3	1759.3	300	1467.1	NC	NC
1600	1200	645	325	1809.0	1870.4	195	1263.0	NC	NC
1600	1400	350	325	1809.0	1870.4	300	1467.1	NC	NC
1600	1500	483	325	1809.0	1870.4	322	1570.3	NC	NC
1800	1600	515	350	1880.7	2075.3	325	1809.0	NC	NC

Weight: fitting alone - Reference: fitting
For more information, please contact us

Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

Fittings DN 1400 to 2000 / PAMLOCK flanged socket with PAMLOCK anchored joint

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: Bituminous coating
- EN 545, ISO 2531

DN	Lu	P	DI	B	Weight / kg			Reference		
	mm				PN10	PN16	PN25	PN10	PN16	PN25
1400	310	300	1467.1	1632.0	740	792	921	SPC14BE1	SPC14BE2	SPC14BE3
1500	443	322	1570.3	1759.3	972	1060	-	SPC15BE1	SPC15BE2	-
1600	330	325	1809.0	1870.4	1076	1159	-	SPC16BE1	SPC16BE2	-
1800	475	350	1880.7	2075.3	1505	1588	-	SPC18BE1	SPC18BE2	-
2000	457	394	2088.0	2313.0	-	2200	-	-	SPC20BE2	-

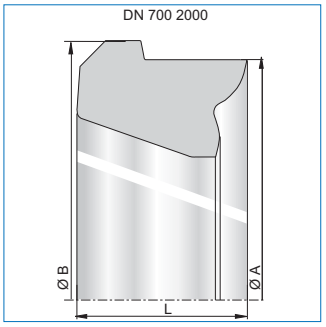
Weight: fitting alone - Reference: fitting

Note:
Also available:
- Blue epoxy coating in compliance with EN 14901 or
- Polyurethane coating in compliance with EN 15655

Joints DN 700 to 2000 / STANDARD gasket for pipes and fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- Easy and quick assembling
- Gap accepted
- Important safety factor above PFA
- High angular deflection
- EN 681.1
- EN 545, ISO 2531

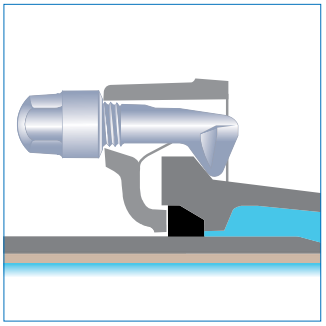


DN	L	A	B	Weight	Reference
	mm			kg	
700	48.2	787.6	797.6	2.871	JSB70BA
800	51.4	895.4	905.4	3.670	JSB80BA
900	54.6	1002.3	1012.3	4.612	JSB90BA
1000	57.8	1109.1	1119.1	5.588	JSC10BA
1100	65.1	1218.5	1229.5	7.680	JSC11BA
1200	68.2	1326.2	1338.2	9.335	JSC12BA
1400	81.6	1546.4	1554.9	15.489	JSC14BA
1500	89.2	1656.6	1675.6	19.766	JSC15BA
1600	89.2	1761.4	1780.4	21.046	JSC16BA
1800	96.6	1977.0	1998.0	27.722	JSC18BA
2000	104.6	2204.8	2226.8	29.000	JSC20BA

Joints DN 700 to 2000 / EXPRESS joint for EXPRESS fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM (EN 681-1)
- Counterflange coating: Bituminous coating
- Parkerised and cataphoresis epoxy coated bolts and nuts
- EN 545, ISO 2531
- High angular deflection accepted



DN	Counterflange		EXPRESS gasket		Bolt		Complete kit
	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference	
700	38	JEB70A	2.565	JEB70BA	11.76	JXM27DR102V (X16)	JEB70A-E00
800	47	JEB80A	3.310	JEB80BA	13.23	JXM27DR102V (X18)	JEB80A-E00
900	58	JEB90A	4.177	JEB90BA	14.70	JXM27DR102V (X20)	JEB90A-E00
1000	70	JEC10A	5.220	JEC10BA	17.64	JXM27DR102V (X24)	JEC10A-E00
1100	83	JEC11A	6.140	JEC11BA	19.11	JXM27DR102V (X26)	JEC11A-E00
1200	99	JEC12A	7.390	JEC12BA	22.05	JXM27DR102V (X30)	JEC12A-E00

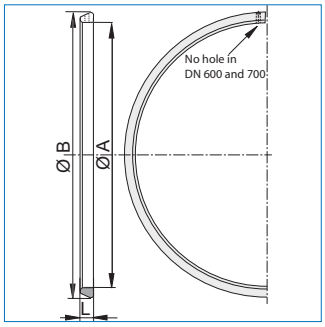
DN 1400 to 2000 (collar.) Please contact us

Joints DN 700 to 1200 / UNIVERSAL Ve joint for UNIVERSAL Ve pipes and fittings

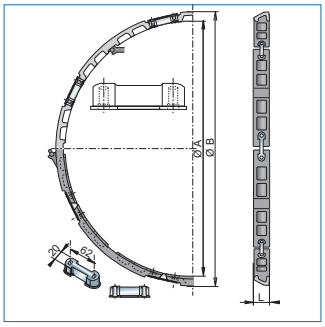
Field of use:
For drinking water anchored mains used in extreme conditions

Main characteristics:
- Material: EPDM
- Locking ring with external spheric profile made in one or several pieces
- EN 545, ISO 2531

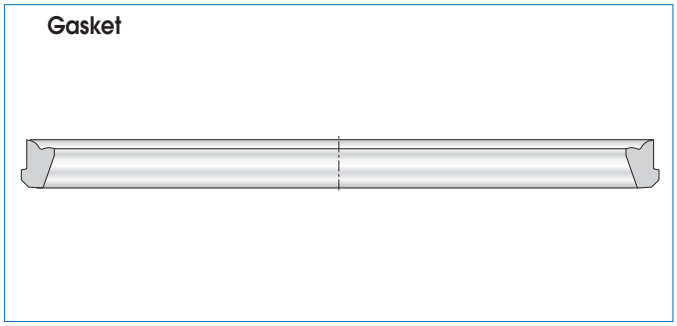
STANDARD UNIVERSAL locking ring



DN 700



DN 800-1200



DN	Locking ring			STANDARD gasket	
	Weight (kg)	Reference	Segments	Weight (kg)	Reference
700	9.7	110671	1	2.871	JSB70BA
800	17.3	JFB80S	7	3.670	JSB80BA
900	22.6	JFB90S	8	4.612	JSB90BA
1000	24.8	JFC10S	9	5.588	JSC10BA
1200	26.9	JFC12S	10	9.335	JSC12BA

Joints DN 1400 to 1800 / PAMLOCK joint for PAMLOCK pipes and fittings

Field of use:
For drinking water anchored mains

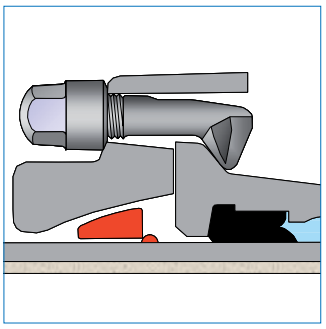
Main characteristics:
- Material: EPDM (EN 681-1)
- EN 545, ISO 2531
- High angular deflection accepted

DN	PAMLOCK anchored kit		STANDARD gasket	
	Weight (kg)	Reference	Weight (kg)	Reference
1400	136.6	JPC14L	15.489	JSC14BA
1500	144	JPC15L	19.766	JSC15BA
1600	150	JPC16L	21.046	JSC16BA
1800	180	JPC18L	27.722	JSC18BA

Joints DN 700 to 1200 / STANDARD Ve joint for STANDARD Ve K9 pipes and STANDARD Ve fittings

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM (EN 681-1)
- Bolts in cast iron
- EN 545, ISO 2531
- High angular deflection



D	Counterflange		Locking ring		STANDARD gasket		Bolts in cast iron	
	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference	Weight (kg)	Reference
700	109	JSB70V	14.6	JSB70E	2.871	JSB70BA	22.08	JXM27DR123 (X24)
800	140	JCB80V	15.75	JSB80S	3.670	JSB80BA	27.60	JXM27DR123 (X30)
900	184	JCB90V	17.2	JSB90S	4.612	JSB90BA	27.60	JXM27DR123 (X30)
1000	211	JCC10V	19.35	JCC10S	5.588	JSC10BA	27.60	JXM27DR123 (X30)
1100	232	JSC11V	17.5	JSC11S	7.680	JSC11BA	36.80	JXM27DR123 (X40)
1200	222	JSC12V	21.5	JSC12S	9.335	JSC12BA	36.80	JXM27DR123 (X40)

DN 40 to 2000

Flanged range

Pipes – Fittings – Joints – Accessories

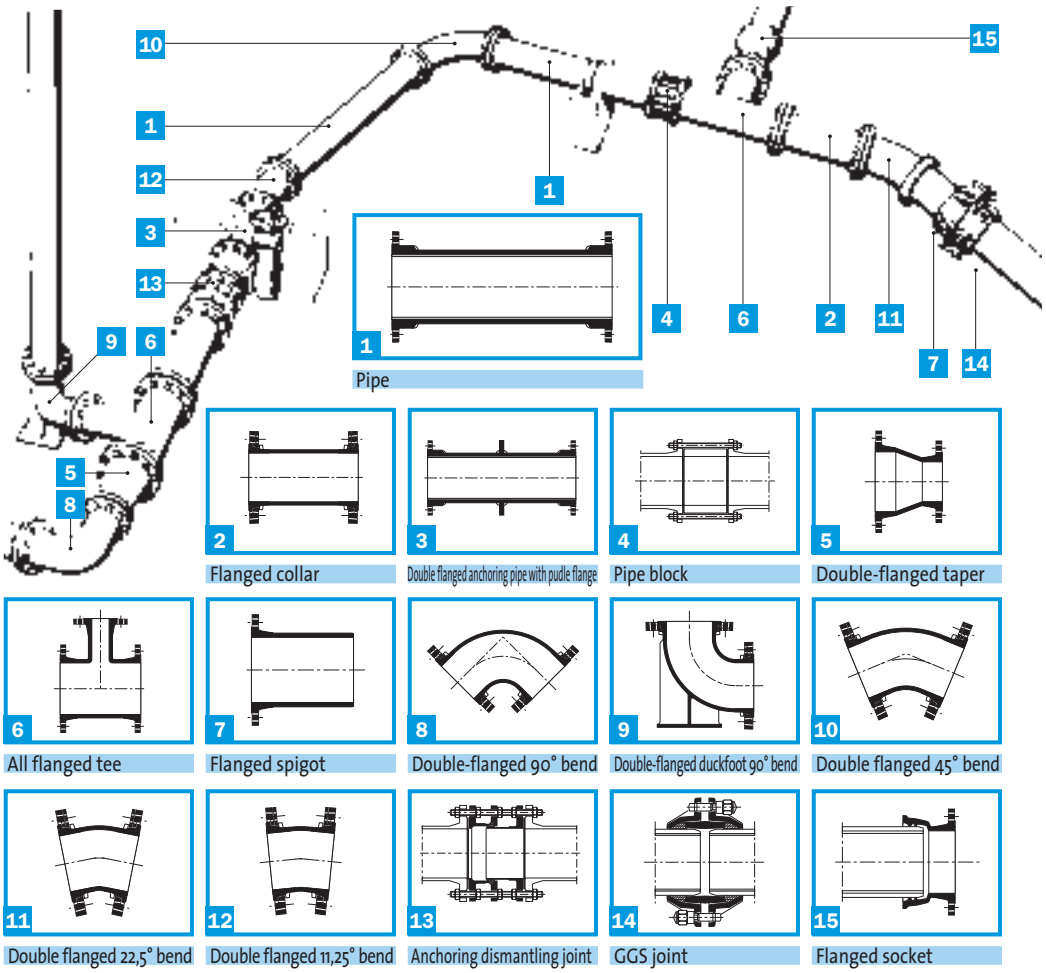
Flanged pipelines

The added value

- Easy adaptation to all system configuration thanks to a complete range of fitting.
- Good resistance to different fluid tapes.
- Possible to dismantle allowing the modification and control of installation.
- Self-anchoring: all the pipe system elements are kept together.
- Easy and precised assembly.

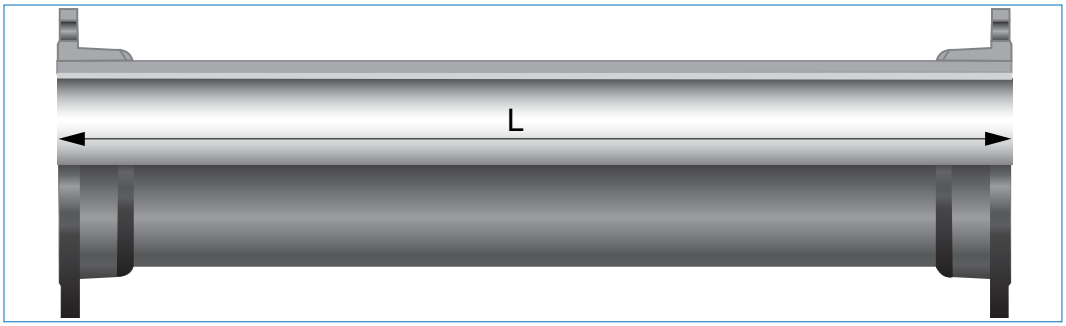
The coatings

- Rotatable flanged fittings from DN 40 to DN 600: blue cataphoresis coating.
- Fixed flanged fittings from DN 60 to DN 2000: blue epoxy coating.
- Fixed flanged fittings with DN > 600: black bituminous coating or equivalent.
- Double welded flanged anchoring pipe with puddle flange, integrally cast double flanged anchoring pipe with puddle flange, flanged spigot, welded flanged spigot, anchoring flanged spigot, welded flanged spigot with puddle flange, all flanged collar and pipe block
  - Internal coating: Centrifuged cement mortar lining
  - External coating: zinc + black bituminous coating



Double welded flanged pipe
L = 1.00 m





Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

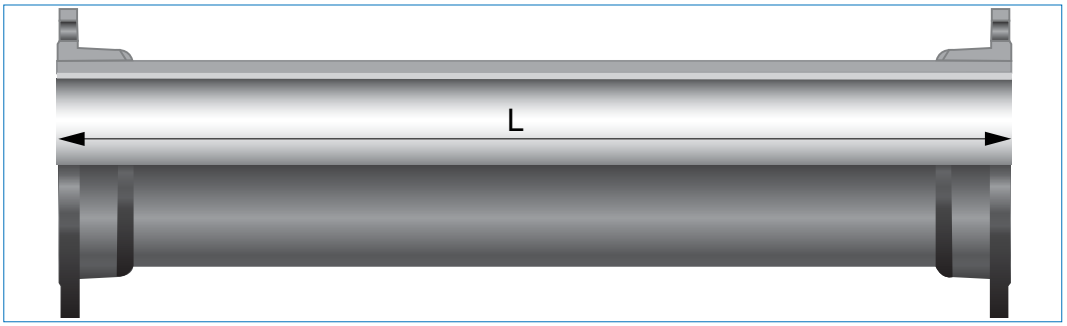
DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
60	1000	K9	6.0	16	16	16.6	BBA60FA1CAD	BBA60FA1CAD	BBA60FA3CAD
80	1000	K9	6.0	21	21	21	BBA80FA1CAD	BBA80FA1CAD	BBA80FA1CAD
100	1000	K9	6.0	24.8	24.8	25.8	BBB10FA1CAD	BBB10FA1CAD	BBB10FA3CAD
125	1000	K9	6.0	31.4	31.4	34.4	BBB12FA1CAD	BBB12FA1CAD	BBB12FA3CAD
150	1000	K9	6.0	38.2	38.2	39.8	BBB15FA1CAD	BBB15FA1CAD	BBB15FA3CAD
200	1000	K9	6.3	57	52.2	67.9	BBB20FA1CAD	BBB20FA2CAD	BBB20FA3CAD
250	1000	K9	6.8	76	76	80.8	BBB25FA1CAD	BBB25FA2CAD	BBB25FA3CAD
300	1000	K9	7.2	97.5	97.5	106.6	BBB30FA1CAD	BBB30FA2CAD	BBB30FA3CAD
350	1000	K9	7.7	122.5	130 .5	142.4	BBB35FA1CAD	BBB35FA2CAD	BBB35FA3CAD
400	1000	K9	8.1	139	163.8	175.6	BBB40FA1CAD	BBB40FA2CAD	BBB40FA3CAD
450	1000	K9	8.6	166	185	220.7	BBB45FA1CAD	BBB45FA2CAD	BBB45FA3CAD
500	1000	K9	9.0	229	221	249.1	BBB50FA1CAD	BBB50FA2CAD	BBB50FA3CAD
600	1000	K9	9.9	257	309	325.7	BBB60FA1CAD	BBB60FA2CAD	BBB60FA3CAD
700	1000	K9	10.8	339	369	-	BBB70FA1CAD	BBB70FA2CAD	-
800	1000	K9	11.7	430	464	-	BBB80FA1CAD	BBB80FA2CAD	-
900	1000	K9	12.6	514	552	-	BBB90FA1CAD	BBB90FA2CAD	-
1000	1000	K9	13.5	621	693	-	BBC10FA1CAD	BBC10FA2CAD	-
1100	1000	K9	14.4	755	-	-	BBC11FA1CAD	-	-
1200	1000	K9	15.3	883	998	-	BBC12FA1CAD	BBC12FA2CAD	-
1400	1000	K9	17.1	1160	-	-	BBC14FA1CAD	-	-

For more information, please contact us.

DRINKING WATER SUPPLY

Double welded flanged pipe
L = 2.00 m





Field of use:
For drinking water mains

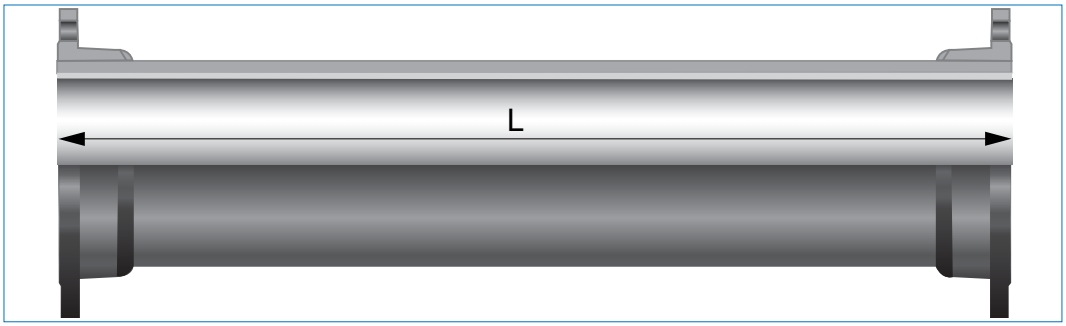
Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
60	2000	K9	6.0	27	27	31.8	BBA60FA1EAD	BBA60FA1EAD	BBA60FA3EAD
80	2000	K9	6.0	37	37	37	BBA80FA1EAD	BBA80FA1EAD	BBA80FA1EAD
100	2000	K9	6.0	42.2	42.2	43.6	BBB10FA1EAD	BBB10FA1EAD	BBB10FA3EAD
125	2000	K9	6.0	53.2	53.2	56.8	BBB12FA1EAD	BBB12FA1EAD	BBB12FA3EAD
150	2000	K9	6.0	64.5	64.5	66	BBB15FA1EAD	BBB15FA1EAD	BBB15FA3EAD
200	2000	K9	6.3	86	94	91	BBB20FA1EAD	BBB20FA2EAD	BBB20FA3EAD
250	2000	K9	6.8	124	124	122.8	BBB25FA1EAD	BBB25FA2EAD	BBB25FA3EAD
300	2000	K9	7.2	158	168	164.2	BBB30FA1EAD	BBB30FA2EAD	BBB30FA3EAD
350	2000	K9	7.7	203	217.6	232	BBB35FA1EAD	BBB35FA2EAD	BBB35FA3EAD
400	2000	K9	8.1	251	261.8	266.2	BBB40FA1EAD	BBB40FA2EAD	BBB40FA3EAD
450	2000	K9	8.6	272	291	327.4	BBB45FA1EAD	BBB45FA2EAD	BBB45FA3EAD
500	2000	K9	9.0	396	344	372.2	BBB50FA1EAD	BBB50FA2EAD	BBB50FA3EAD
600	2000	K9	9.9	517	468	485.4	BBB60FA1EAD	BBB60FA2EAD	BBB60FA3EAD
700	2000	K9	10.8	544	574	-	BBB70FA1EAD	BBB70FA2EAD	-
800	2000	K9	11.7	681	715	-	BBB80FA1EAD	BBB80FA2EAD	-
900	2000	K9	12.6	814	852	-	BBB90FA1EAD	BBB90FA2EAD	-
1000	2000	K9	13.5	975	1047	-	BBC10FA1EAD	BBC10FA2EAD	-
1100	2000	K9	14.4	1166	-	-	BBC11FA1EAD	-	-
1200	2000	K9	15.3	1356	1472	-	BBC12FA1EAD	BBC12FA2EAD	-
1400	2000	K9	17.1	1800	-	-	BBC14FA1EAD	-	-

For more information, please contact us.

Double welded flanged pipe
L = 3.00 m





Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

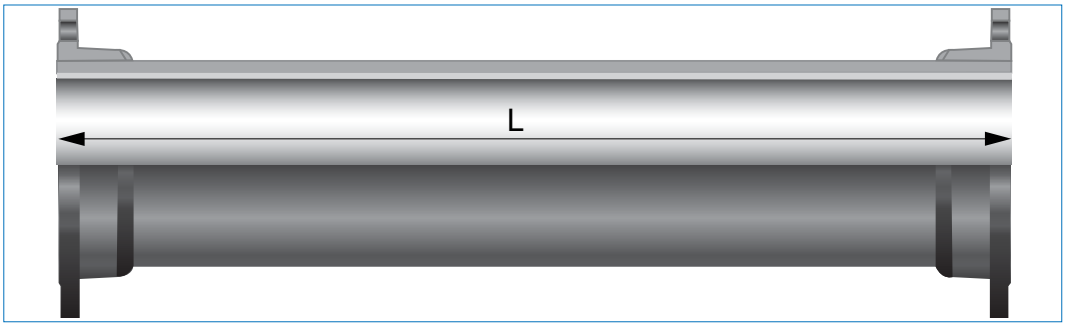
DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
60	3000	K9	6.0	45.1	45.1	45.1	BBA60FA1GAD	BBA60FA1GAD	BBA60FA3GAD
80	3000	K9	6.0	56	56	56	BBA80FA1GAD	BBA80FA1GAD	BBA80FA1GAD
100	3000	K9	6.0	59	59	62.5	BBB10FA1GAD	BBB10FA1GAD	BBB10FA3GAD
125	3000	K9	6.0	76.8	76.8	79.2	BBB12FA1GAD	BBB12FA1GAD	BBB12FA3GAD
150	3000	K9	6.0	90.2	90.2	100	BBB15FA1GAD	BBB15FA1GAD	BBB15FA3GAD
200	3000	K9	6.3	120.5	131	145.7	BBB20FA1GAD	BBB20FA2GAD	BBB20FA3GAD
250	3000	K9	6.8	172	172	196	BBB25FA1GAD	BBB25FA2GAD	BBB25FA3GAD
300	3000	K9	7.2	218.5	218.5	263.1	BBB30FA1GAD	BBB30FA2GAD	BBB30FA3GAD
350	3000	K9	7.7	283.5	299.6	314	BBB35FA1GAD	BBB35FA2GAD	BBB35FA3GAD
400	3000	K9	8.1	321	359.8	356.8	BBB40FA1GAD	BBB40FA2GAD	BBB40FA3GAD
450	3000	K9	8.6	379	398	434.1	BBB45FA1GAD	BBB45FA2GAD	BBB45FA3GAD
500	3000	K9	9.0	438	467	495.3	BBB50FA1GAD	BBB50FA2GAD	BBB50FA3GAD
600	3000	K9	9.9	575	627	645.1	BBB60FA1GAD	BBB60FA2GAD	BBB60FA3GAD
700	3000	K9	10.8	749	779	-	BBB70FA1GAD	BBB70FA2GAD	-
800	3000	K9	11.7	931	965	-	BBB80FA1GAD	BBB80FA2GAD	-
900	3000	K9	12.6	1113	1151	-	BBB90FA1GAD	BBB90FA2GAD	-
1000	3000	K9	13.5	1328	1400	-	BBC10FA1GAD	BBC10FA2GAD	-
1100	3000	K9	14.4	1577	-	-	BBC11FA1GAD	-	-
1200	3000	K9	15.3	1829	1833	-	BBC12FA1GAD	BBC12FA2GAD	-
1400	3000	K9	17.1	2440	-	-	BBC14FA1GAD	-	-

For more information, please contact us.

DRINKING WATER SUPPLY

Double welded flanged pipe
L = 4.00 m





Field of use:
For drinking water mains

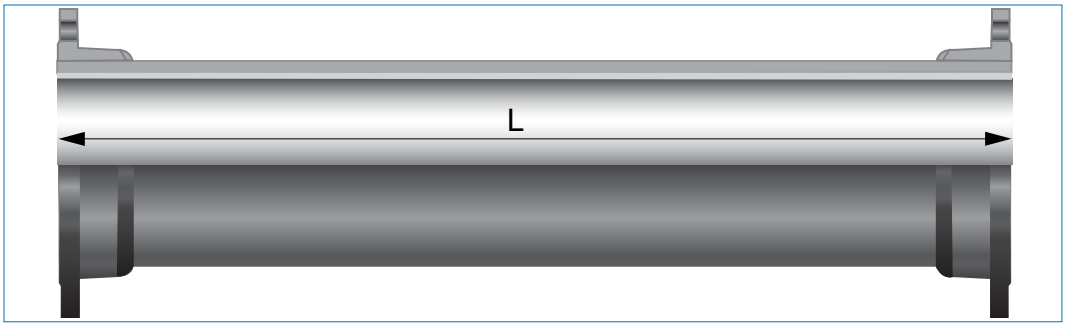
Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
60	4000	K9	6.0	48.5	48.5	58.4	BBA60FA1JAD	BBA60FA1JAD	BBA60FA3JAD
80	4000	K9	6.0	63	63	63	BBA80FA1JAD	BBA80FA1JAD	BBA80FA1JAD
100	4000	K9	6.0	77.5	77.5	80.2	BBB10FA1JAD	BBB10FA1JAD	BBB10FA3JAD
125	4000	K9	6.0	96.4	96.4	101.6	BBB12FA1JAD	BBB12FA1JAD	BBB12FA3JAD
150	4000	K9	6.0	116.2	116.2	130.8	BBB15FA1JAD	BBB15FA1JAD	BBB15FA3JAD
200	4000	K9	6.3	178.8	168	184.6	BBB20FA1JAD	BBB20FA2JAD	BBB20FA3JAD
250	4000	K9	6.8	226.2	222.8	247.2	BBB25FA1JAD	BBB25FA2JAD	BBB25FA3JAD
300	4000	K9	7.2	266	279	327.8	BBB30FA1JAD	BBB30FA2JAD	BBB30FA3JAD
350	4000	K9	7.7	364	381.6	396	BBB35FA1JAD	BBB35FA2JAD	BBB35FA3JAD
400	4000	K9	8.1	411	457.8	447.4	BBB40FA1JAD	BBB40FA2JAD	BBB40FA3JAD
450	4000	K9	8.6	485	504	540.8	BBB45FA1JAD	BBB45FA2JAD	BBB45FA3JAD
500	4000	K9	9.0	561	590	618.4	BBB50FA1JAD	BBB50FA2JAD	BBB50FA3JAD
600	4000	K9	9.9	734	786	804.8	BBB60FA1JAD	BBB60FA2JAD	BBB60FA3JAD
700	4000	K9	10.8	954	984	-	BBB70FA1JAD	BBB70FA2JAD	-
800	4000	K9	11.7	1182	1216	-	BBB80FA1JAD	BBB80FA2JAD	-
900	4000	K9	12.6	1413	1451	-	BBB90FA1JAD	BBB90FA2JAD	-
1000	4000	K9	13.5	1681	1753	-	BBC10FA1JAD	BBC10FA2JAD	-
1100	4000	K9	14.4	1988	-	-	BBC11FA1JAD	-	-
1200	4000	K9	15.3	2302	-	-	BBC12FA1JAD	-	-
1400	4000	K9	17.1	3080	-	-	BBC14FA1JAD	-	-

For more information, please contact us.

Double welded flanged pipe
L = 5.00 m





Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

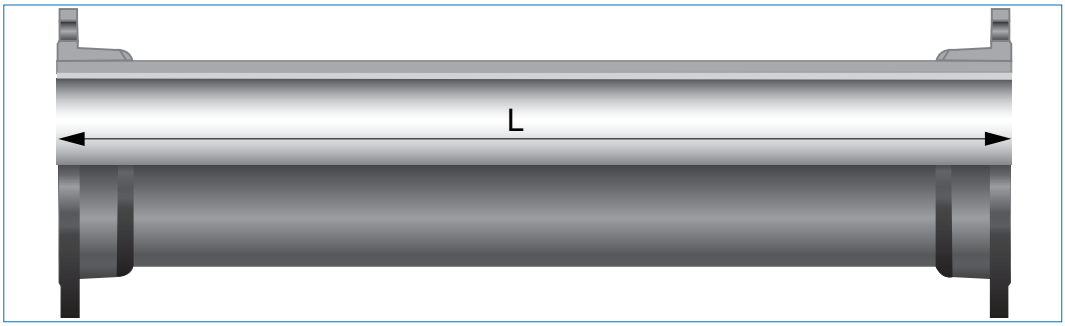
DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
60	5000	K9	6.0	59	59	71.7	BBA60FA1LAD	BBA60FA1LAD	BBA60FA3LAD
80	5000	K9	6.0	77	77	77	BBA80FA1LAD	BBA80FA1LAD	BBA80FA1LAD
100	5000	K9	6.0	95	95	97.9	BBB10FA1LAD	BBB10FA1LAD	BBB10FA3LAD
125	5000	K9	6.0	118.1	118.1	124	BBB12FA1LAD	BBB12FA1LAD	BBB12FA3LAD
150	5000	K9	6.0	142.2	142.2	153.9	BBB15FA1LAD	BBB15FA1LAD	BBB15FA3LAD
200	5000	K9	6.3	190	205	196.6	BBB20FA1LAD	BBB20FA2LAD	BBB20FA3LAD
250	5000	K9	6.8	268	281.3	298.5	BBB25FA1LAD	BBB25FA2LAD	BBB25FA3LAD
300	5000	K9	7.2	339.5	339.5	383	BBB30FA1LAD	BBB30FA2LAD	BBB30FA3LAD
350	5000	K9	7.7	477.6	463.6	478	BBB35FA1LAD	BBB35FA2LAD	BBB35FA3LAD
400	5000	K9	8.1	501	512	538	BBB40FA1LAD	BBB40FA2LAD	BBB40FA3LAD
450	5000	K9	8.6	592	611	647.5	BBB45FA1LAD	BBB45FA2LAD	BBB45FA3LAD
500	5000	K9	9.0	683	712	741.5	BBB50FA1LAD	BBB50FA2LAD	BBB50FA3LAD
600	5000	K9	9.9	894	946	965	BBB60FA1LAD	BBB60FA2LAD	BBB60FA3LAD
700	5000	K9	10.8	1159	1189	-	BBB70FA1LAD	BBB70FA2LAD	-
800	5000	K9	11.7	1432	1466	-	BBB80FA1LAD	BBB80FA2LAD	-
900	5000	K9	12.6	1713	1751	-	BBB90FA1LAD	BBB90FA2LAD	-
1000	5000	K9	13.5	2034	2106	-	BBC10FA1LAD	BBC10FA2LAD	-
1100	5000	K9	14.4	2399	-	-	BBC11FA1LAD	-	-
1200	5000	K9	15.3	2775	-	-	BBC12FA1LAD	-	-
1400	5000	K9	17.1	3720	-	-	BBC14FA1LAD	-	-

For more information, please contact us.

DRINKING WATER SUPPLY

Double welded flanged pipe
L = 5.90 m





Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

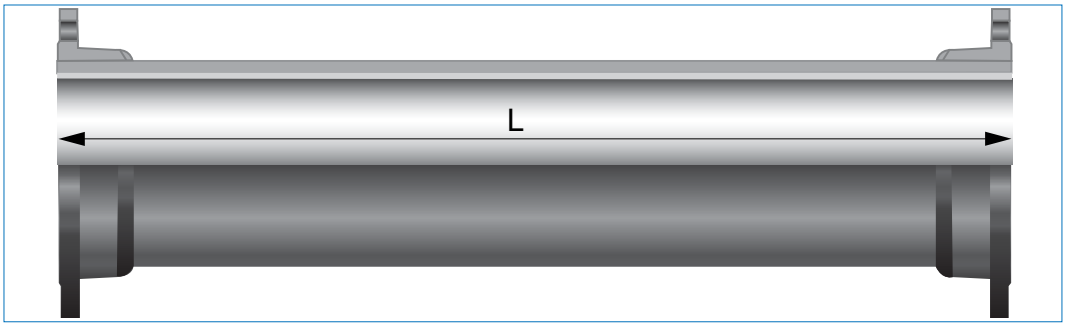
DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
60	5900	K9	6.0	69	69	69.5	BBA60FA1SAD	BBA60FA1SAD	BBA60FA3SAD
80	5900	K9	6.0	89.5	89.5	89.5	BBA80FA1SAD	BBA80FA1SAD	BBA80FA1SAD
100	5900	K9	6.0	110.5	110.5	113.8	BBB10FA1SAD	BBB10FA1SAD	BBB10FA3SAD
125	5900	K9	6.0	138.2	138.2	144.2	BBB12FA1SAD	BBB12FA1SAD	BBB12FA3SAD
150	5900	K9	6.0	165.6	165.6	168.2	BBB15FA1SAD	BBB15FA1SAD	BBB15FA3SAD
200	5900	K9	6.3	220	238.3	258.5	BBB20FA1SAD	BBB20FA2SAD	BBB20FA3SAD
250	5900	K9	6.8	311.2	311.2	301.8	BBB25FA1SAD	BBB25FA2SAD	BBB25FA3SAD
300	5900	K9	7.2	412	424.1	450.7	BBB30FA1SAD	BBB30FA2SAD	BBB30FA3SAD
350	5900	K9	7.7	517	537.4	551.8	BBB35FA1SAD	BBB35FA2SAD	BBB35FA3SAD
400	5900	K9	8.1	582	593	619.5	BBB40FA1SAD	BBB40FA2SAD	BBB40FA3SAD
450	5900	K9	8.6	688	707	743.5	BBB45FA1SAD	BBB45FA2SAD	BBB45FA3SAD
500	5900	K9	9.0	794	823	852.3	BBB50FA1SAD	BBB50FA2SAD	BBB50FA3SAD
600	5900	K9	9.9	1037	1089	1108.2	BBB60FA1SAD	BBB60FA2SAD	BBB60FA3SAD

DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
700	6000	K9	10.8	1364	1394	-	BBB70FA1NAD	BBB70FA2NAD	-
800	6000	K9	11.7	1682	1716	-	BBB80FA1NAD	BBB80FA2NAD	-
900	6000	K9	12.6	2013	2051	-	BBB90FA1NAD	BBB90FA2NAD	-
1000	6000	K9	13.5	2388	2460	-	BBC10FA1NAD	BBC10FA2NAD	-
1100	6000	K9	14.4	2810	-	-	BBC11FA1NAD	-	-
1200	6000	K9	15.3	3248	-	-	BBC12FA1NAD	-	-
1400	6000	K9	17.1	4360	-	-	BBC14FA1NAD	-	-

For more information, please contact us.

Double welded flanged pipe
L = 6.40 m - L = 7.00 m - L = 7.40 m





Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
700	6400	K9	10.8	1146	1476	-	BBB70FA1TAD	BBB70FA2TAD	-
800	6400	K9	11.7	1782	1816	-	BBB80FA1TAD	BBB80FA2TAD	-
900	6400	K9	12.6	2133	2171	-	BBB90FA1TAD	BBB90FA2TAD	-
1000	6400	K9	13.5	2529	2601	-	BBC10FA1TAD	BBC10FA2TAD	-

DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
1100	7000	K9	14.4	3228	-	-	BBC11FA1UAD	-	-
1200	7000	K9	15.3	3721	-	-	BBC12FA1UAD	-	-
1400	7000	K9	17.1	5000	-	-	BBC14FA1UAD	-	-

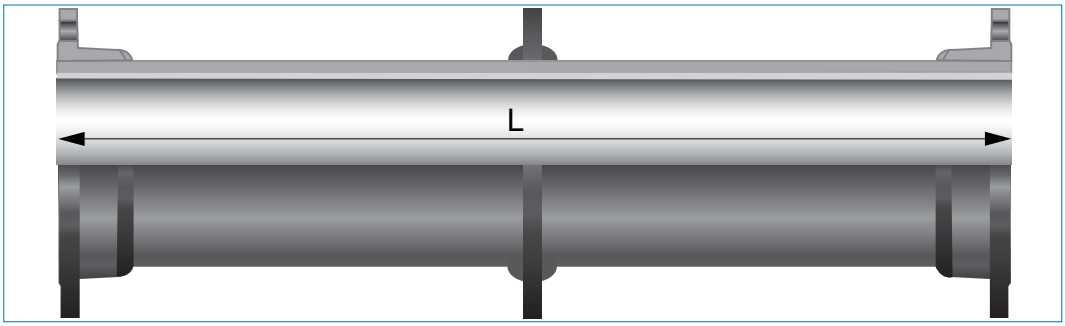
DN	L	Class	e	Weight / kg			Reference		
	mm		mm	PN10	PN16	PN25	PN10	PN16	PN25
1100	7400	K9	14.4	3393	-	-	BBC11FA1VAD	-	-
1200	7400	K9	15.3	3910	-	-	BBC12FA1VAD	-	-
1400	7400	K9	17.1	5256	-	-	BBC14FA1VAD	-	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 0.50 m - L = 0.60 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	500	K9	10.6	10.6	12.9	BBA60FD1BAD	BBA60FD1BAD	BBA60FD3BAD
125	500	K9	23.2	23 .2	-	BBB12FD1BAD	BBB12FD1BAD	-
150	500	K9	30.1	30.1	-	BBB15FD1BAD	BBB15FD1BAD	-
200	500	K9	43.1	-	-	BBB20FD1BAD	-	-
250	500	K9	57.9	-	-	BBB25FD1BAD	-	-
300	500	K9	-	79.4	-	-	BBB30FD2BAD	-
400	500	K9	-	131.3	-	-	BBB40FD2BAD	-
500	500	K9	165	-	-	BBB50FD1BAD	-	-
600	500	K9	-	278.8	-	-	BBB60FD2BAD	-

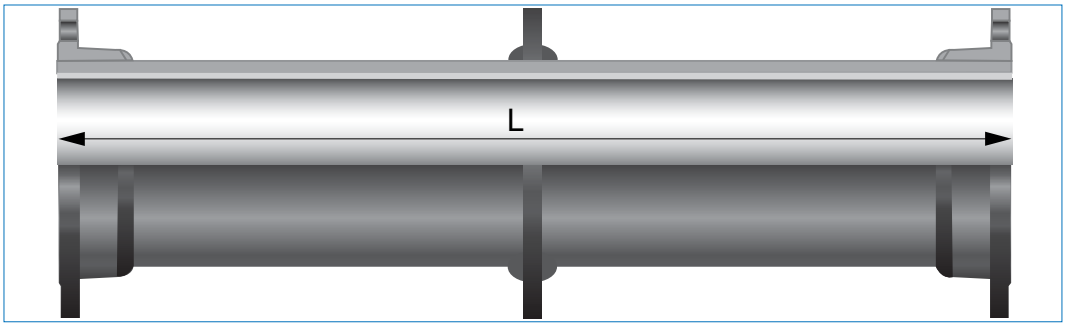
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	600	K9	14	14	14.6	BBA60FD1QAD	BBA60FD1QAD	BBA60FD3QAD
80	600	K9	18	18	18	BBA80FD1QAD	BBA80FD1QAD	BBA80FD1QAD
100	600	K9	21.5	21.5	22.5	BBB10FD1QAD	BBB10FD1QAD	BBB10FD3QAD
125	600	K9	27.5	27.5	27.9	BBB12FD1QAD	BBB12FD1QAD	BBB12FD3QAD
150	600	K9	34	34	35.4	BBB15FD1QAD	BBB15FD1QAD	BBB15FD3QAD
200	600	K9	46.6	46.6	50.2	BBB20FD1QAD	BBB20FD2QAD	BBB20FD3QAD
250	600	K9	63.5	-	76.8	BBB25FD1QAD	-	BBB25FD3QAD
300	600	K9	86.1	85.8	107.8	BBB30FD1QAD	BBB30FD2QAD	BBB30FD3QAD
400	600	K9	-	140	-	-	BBB40FD2QAD	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 0.70 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



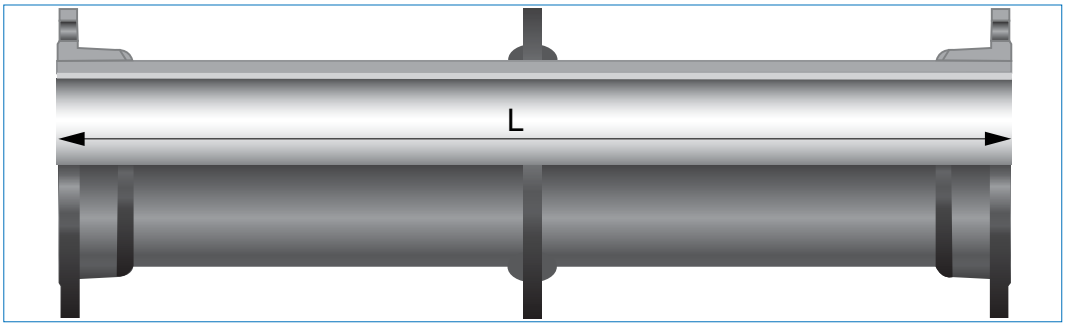
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
80	700	K9	25.6	25.6	25.6	BBA80FD1RAD	BBA80FD1RAD	BBA80FD1RAD
100	700	K9	-	-	23.9	-	-	BBB10FD3RAD
150	700	K9	-	-	42.4	-	-	BBB15FD3RAD
350	700	K9	-	119.9	-	-	BBB35FD2RAD	-
600	700	K9	197.1	311	326.8	BBB60FD1RAD	BBB60FD2RAD	BBB60FD3RAD

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 1.00 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



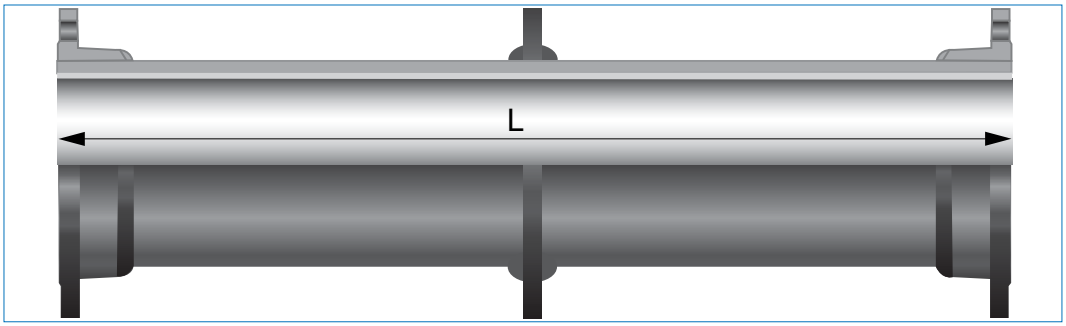
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	1000	K9	18.6	18.6	19.2	BBA60FD1CAD	BBA60FD1CAD	BBA60FD3CAD
80	1000	K9	30	30	30	BBA80FD1CAD	BBA80FD1CAD	BBA80FD1CAD
100	1000	K9	28.5	28.5	29.5	BBB10FD1CAD	BBB10FD1CAD	BBB10FD3CAD
125	1000	K9	36.2	36.2	37.6	BBB12FD1CAD	BBB12FD1CAD	BBB12FD3CAD
150	1000	K9	44.5	44.5	45.9	BBB15FD1CAD	BBB15FD1CAD	BBB15FD3CAD
200	1000	K9	60.7	58.6	71.2	BBB20FD1CAD	BBB20FD2CAD	BBB20FD3CAD
250	1000	K9	81.9	82.3	88.9	BBB25FD1CAD	BBB25FD2CAD	BBB25FD3CAD
300	1000	K9	109.2	112	123.8	BBB30FD1CAD	BBB30FD2CAD	BBB30FD3CAD
350	1000	K9	137.9	145.9	162.9	BBB35FD1CAD	BBB35FD2CAD	BBB35FD3CAD
400	1000	K9	165.6	172.6	247.2	BBB40FD1CAD	BBB40FD2CAD	BBB40FD3CAD
450	1000	K9	195.2	214.2	250.2	BBB45FD1CAD	BBB45FD2CAD	BBB45FD3CAD
500	1000	K9	226.6	255.6	283.6	BBB50FD1CAD	BBB50FD2CAD	BBB50FD3CAD
600	1000	K9	306.7	358.7	374.7	BBB60FD1CAD	BBB60FD2CAD	BBB60FD3CAD
700	1000	K9	406.4	369.6	-	BBB70FD1CAD	BBB70FD2CAD	-
800	1000	K9	521.3	555	-	BBB80FD1CAD	BBB80FD2CAD	-
900	1000	K9	622	-	-	BBB90FD1CAD	-	-
1000	1000	K9	755	-	-	BBC10FD1CAD	-	-
1100	1000	K9	-	-	-	-	-	-
1200	1000	K9	1089	1203.2	-	BBC12FD1CAD	BBC12FD2CAD	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 1.50 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



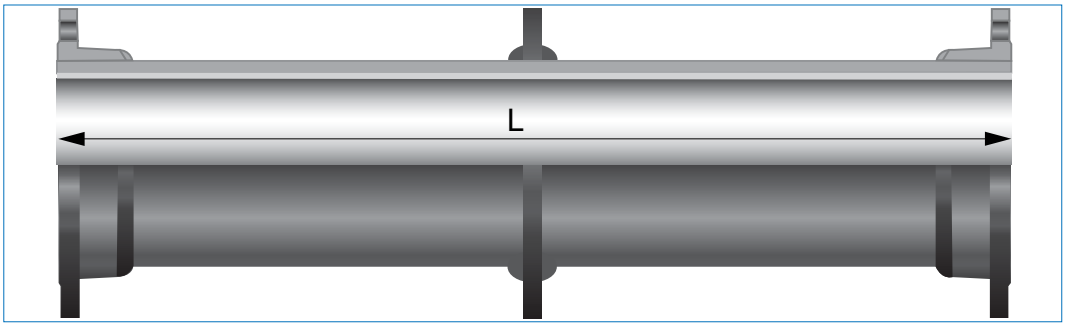
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
80	1500	K9	37.4	37.4	37.4	BBA80FD1DAD	BBA80FD1DAD	BBA80FD1DAD
100	1500	K9	37.4	37.4	31.3	BBB10FD1DAD	BBB10FD1DAD	BBB10FD3DAD
125	1500	K9	54.1	54.1	-	BBB12FD1DAD	BBB12FD1DAD	-
150	1500	K9	56.4	56.4	-	BBB15FD1DAD	BBB15FD1DAD	-
200	1500	K9	-	78	-	-	BBB20FD2DAD	-
250	1500	K9	-	105.8	-	-	BBB25FD2DAD	-
300	1500	K9	138	144	-	BBB30FD1DAD	BBB30FD2DAD	-
500	1500	K9	-	317.1	-	-	BBB50FD2DAD	-
600	1500	K9	387	438.5	-	BBB60FD1DAD	BBB60FD2DAD	-
700	1500	K9	509.1	554	-	BBB70FD1DAD	BBB70FD2DAD	-
800	1500	K9	647	698	-	BBB80FD1DAD	BBB80FD2DAD	-
900	1500	K9	772	829	-	BBB90FD1DAD	BBB90FD2DAD	-
1000	1500	K9	933	1041	-	BBC10FD1DAD	BBC10FD2DAD	-
1100	1500	K9	-	-	-	-	-	-
1200	1500	K9	-	-	-	-	-	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 2.00 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	2000	K9	32.8	-	32.8	BBA60FD1EAD	-	BBA60FD3EAD
80	2000	K9	44.7	44.7	44.7	BBA80FD1EAD	BBA80FD1EAD	BBA80FD1EAD
100	2000	K9	46.3	-	46.9	BBB10FD1EAD	-	BBB10FD3EAD
125	2000	K9	56.8	-	59.2	BBB12FD1EAD	-	BBB12FD3EAD
150	2000	K9	71.5	-	78.3	BBB15FD1EAD	-	BBB15FD3EAD
200	2000	K9	109.1	97.5	110.1	BBB20FD1EAD	BBB20FD2EAD	BBB20FD3EAD
250	2000	K9	134.8	131.4	148.6	BBB25FD1EAD	BBB25FD2EAD	BBB25FD3EAD
300	2000	K9	175.6	176.4	203	BBB30FD1EAD	BBB30FD2EAD	BBB30FD3EAD
350	2000	K9	214.3	225.5	239.3	BBB35FD1EAD	BBB35FD2EAD	BBB35FD3EAD
400	2000	K9	256.2	267.2	345.2	BBB40FD1EAD	BBB40FD2EAD	BBB40FD3EAD
450	2000	K9	301.9	320.9	356.9	BBB45FD1EAD	BBB45FD2EAD	BBB45FD3EAD
500	2000	K9	349.7	378.7	406.7	BBB50FD1EAD	BBB50FD2EAD	BBB50FD3EAD
600	2000	K9	466.4	518.4	534.4	BBB60FD1EAD	BBB60FD2EAD	BBB60FD3EAD
700	2000	K9	611.8	642	-	BBB70FD1EAD	BBB70FD2EAD	-
800	2000	K9	772.6	806.6	-	BBB80FD1EAD	BBB80FD2EAD	-
900	2000	K9	923	924	-	BBB90FD1EAD	BBB90FD2EAD	-
1000	2000	K9	1110	1182	-	BBC10FD1EAD	BBC10FD2EAD	-
1100	2000	K9	-	-	-	-	-	-
1200	2000	K9	1563	1677	-	BBC12FD1EAD	BBC12FD2EAD	-

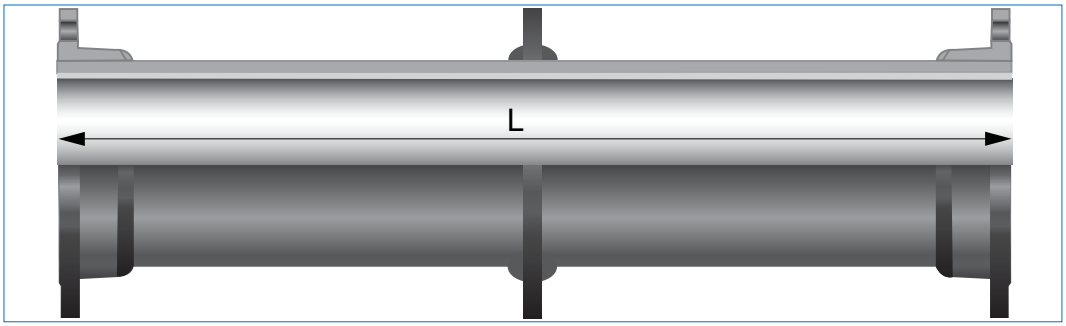
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
200	2500	K9	-	117	-	-	BBB20FD2FAD	-
300	2500	K9	-	208.8	-	-	BBB30FD2FAD	-
500	2500	K9	-	440	-	-	BBB50FD2FAD	

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 3.00 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	3000	K9	46.1	46.1	46.1	BBA60FD1GAD	BBA60FD1GAD	BBA60FD3GAD
80	3000	K9	59.4	59.4	59.4	BBA80FD1GAD	BBA80FD1GAD	BBA80FD1GAD
100	3000	K9	64	64	64.6	BBB10FD1GAD	BBB10FD1GAD	BBB10FD3GAD
125	3000	K9	79.2	79.2	81.6	BBB12FD1GAD	BBB12FD1GAD	BBB12FD3GAD
150	3000	K9	99.1	99.1	105.9	BBB15FD1GAD	BBB15FD1GAD	BBB15FD3GAD
200	3000	K9	148	136.4	149	BBB20FD1GAD	BBB20FD2GAD	BBB20FD3GAD
250	3000	K9	186.1	182.7	200	BBB25FD1GAD	BBB25FD2GAD	BBB25FD3GAD
300	3000	K9	240.3	241.1	267.7	BBB30FD1GAD	BBB30FD2GAD	BBB30FD3GAD
350	3000	K9	290.7	311.5	315.7	BBB35FD1GAD	BBB35FD2GAD	BBB35FD3GAD
400	3000	K9	346.8	357.8	381.8	BBB40FD1GAD	BBB40FD2GAD	BBB40FD3GAD
450	3000	K9	408.6	427.6	463.6	BBB45FD1GAD	BBB45FD2GAD	BBB45FD3GAD
500	3000	K9	472.8	501.8	529.8	BBB50FD1GAD	BBB50FD2GAD	BBB50FD3GAD
600	3000	K9	626.1	678.1	694.1	BBB60FD1GAD	BBB60FD2GAD	BBB60FD3GAD
700	3000	K9	817.2	847	-	BBB70FD1GAD	BBB70FD2GAD	-
800	3000	K9	1023.9	-	-	BBB80FD1GAD	-	-
900	3000	K9	1223	-	-	BBB90FD1GAD	-	-
1000	3000	K9	1465	-	-	BBC10FD1GAD	-	-
1100	3000	K9	-	-	-	-	-	-
1200	3000	K9	1982	-	-	BBC12FD1GAD	-	-

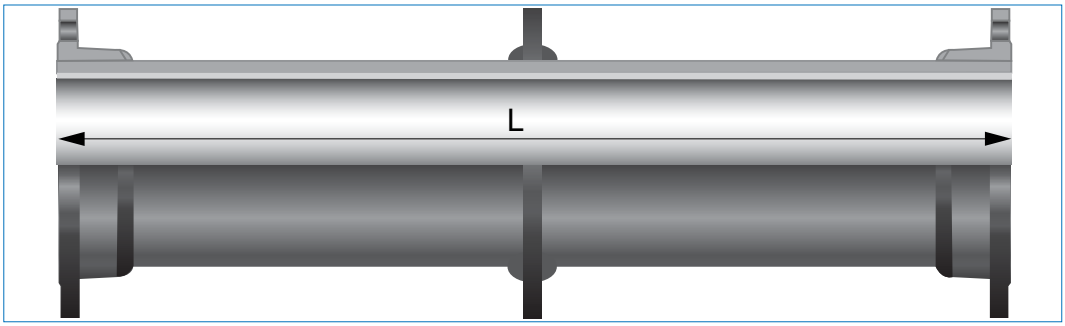
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
300	3500	K9	-	273.5	-	-	BBB30FD2HAD	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 4.00 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



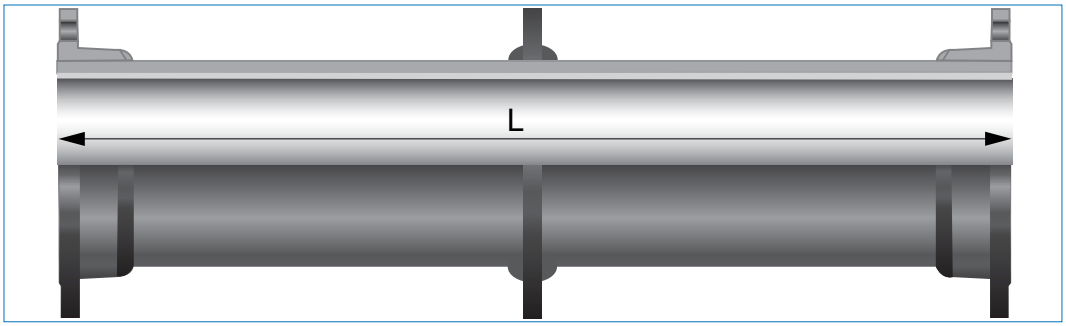
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	4000	K9	59.4	59.4	59.4	BBA60FD1JAD	BBA60FD1JAD	BBA60FD3JAD
80	4000	K9	74.1	74.1	74 .1	BBA80FD1JAD	BBA80FD1JAD	BBA80FD1JAD
100	4000	K9	81.7	81.7	82.3	BBB10FD1JAD	BBB10FD1JAD	BBB10FD3JAD
125	4000	K9	101.6	101.6	104	BBB12FD1JAD	BBB12FD1JAD	BBB12FD3JAD
150	4000	K9	126.7	126.7	133.5	BBB15FD1JAD	BBB15FD1JAD	BBB15FD3JAD
200	4000	K9	186.9	175.3	187.9	BBB20FD1JAD	BBB20FD2JAD	BBB20FD3JAD
250	4000	K9	237.4	234	251.2	BBB25FD1JAD	BBB25FD2JAD	BBB25FD3JAD
300	4000	K9	305	305.8	332.4	BBB30FD1JAD	BBB30FD2JAD	BBB30FD3JAD
350	4000	K9	367.1	375.1	392.1	BBB35FD1JAD	BBB35FD2JAD	BBB35FD3JAD
400	4000	K9	437.4	448.4	472.4	BBB40FD1JAD	BBB40FD2JAD	BBB40FD3JAD
450	4000	K9	515.3	534.3	570.3	BBB45FD1JAD	BBB45FD2JAD	BBB45FD3JAD
500	4000	K9	595.9	624.9	652.9	BBB50FD1JAD	BBB50FD2JAD	BBB50FD3JAD
600	4000	K9	785.8	837.8	853.8	BBB60FD1JAD	BBB60FD2JAD	BBB60FD3JAD
700	4000	K9	1022.6	1053	-	BBB70FD1JAD	BBB70FD2JAD	-
800	4000	K9	1275.2	-	-	BBB80FD1JAD	-	-
900	4000	K9	1524	1489	-	BBB90FD1JAD	BBB90FD2JAD	-
1000	4000	K9	1819	-	-	BBC10FD1JAD	-	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 5.00 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



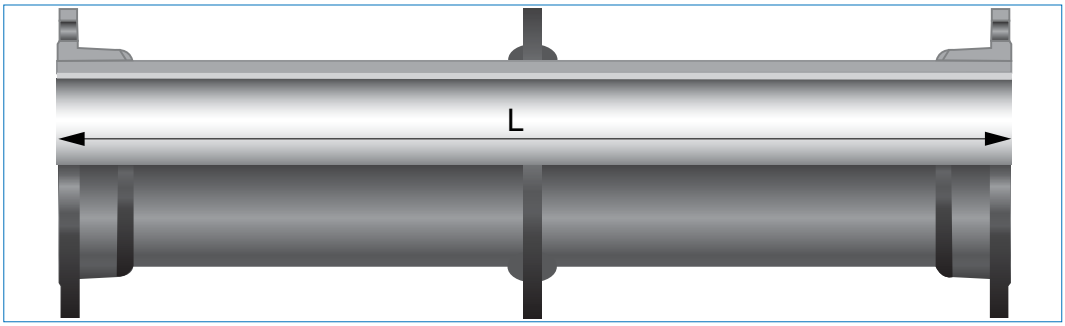
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	5000	K9	72.7	72.7	72.7	BBA60FD1LAD	BBA60FD1LAD	BBA60FD3LAD
80	5000	K9	88.8	88.8	88.8	BBA80FD1LAD	BBA80FD1LAD	BBA80FD1LAD
100	5000	K9	99.4	99.4	99.7	BBB10FD1LAD	BBB10FD1LAD	BBB10FD3LAD
125	5000	K9	124	154.3	126.4	BBB12FD1LAD	BBB12FD1LAD	BBB12FD3LAD
150	5000	K9	154 .3	124	161.1	BBB15FD1LAD	BBB15FD1LAD	BBB15FD3LAD
200	5000	K9	225.8	214.2	226.8	BBB20FD1LAD	BBB20FD2LAD	BBB20FD3LAD
250	5000	K9	288.7	285.3	302.5	BBB25FD1LAD	BBB25FD2LAD	BBB25FD3LAD
300	5000	K9	369.7	370.5	397.1	BBB30FD1LAD	BBB30FD2LAD	BBB30FD3LAD
350	5000	K9	443.5	451.5	468.5	BBB35FD1LAD	BBB35FD2LAD	BBB35FD3LAD
400	5000	K9	528	539	563	BBB40FD1LAD	BBB40FD2LAD	BBB40FD3LAD
450	5000	K9	622	641	677	BBB45FD1LAD	BBB45FD2LAD	BBB45FD3LAD
500	5000	K9	719	748	776	BBB50FD1LAD	BBB50FD2LAD	BBB50FD3LAD
600	5000	K9	945.5	997.5	1013.5	BBB60FD1LAD	BBB60FD2LAD	BBB60FD3LAD
700	5000	K9	1228	1258	-	BBB70FD1LAD	BBB70FD2LAD	-
800	5000	K9	1526.5	-	-	BBB80FD1LAD	-	-
900	5000	K9	1825	-	-	BBB90FD1LAD	-	-
1000	5000	K9	2173	-	-	BBC10FD1LAD	-	-

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 5.90 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531



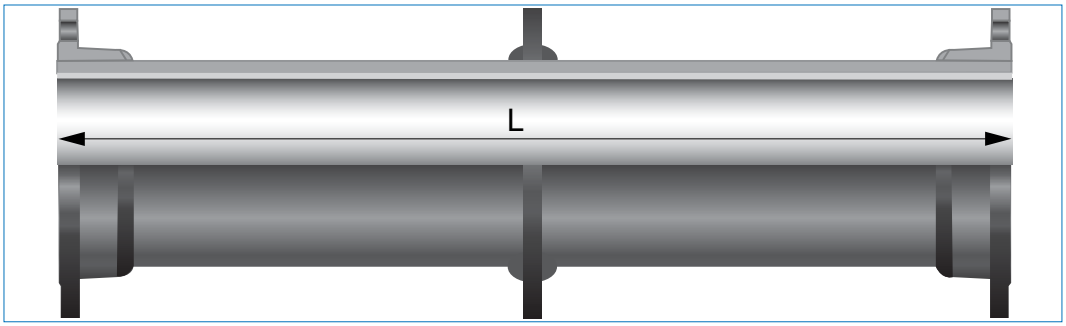
DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
60	5900	K9	84.7	84.7	72.1	BBA60FD1SAD	BBA60FD1SAD	BBA60FD3SAD
80	5900	K9	102	102	102	BBA80FD1SAD	BBA80FD1SAD	BBA80FD1SAD
100	5900	K9	115.3	115.3	115.9	BBB10FD1SAD	BBB10FD1SAD	BBB10FD3SAD
125	5900	K9	144.2	144.2	146.4	BBB12FD1SAD	BBB12FD1SAD	BBB12FD3SAD
150	5900	K9	179.1	179.1	185.9	BBB15FD1SAD	BBB15FD1SAD	BBB15FD3SAD
200	5900	K9	260.8	249.2	261.8	BBB20FD1SAD	BBB20FD2SAD	BBB20FD3SAD
250	5900	K9	334.8	331.5	348.7	BBB25FD1SAD	BBB25FD2SAD	BBB25FD3SAD
300	5900	K9	391.4	394.2	406	BBB30FD1SAD	BBB30FD2SAD	BBB30FD3SAD
350	5900	K9	512.3	520.3	537.3	BBB35FD1SAD	BBB35FD2SAD	BBB35FD3SAD
400	5900	K9	594	606	643	BBB40FD1SAD	BBB40FD2SAD	BBB40FD3SAD
450	5900	K9	724	743	782	BBB45FD1SAD	BBB45FD2SAD	BBB45FD3SAD
500	5900	K9	843	875	918	BBB50FD1SAD	BBB50FD2SAD	BBB50FD3SAD
600	5900	K9	1107	1165	1216	BBB60FD1SAD	BBB60FD2SAD	BBB60FD3SAD

For more information, please contact us.

Double welded flanged anchoring pipe with puddle flange (Central puddle flange) - L = 6.00 m - L = 6.40 m

Field of use:
For drinking water mains

Main characteristics:
- External coating: metallic zinc (200g/m²) + Bituminous coating
- Internal lining: Centrifuged cement mortar lining
- EN 545, ISO 2531

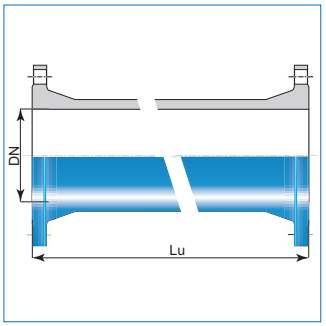


DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
700	6000	K9	1434.5	1466.3	-	BBB70FD1NAD	BBB70FD2NAD	-
800	6000	K9	1775.6	-	-	BBB80FD1NAD	-	-
900	6000	K9	2125	-	-	BBB90FD1NAD	-	-
1000	6000	K9	2528	-	-	BBC10FD1NAD	-	

DN	L	Class	Weight / kg			Reference		
	mm		PN10	PN16	PN25	PN10	PN16	PN25
700	6400	K9	1516.6	1548.4	-	BBB70FD1TAD	BBB70FD2TAD	-
800	6400	K9	1876	-	-	BBB80FD1TAD	-	-
900	6400	K9	2246	-	-	BBB90FD1TAD	-	-
1000	6400	K9	2669	-	-	BBC10FD1TAD	-	-

For more information, please contact us.

Integrally cast double flanged pipe
Fixed flange



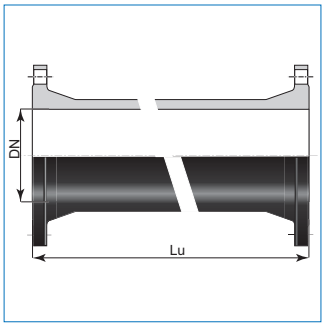
Field of use:
For drinking water mains

Main characteristics:
- Blue epoxy coating in compliance with EN 14901
- EN 545, ISO 2531

DN	Lu	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
250	1000	80.9	56	-	BBB25MA1CTT	BBB25MA2CTT	-
300	1000	96	96	-	BBB30MA1CTT	BBB30MA2CTT	-
300	1500	125	-	-	BBB30MA1DTT	-	-
300	2000	212	-	-	BBB30MA1ETT	-	-
350	1000	152	-	-	BBB35MA1CTT	-	-
350	1500	209	-	-	BBB35MA1DTT	-	-
350	2000	262	-	-	BBB35MA1ETT	-	-
400	1000	-	185	-	-	BBB40MA2CTT	-
400	1500	-	245	-	-	BBB40MA2DTT	-
500	1000	181	181	-	BBB50MA1CTT	BBB50MA2CTT	-
500	1500	364	-	-	BBB50MA1DTT	-	-
500	2000	457	-	-	BBB50MA1ETT	-	-
500	2500	556	-	-	BBB50MA1FTT	-	-
600	1000	367	361.6	-	BBB60MA1CTT	BBB60MA2CTT	-
600	1500	482	580	-	BBB60MA1DTT	BBB60MA2DTT	-
600	2000	630	566.3	-	BBB60MA1ETT	BBB60MA2ETT	-
600	2500	-	745	-	-	BBB60MA2FTT	-
800	1000	585	541	-	BBB80MA1CTT	BBB80MA2CTT	-
900	3000	-	-	1634	-	-	BBB90MA3GTT
1000	1000	859	804	-	BBC10MA1CTT	BBC10MA2CTT	-
1000	2000	1478	-	-	BBC10MA1ETT	-	-
1000	2500	-	-	1949			BBC10MA3FTT
1000	3000	-	2042	-	-	BBC10MA2GTT	-
1600	2000	2640	-	-	BBC16MA1ETT	-	-
1600	3000	3780	-	-	BBC16MA1GTT	-	-
1800	1500	2575	-	-	BBC18MA1DTT	-	-
1800	3000	4547	-	-	BBC18MA1GTT	-	-
2000	1000	2510	-	-	BBC20MA1CTT	-	-
2000	2000	4340	-	-	BBC20MA1ETT	-	-
2000	2500	5240	-	-	BBC20MA1FTT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Integrally cast double flanged pipe
Fixed flange



Field of use:
For drinking water mains

Main characteristics:
- Bituminous coating
- EN 545, ISO 2531

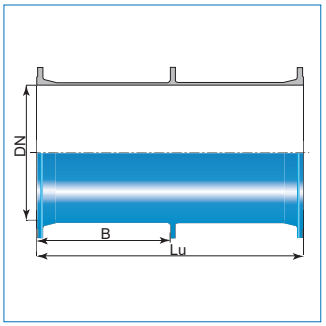
DN	L	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
700	1000	458	443	518.8	BBB70MA1C	BBB70MA2C	BBB70MA3C
700	2000	796.2	781	857	BBB70MA1E	BBB70MA2E	BBB70MA3E
700	3000	1134	1120	1195	BBB70MA1G	BBB70MA2G	BBB70MA3G
800	1000	584.7	541	669.5	BBB80MA1C	BBB80MA2C	BBB80MA3C
800	2000	1008	963.6	1093	BBB80MA1E	BBB80MA2E	BBB80MA3E
800	3000	1431	1387	1516	BBB80MA1G	BBB80MA2G	BBB80MA3G
900	1000	705.8	652	813.8	BBB90MA1C	BBB90MA2C	BBB90MA3C
900	2000	1222	1168	-	BBB90MA1E	BBB90MA2E	BBB90MA3E
900	3000	1739	1685	-	BBB90MA1G	BBB90MA2G	BBB90MA3G
1000	1000	859	804	1020.6	BBC10MA1C	BBC10MA2C	BBC10MA3C
1000	2000	1478	1423	-	BBC10MA1E	BBC10MA2E	-
1000	3000	2098	2042	2259	BBC10MA1G	BBC10MA2G	BBC10MA3G
1200	1000	1036	1148	-	BBC12MA1C	BBC12MA2C	-
1200	2000	1766	1878	-	BBC12MA1E	BBC12MA2E	-
1200	3000	2496	2608	-	BBC12MA1G	BBC12MA2G	-
1400	1000	1110	1212	-	BBC14MA1C	BBC14MA2C	-
1400	2000	1870	1972	-	BBC14MA1E	BBC14MA2E	-
1400	3000	2630	2732	-	BBC14MA1G	BBC14MA2G	-
1500	1000	1385	1585	-	BBC15MA1C	BBC15MA2C	-
1500	2000	2440	2635	-	BBC15MA1E	BBC15MA2E	-
1500	3000	3475	3675	-	BBC15MA1G	BBC15MA2G	-
1800	1000	1917	2086	-	BBC18MA1C	BBC18MA2C	-
1800	2000	3232	3413	-	BBC18MA1E	BBC18MA2E	-
1800	3000	4547	4740	-	BBC18MA1G	BBC18MA2G	-
2000	1000	2510	2770	-	BBC20MA1C	BBC20MA2C	-
2000	2000	4340	4600	-	BBC20MA1E	BBC20MA2E	-
2000	3000	6170	6430	-	BBC20MA1G	BBC20MA2G	-

Weight : fitting only - References : fitting
For more information, please contact us.

Integrally cast double flanged anchoring pipe with puddle flange Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Blue epoxy coating in compliance with EN 14901
- EN 545, ISO 2531



DN	Lu	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
300	1000	135	-	-	BBB30MD1CTT	-	-
350	1000	168	-	-	BBB35MD1CTT	-	-
500	1000	254	261.8	-	BBB50MD1CTT	BBB50MD2CTT	-
600	1000	-	401	-	-	BBB60MD2CTT	-
800	1500	-	-	943	-	-	BBB80MD3DTT
1500	2000	2610	-	-	BBC15MD1ETT	-	-
2000	3000	6470	-	-	BBC20MD1GTT	-	-

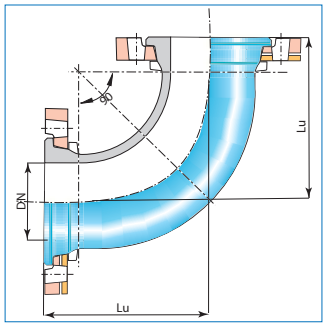
For more information, please contact us.

Fittings/ All flanged 90° bend Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
90°	**40**	140	6.3	6.3	6.3	6.3	BAA40CA1	BAA40CA1	BAA40CA1	BAA40CA1
90°	**50**	150	7.3	7.3	7.3	7.3	BAA50CA1	BAA50CA1	BAA50CA1	BAA50CA1
90°	**60**	160	8.5	8.5	7.7	7.7	BAA60CA1	BAA60CA1	BAA60CA3	BAA60CA3
90°	**65**	160	9.6	9.6	9.8	9.8	BAA65CA1	BAA65CA1	BAA65CA3	BAA65CA3
90°	**80**	165	11.2	11.2	11.2	11.2	BAA80CA1	BAA80CA1	BAA80CA1	BAA80CA1
90°	**100**	180	13	13	14	14	BAB10CA1	BAB10CA1	BAB10CA3	BAB10CA3
90°	**125**	200	17.6	17.6	18.4	18.4	BAB12CA1	BAB12CA1	BAB12CA3	BAB12CA3
90°	**150**	220	23	23	25	25	BAB15CA1	BAB15CA1	BAB15CA3	BAB15CA3
90°	**200**	260	37.5	37.5	40.5	43.5	BAB20CA1	BAB20CA2	BAB20CA3	BAB20CA4
90°	**250**	350	59	58	64	81.8	BAB25CA1	BAB25CA2	BAB25CA3	BAB25CA4
90°	**300**	400	85	83	91	122	BAB30CA1	BAB30CA2	BAB30CA3	BAB30CA40NN
90°	**350**	450	121	123	135	-	BAB35CA10NN	BAB35CA20NN	BAB35CA30NN	-
90°	**400**	500	163.5	171.5	190	-	BAB40CA10NN	BAB40CA20NN	BAB40CA30NN	-
90°	**500**	600	242	268	280	-	BAB50CA10NN	BAB50CA20NN	BAB50CA30NN	-
90°	**600**	700	359	409	415	-	BAB60CA10NN	BAB60CA20NN	BAB60CA30NN	-

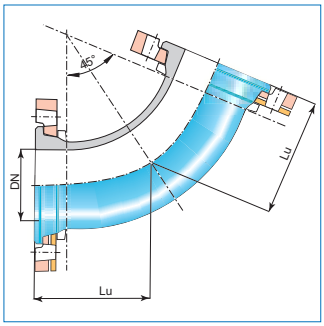
Weight : fitting only - References : fitting
Available also with fixed flanges DN 60-600 and with blue cataphoresis coating or blue epoxy coating.
For more information, please contact us.

Fittings/ All flanged 45° bend Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
45°	**40**	140	6.5	6.5	6.5	6.5	BAA40CB1	BAA40CB1	BAA40CB1	BAA40CB1
45°	**50**	150	7.6	7.6	7.6	7.6	BAA50CB1	BAA50CB1	BAA50CB1	BAA50CB1
45°	**60**	160	8.3	8.3	7.5	7.5	BAA60CB1	BAA60CB1	BAA60CB3	BAA60CB3
45°	**65**	160	9.3	9.3	9.5	9.5	BAA65CB1	BAA65CB1	BAA65CB3	BAA65CB3
45°	**80**	130	10	10	10	10	BAA80CB1	BAA80CB1	BAA80CB1	BAA80CB1
45°	**100**	140	12.1	12.1	13.6	13.6	BAB10CB1	BAB10CB1	BAB10CB3	BAB10CB3
45°	**125**	150	16.2	16.2	18	18	BAB12CB1	BAB12CB1	BAB12CB3	BAB12CB3
45°	**150**	160	21	21	23	23	BAB15CB1	BAB15CB1	BAB15CB3	BAB15CB3
45°	**200**	180	31	31	34	37	BAB20CB1	BAB20CB2	BAB20CB3	BAB20CB4
45°	**250**	245	47.9	47.9	52.9	79	BAB25CB1	BAB25CB2	BAB25CB3	BAB25CB4
45°	**300**	275	67.5	66.1	73.3	113	BAB30CB1	BAB30CB2	BAB30CB3	BAB30CB4
45°	**350**	306	100	102	114	-	BAB35CB10NN	BAB35CB20NN	BAB35CB30NN	-
45°	**400**	337	124	133	151	-	BAB40CB10NN	BAB40CB20NN	BAB40CB30NN	-
45°	**450**	370	158	171	185	-	BAB45CB10NN	BAB45CB20NN	BAB45CB30NN	-
45°	**500**	400	197	223	235	-	BAB50CB10NN	BAB50CB20NN	BAB50CB30NN	-
45°	**600**	463	289	339	345	-	BAB60CB10NN	BAB60CB20NN	BAB60CB30NN	-

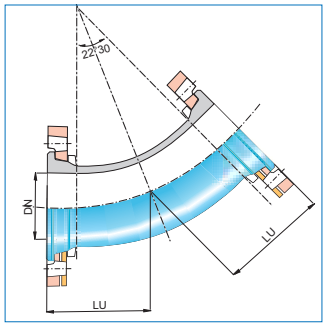
Weight : fitting only - References : fitting
Available also with fixed flanges DN 60-600 and with blue epoxy coating.
For more information, please contact us.

Fittings/ All flanged 22.30° bend Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





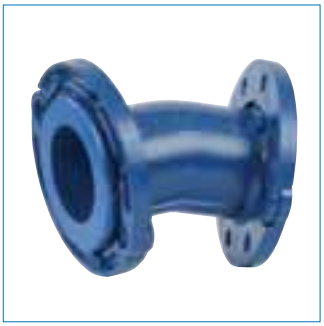
Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
22°30	**40**	94	5.4	5.4	5.4	5.4	BAA40CD1	BAA40CD1	BAA40CD1	BAA40CD1
22°30	**50**	104	6.5	6.5	6.5	6.5	BAA50CD1	BAA50CD1	BAA50CD1	BAA50CD1
22°30	**60**	114	7.2	7.2	6.4	6.4	BAA60CD1	BAA60CD1	BAA60CD3	BAA60CD3
22°30	**65**	114	8.3	8.3	-	-	BAA65CD1	BAA65CD1	-	-
22°30	**80**	105	9.3	9.3	9.3	9.3	BAA80CD1	BAA80CD1	BAA80CD1	BAA80CD1
22°30	**100**	110	11	11	12	12	BAB10CD1	BAB10CD1	BAB10CD3	BAB10CD3
22°30	**125**	105	14	14	15.8	15.8	BAB12CD1	BAB12CD1	BAB12CD3	BAB12CD3
22°30	**150**	109	18.2	18.2	20.4	20.4	BAB15CD1	BAB15CD1	BAB15CD3	BAB15CD3
22°30	**200**	131	27	27	30	30.4	BAB20CD1	BAB20CD2	BAB20CD3	BAB20CD4
22°30	**250**	190	43	42.2	48	-	BAB25CD1	BAB25CD2	BAB25CD3	-
22°30	**300**	210	59.7	58.3	65.5	89	BAB30CD1	BAB30CD2	BAB30CD3	BAB30CD4
22°30	**350**	215	84.2	85.8	98	-	BAB35CD10NN	BAB35CD20NN	BAB35CD30NN	-
22°30	**400**	237.5	92	113	119	-	BAB40CD10NN	BAB40CD20NN	BAB40CD30NN	-
22°30	**450**	253	128	141	155.4	-	BAB45CD10NN	BAB45CD20NN	BAB45CD30NN	-
22°30	**500**	272.5	143	169	181	-	BAB50CD10NN	BAB50CD20NN	BAB50CD30NN	-
22°30	**600**	320.5	211	261	268	-	BAB60CD10NN	BAB60CD20NN	BAB60CD30NN	-

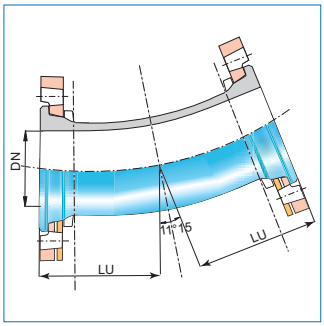
Weight : fitting only - References : fitting
Available also with fixed flanges DN 60-600 and with blue epoxy coating.
For more information, please contact us.

Fittings/ All flanged 11.15° bend Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





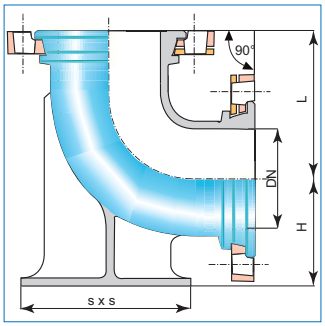
Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
11°15	**40**	99	5.6	5.6	5.6	5.6	BAA40CE1	BAA40CE1	BAA40CE1	BAA40CE1
11°15	**50**	109	6.6	6.6	6.6	6.6	BAA50CE1	BAA50CE1	BAA50CE1	BAA50CE1
11°15	**60**	119	7.4	7.4	6.6	6.6	BAA60CE1	BAA60CE1	BAA60CE3	BAA60CE3
11°15	**65**	119	8.4	8.4	-	-	BAA65CE1	BAA65CE1	-	-
11°15	**80**	113	9.6	9.6	9.6	9.6	BAA80CE1	BAA80CE1	BAA80CE1	BAA80CE1
11°15	**100**	115	11.3	11.3	12.3	12.3	BAB10CE1	BAB10CE1	BAB10CE3	BAB10CE3
11°15	**125**	111	14.4	14.4	15.3	15.3	BAB12CE1	BAB12CE1	BAB12CE3	BAB12CE3
11°15	**150**	113	18.5	18.5	20.5	20.5	BAB15CE1	BAB15CE1	BAB15CE3	BAB15CE3
11°15	**200**	132	27	27	30	33.5	BAB20CE1	BAB20CE2	BAB20CE3	BAB20CE4
11°15	**250**	165	40.7	39.9	45.7	-	BAB25CE1	BAB25CE2	BAB25CE3	-
11°15	**300**	175	54.9	53.5	60.7	-	BAB30CE1	BAB30CE2	BAB30CE3	-
11°15	**350**	191	80	81.6	93.8	-	BAB35CE10NN	BAB35CE20NN	BAB35CE30NN	-
11°15	**400**	203	85	106	112	-	BAB40CE10NN	BAB40CE20NN	BAB40CE30NN	-
11°15	**450**	220	120	133	147.4	-	BAB45CE10NN	BAB45CE20NN	BAB45CE30NN	-
11°15	**500**	232.5	131	157	169	-	BAB50CE10NN	BAB50CE20NN	BAB50CE30NN	-
11°15	**600**	274.5	192	242	248	-	BAB60CE10NN	BAB60CE20NN	BAB60CE30NN	-

Weight : fitting only - References : fitting
Available also with fixed flanges DN 60-600 and with blue epoxy coating.
For more information, please contact us.

Fittings/ Double-flanged duckfoot 90° bend Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



Angle Degree	DN	Lu	H	Weight / kg				Reference			
		mm		PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
90°	**40**	140	100	8.8	8.8	8.8	8.8	BAA40CF1	BAA40CF1	BAA40CF1	BAA40CF1
90°	**50**	150	100	9.9	9.9	9.9	9.9	BAA50CF1	BAA50CF1	BAA50CF1	BAA50CF1
90°	**60**	160	100	10.6	10.6	9.8	9.8	BAA60CF1	BAA60CF1	BAA60CF3	BAA60CF3
90°	**65**	160	100	11.7	11.7	11.9	11.9	BAA65CF1	BAA65CF1	BAA65CF3	BAA65CF3
90°	**80**	165	110	14	14	14	14	BAA80CF1	BAA80CF1	BAA80CF1	BAA80CF1
90°	**100**	180	125	17.2	17.2	18.2	18.2	BAB10CF1	BAB10CF1	BAB10CF3	BAB10CF3
90°	**125**	200	140	23	23	24.5	24.5	BAB12CF1	BAB12CF1	BAB12CF3	BAB12CF3
90°	**150**	220	160	31.5	31.5	33.5	33.5	BAB15CF1	BAB15CF1	BAB15CF3	BAB15CF3
90°	**200**	260	190	48	48	51	-	BAB20CF1	BAB20CF2	BAB20CF3	-
90°	**250**	350	225	85	84.5	90	-	BAB25CF1	BAB25CF2	BAB25CF3	-
90°	**300**	400	255	118.5	117	124.5	-	BAB30CF1	BAB30CF2	BAB30CF3	-

Weight : fitting only - References : fitting
For more information, please contact us.

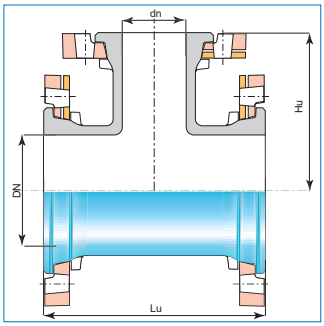
DRINKING WATER SUPPLY

Fittings/ All flanged tee Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN	dn	Lu	hu	Weight / kg				Reference			
		mm		PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
40	**40**	280	140	9.3	9.3	9.3	9.3	BAA40UE1A	BAA40UE1A	BAA40UE1A	BAA40UE1A
50	**40**	300	140	10.4	10.4	10.4	10.4	BAA50UE1A	BAA50UE1A	BAA50UE1A	BAA50UE1A
50	**50**	300	150	10.9	10.9	10.9	10.9	BAA50UE1B	BAA50UE1B	BAA50UE1B	BAA50UE1B
60	**40**	320	140	11.1	11.1	10.3	10.3	BAA60UE1A	BAA60UE1A	BAA60UE3A	BAA60UE3A
60	**50**	320	150	11.6	11.6	11.4	11.4	BAA60UE1B	BAA60UE1B	BAA60UE3B	BAA60UE3B
60	**60**	320	160	12	12	10.3	10.3	BAA60UE1C	BAA60UE1C	BAA60UE3C	BAA60UE3C
80	**40**	330	140	13.6	13.6	13.6	13.6	BAA80UE1A	BAA80UE1A	BAA80UE1A	BAA80UE1A
80	**50**	330	150	14.1	14.1	14.1	14.1	BAA80UE1B	BAA80UE1B	BAA80UE1B	BAA80UE1B
80	**60**	330	160	14.3	14.3	13.9	13.9	BAA80UE1C	BAA80UE1C	BAA80UE3C	BAA80UE3C
80	**65**	330	160	15	15	15.3	15.3	BAA80UE1D	BAA80UE1D	BAA80UE3D	BAA80UE3D
80	**80**	330	165	15.3	15.3	15.3	15.3	BAA80UE1E	BAA80UE1E	BAA80UE1E	BAA80UE1E
100	**40**	360	150	16.4	16.4	17.4	17.4	BAB10UE1A	BAB10UE1A	BAB10UE3A	BAB10UE3A
100	**50**	360	160	16.9	16.9	17.9	17.9	BAB10UE1B	BAB10UE1B	BAB10UE3B	BAB10UE3B
100	**60**	360	170	17.3	17.3	17.9	17.9	BAB10UE1C	BAB10UE1C	BAB10UE3C	BAB10UE3C
100	**65**	360	170	17.8	17.8	18.9	18.9	BAB10UE1D	BAB10UE1D	BAB10UE3D	BAB10UE3D
100	**80**	360	175	18.1	18.1	19.3	19.3	BAB10UE1E	BAB10UE1E	BAB10UE3E	BAB10UE3E
100	**100**	360	180	19	19	20.5	20.5	BAB10UE1F	BAB10UE1F	BAB10UE3F	BAB10UE3F
125	**40**	400	165	21.5	21.5	-	-	BAB12UE1A	BAB12UE1A	-	-
125	**50**	400	175	22.1	22.1	24	24	BAB12UE1B	BAB12UE1B	BAB12UE3B	BAB12UE3B
125	**60**	400	185	22.5	22.5	23.9	23.9	BAB12UE1C	BAB12UE1C	BAB12UE3C	BAB12UE3C
125	**65**	400	185	23	23	23.1	23.1	BAB12UE1D	BAB12UE1D	BAB12UE3D	BAB12UE3D
125	**80**	400	190	23.5	23.5	25.5	25.5	BAB12UE1E	BAB12UE1E	BAB12UE3E	BAB12UE3E
125	**100**	400	195	24.5	24.5	26.8	26.8	BAB12UE1F	BAB12UE1F	BAB12UE3F	BAB12UE3F
125	**125**	400	200	25.5	25.5	28.2	28.2	BAB12UE1G	BAB12UE1G	BAB12UE3G	BAB12UE3G
150	**40**	440	175	26	26	30	30	BAB15UE1A	BAB15UE1A	BAB15UE3A	BAB15UE3A
150	**50**	440	185	28.5	28.5	30.5	30.5	BAB15UE1B	BAB15UE1B	BAB15UE3B	BAB15UE3B
150	**60**	440	195	29	29	30.5	30.5	BAB15UE1C	BAB15UE1C	BAB15UE3C	BAB15UE3C
150	**65**	440	195	29.5	29.5	31.5	31.5	BAB15UE1D	BAB15UE1D	BAB15UE3D	BAB15UE3D
150	**80**	440	205	30	30	32	32	BAB15UE1E	BAB15UE1E	BAB15UE3E	BAB15UE3E
150	**100**	440	210	31	31	33.5	33.5	BAB15UE1F	BAB15UE1F	BAB15UE3F	BAB15UE3F
150	**125**	440	210	32.5	32.5	35.5	35.5	BAB15UE1G	BAB15UE1G	BAB15UE3G	BAB15UE3G
150	**150**	440	220	35	35	38	38	BAB15UE1J	BAB15UE1J	BAB15UE3J	BAB15UE3J
200	**40**	520	200	41.5	41.5	44.5	48.1	BAB20UE1A	BAB20UE2A	BAB20UE3A	BAB20UE4A
200	**50**	520	210	42	42	45	45	BAB20UE1B	BAB20UE2B	BAB20UE3B	BAB20UE4B
200	**60**	520	220	42.5	42	45	48	BAB20UE1C	BAB20UE2C	BAB20UE3C	BAB20UE4C
200	**65**	520	220	43	43	46	51	BAB20UE1D	BAB20UE2D	BAB20UE3D	BAB20UE4D
200	**80**	520	235	43.5	43.5	46.5	51	BAB20UE1E	BAB20UE2E	BAB20UE3E	BAB20UE4E
200	**100**	520	240	44.5	44.5	48	52	BAB20UE1F	BAB20UE2F	BAB20UE3F	BAB20UE4F
200	**125**	520	240	46	46	50	-	BAB20UE1G	BAB20UE2G	BAB20UE3G	-
200	**150**	520	250	48.5	48	52.1	56	BAB20UE1J	BAB20UE2J	BAB20UE3J	BAB20UE4J
200	**200**	520	260	52	51	55.5	57.4	BAB20UE1K	BAB20UE2K	BAB20UE3K	BAB20UE4K

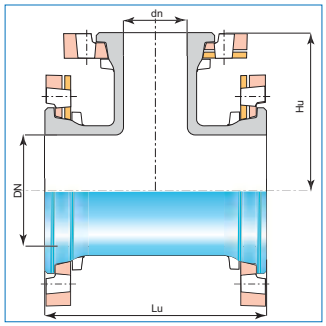
Weight : fitting only - References : fitting
Available also with fixed flanges DN 60-600 and with blue epoxy coating.
For more information, please contact us.

Fittings/ All flanged tee Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN	dn	Lu	hu	Weight / kg				Reference			
		mm		PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
250	**60**	360	272	52	51	56	77.5	BAB25UE1C	BAB25UE2C	BAB25UE3C	BAB25UE4C
250	**65**	360	272	52	51	56	78.5	BAB25UE1D	BAB25UE2D	BAB25UE3D	BAB25UE4D
250	**80**	430	250	58	57.2	63	80.6	BAB25UE1E	BAB25UE2E	BAB25UE3E	BAB25UE4E
250	**150**	447	280	63	62	68.9	86.5	BAB25UE1J	BAB25UE2J	BAB25UE3J	BAB25UE4J
250	**200**	540	290	73.2	72.3	80	99	BAB25UE1K	BAB25UE2K	BAB25UE3K	BAB25UE4K
250	**250**	600	300	84	83	92	118	BAB25UE1L	BAB25UE2L	BAB25UE3L	BAB25UE4L
300	**60**	450	297	74	72	79	112	BAB30UE1C	BAB30UE2C	BAB30UE3C	BAB30UE4C
300	**65**	450	297	74	72	79.8	113	BAB30UE1D	BAB30UE2D	BAB30UE3D	BAB30UE4D
300	**80**	450	298	75	73	81	103	BAB30UE1E	BAB30UE2E	BAB30UE3E	BAB30UE4E
300	**150**	560	310	89	87	96	125	BAB30UE1J	BAB30UE2J	BAB30UE3J	BAB30UE4J
300	**200**	560	320	93	92	108	136	BAB30UE1K	BAB30UE2K	BAB30UE3K	BAB30UE4K
300	**250**	680	305	108	106	117	149	BAB30UE1L	BAB30UE2L	BAB30UE3L	BAB30UE4L
300	**300**	680	340	117	115	126	165	BAB30UE1M	BAB30UE2M	BAB30UE3M	BAB30UE4M
350	**60**	424	322	89	91	103	-	BAB35UE1CNN	BAB35UE2CNN	BAB35UE3CNN	-
350	**65**	424	322	89	90.6	97	-	BAB35UE1DNN	BAB35UE2DNN	BAB35UE3DNN	-
350	**80**	470	310	97	98	110	-	BAB35UE1ENN	BAB35UE2ENN	BAB35UE3ENN	-
350	**150**	590	340	113	114	128	-	BAB35UE1JNN	BAB35UE2JNN	BAB35UE3JNN	-
350	**200**	590	350	117	119	132	-	BAB35UE1KNN	BAB35UE2KNN	BAB35UE3KNN	-
350	**250**	644	360	129	130	145.1	-	BAB35UE1LNN	BAB35UE2LNN	BAB35UE3LNN	-
350	**300**	760	370	143	144	-	-	BAB35UE1MNN	BAB35UE2MNN	-	-
350	**350**	760	380	157	159	178	-	BAB35UE1YNN	BAB35UE2YNN	BAB35UE3YNN	-
400	**80**	490	340	114	122.8	140	-	BAB40UE1ENN	BAB40UE2ENN	BAB40UE3ENN	-
400	**150**	605	370	133	142	160	-	BAB40UE1JNN	BAB40UE2JNN	BAB40UE3JNN	-
400	**200**	605	380	136.5	145.4	164.90	-	BAB40UE1KNN	BAB40UE2KNN	BAB40UE3KNN	-
400	**250**	724	390	158	167	187	-	BAB40UE1LNN	BAB40UE2LNN	BAB40UE3LNN	-
400	**300**	724	400	163.8	172.1	193.7	-	BAB40UE1MNN	BAB40UE2MNN	BAB40UE3MNN	-
400	**400**	840	420	194.5	208	235	-	BAB40UE1NNN	BAB40UE2NNN	BAB40UE3NNN	-
450	**100**	515	395	140.5	153.3	168.2	-	BAB45UE1FNN	BAB45UE2FNN	BAB45UE3FNN	-
450	**150**	620	400	144	156.8	172.2	-	BAB45UE1JNN	BAB45UE2JNN	BAB45UE3JNN	-
450	**200**	620	410	174.5	187.3	203.1	-	BAB45UE1KNN	BAB45UE2KNN	BAB45UE3KNN	-
450	**250**	730	420	180	192.4	209.6	-	BAB45UE1LNN	BAB45UE2LNN	BAB45UE3LNN	-
450	**300**	730	430	186	195.7	218.8	-	BAB45UE1MNN	BAB45UE2MNN	BAB45UE3MNN	-
450	**400**	906	450	228	245	259	-	BAB45UE1NNN	BAB45UE2NNN	BAB45UE3NNN	-
450	**450**	906	460	237	256	277.8	-	BAB45UE1PNN	BAB45UE2PNN	BAB45UE3PNN	-
500	**150**	650	430	192	218	230	-	BAB50UE1JNN	BAB50UE2JNN	BAB50UE3JNN	-
500	**200**	650	440	196	222	235	-	BAB50UE1KNN	BAB50UE2KNN	BAB50UE3KNN	-
500	**250**	768	450	223	249	263	-	BAB50UE1LNN	BAB50UE2LNN	BAB50UE3LNN	-
500	**300**	768	460	229	255	270	-	BAB50UE1MNN	BAB50UE2MNN	BAB50UE3MNN	-
500	**400**	880	480	263	293	314	-	BAB50UE1NNN	BAB50UE2NNN	BAB50UE3NNN	-
500	**500**	1000	500	306	345	363	-	BAB50UE1QNN	BAB50UE2QNN	BAB50UE3QNN	-
600	**100**	700	475	255	305	311	-	BAB60UE1FNN	BAB60UE2FNN	BAB60UE3FNN	-
600	**300**	812	520	302.8	352.1	359	-	BAB60UE1MNN	BAB60UE2MNN	BAB60UE3MNN	-
600	**400**	930	540	344	398	413	-	BAB60UE1NNN	BAB60UE2NNN	BAB60UE3NNN	-
600	**500**	1100	550	568.8	632	644	-	BAB60UE1QNN	BAB60UE2QNN	BAB60UE3QNN	-
600	**600**	1100	580	444	519	528	-	BAB60UE1RNN	BAB60UE2RNN	BAB60UE3RNN	-

Weight : fitting only - References : fitting
Available also with fixed flanges DN 60-600 and with blue epoxy coating. For more information, please contact us.
For diameters DN 250 to 500 with branch dn 100 : please consult us

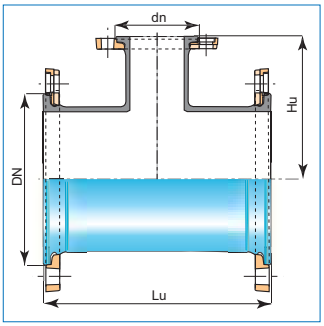
DRINKING WATER SUPPLY

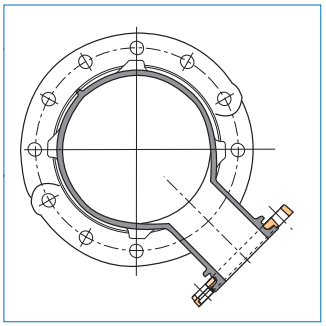
Fittings/ All flanged washout tee Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531







DN	dn	Lu	hu	Weight / kg				Reference			
		mm		PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
250	**100**	430	270	51.7	50.9	56.7	81.3	BAB25UV1F	BAB25UV2F	BAB25UV3F	BAB25UV4F
300	**100**	450	300	68.4	67	74.3	120	BAB30UV1F	BAB30UV2F	BAB30UV3F	BAB30UV4F
350	**100**	470	330	97	98	111		BAB35UV1FNN	BAB35UV2FNN	BAB35UV3FNN	-
400	**100**	490	360	114	123	141	-	BAB40UV1FNN	BAB40UV2FNN	BAB40UV3FNN	-
500	**100**	533	420	168	194	206	-	BAB50UV1FNN	BAB50UV2FNN	BAB50UV3FNN	-
600	**200**	700	500	265	315	322	-	BAB60UV1KNN	BAB60UV2KNN	BAB60UV3KNN	-

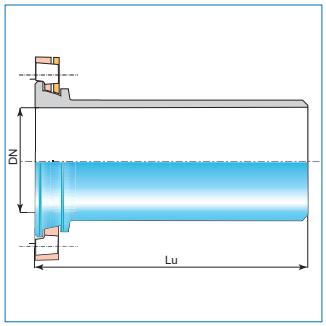
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Flanged spigot
Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



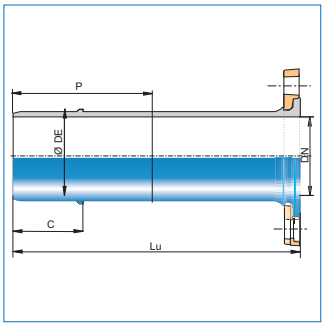


DN	Lu	Weight / kg				Reference			
	mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	**350**	6	6	5.6	5.6	NEA60BU1	NEA60BU1	NEA60BU3	NEA60BU3
80	**350**	8	8	8	8	NEA80BU1	NEA80BU1	NEA80BU1	NEA80BU1
100	**350**	8.56	8.56	6.5	6.5	NEB10BU1	NEB10BU1	NEB10BU3	NEB10BU3
125	**350**	10.88	10.88	8.6	8.6	NEB12BU1	NEB12BU1	NEB12BU3	NEB12BU3
150	**400**	13.96	13.96	14.96	14.96	NEB15BU1	NEB15BU1	NEB15BU3	NEB15BU3
200	**400**	20.6	20.5	22	22.4	NEB20BU1	NEB20BU2	NEB20BU3	NEB20BU4
250	**400**	34	33.5	32.02	-	NEB25BU1	NEB25BU2	NEB25BU3	-
300	**450**	46.8	46.1	41.62	69	NEB30BU1	NEB30BU2	NEB30BU3	NEB30BU4
350	**450**	58.6	59.4	65.5	-	NEB35BU1	NEB35BU2	NEB35BU3	-
400	**480**	70	74	83	-	NEB40BU1	NEB40BU2	NEB40BU3	-
450	**500**	86	92	100	-	NEB45BU1	NEB45BU2	NEB45BU3	-
500	**520**	104	117	123	-	NEB50BU1	NEB50BU2	NEB50BU3	-
600	**560**	144	169.5	172	-	NEB60BU1	NEB60BU2	NEB60BU3	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Anchoring flanged spigot Rotatable flange – With weld bead

Field of use:
For drinking water mains



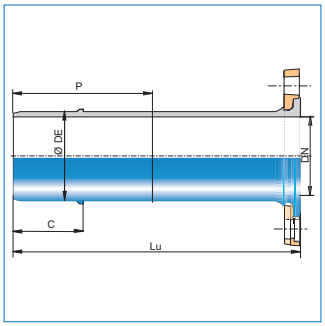
Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531
- To use with anchoring joint UNIVERSAL Ve or STANDARD Ve

DN	Lu	P	Bead position c	Weight / kg				Reference			
	mm			PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
80	**350**	215	85	8	8	8	8	NSA80BV1	NSA80BV1	NSA80BV1	NSA80BV1
100	**350**	215	90	9.6	9.6	10.8	10.8	NSB10BV1	NSB10BV1	NSB10BV3	NSB10BV3
125	**350**	220	95	12.5	12.5	14.2	14.2	NSB12BV1	NSB12BV1	NSB12BV3	NSB12BV3
150	**400**	225	95	17.1	17.1	17.1	17.1	NSB15BV1	NSB15BV1	NSB15BV3	NSB15BV3
200	**400**	230	100	24.5	24	25.5	25.9	NSB20BV1	NSB20BV2	NSB20BV3	NSB20BV4
250	**400**	240	110	33.7	33.5	36.4	22.4	NSB25BV1	NSB25BV2	NSB25BV3	NSB25BV4
300	**450**	250	115	47	47	50	65	NSB30BV1	NSB30BV2	NSB30BV3	NSB30BV4
350	**450**	260	115	58.6	59.4	64	-	NSB35BV1	NSB35BV2	NSB35BV3	-
400	**480**	270	113	70	75	83	-	NSB40BV1	NSB40BV2	NSB40BV3	-
450	**500**	280	120	86	92	100	-	NSB45BV1	NSB45BV2	NSB45BV3	-
500	**520**	290	125	104	117	123	-	NSB50BV1	NSB50BV2	NSB50BV3	-
600	**600**	310	135	144	169	172	-	NSB60BV1	NSB60BV2	NSB60BV3	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Anchoring flanged spigot
Rotatable flange – With weld bead

Field of use:
- For drinking water mains
- For aggressive soils



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531
- To use with anchoring joint UNIVERSAL Ve or STANDARD Ve

DN	Lu	P	Bead position c	Weight / kg				Reference			
	mm			PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
100	**350**	215	90	9.6	9.6	10.8	10.8	SSB10BV10TT	SSB10BV10TT	SSB10BV30TT	SSB10BV30TT
150	**400**	225	95	17.1	17.1	17.1	17.1	SSB15BV10TT	SSB15BV10TT	SSB15BV30TT	SSB15BV30TT
200	**400**	230	100	24.5	24	25.5	-	SSB20BV10TT	SSB20BV20TT	SSB20BV30TT	-
250	**400**	240	110	33.7	33.5	36.4	-	SSB25BV10TT	SSB25BV20TT	SSB25BV30TT	-
300	**450**	250	115	47	47	50	-	SSB30BV10TT	SSB30BV20TT	SSB30BV30TT	-
350	**450**	260	115	58.6	59.4	65.5	-	SSB35BV10TT	SSB35BV20TT	SSB35BV30TT	-
400	**480**	270	113	70	75	83	-	SSB40BV10TT	SSB40BV20TT	SSB40BV30TT	-
450	**500**	280	120	86	92	-	-	SSB45BV10TT	SSB45BV20TT	-	-
500	**520**	290	125	104	117	123	-	SSB50BV10TT	SSB50BV20TT	SSB50BV30TT	-
600	**600**	310	135	144	169	172	-	SSB60BV10TT	SSB60BV20TT	SSB60BV30TT	-

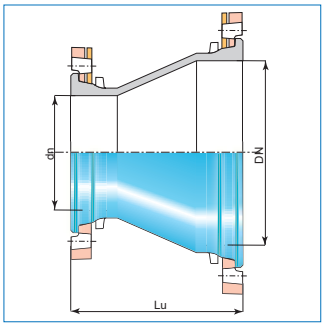
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged taper Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN	dn	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	**40**	200	7.3	7.3	5.9	5.9	BAA60VE1A	BAA60VE1A	BAA60VE3A	BAA60VE3A
60	**50**	216	8.3	8.3	6.4	6.4	BAA60VE1B	BAA60VE1B	BAA60VE3B	BAA60VE3B
65	**40**	200	7.9	7.9	8.1	8.1	BAA65VE1A	BAA65VE1A	BAA65VE3A	BAA65VE3A
65	**50**	216	7.3	7.3	7.3	7.3	BAA65VE1B	BAA65VE1B	BAA65VE3B	BAA65VE3B
80	**40**	200	7.9	7.9	7.9	7.9	BAA80VE1A	BAA80VE1A	BAA80VE1A	BAA80VE1A
80	**50**	251	8.4	8.4	8.4	8.4	BAA80VE1B	BAA80VE1B	BAA80VE1B	BAA80VE1B
80	**60**	200	8.8	8.8	8.4	8.4	BAA80VE1C	BAA80VE1C	BAA80VE3C	BAA80VE3C
80	**65**	200	9.3	9.3	9.4	9.4	BAA80VE1D	BAA80VE1D	BAA80VE3D	BAA80VE3D
100	**40**	200	8.7	8.7	8.9	8.9	BAB10VE1A	BAB10VE1A	BB10VE3A	BB10VE3A
100	**50**	249	9.2	9.2	9.7	9.7	BAB10VE1B	BAB10VE1B	BAB10VE3B	BAB10VE3B
100	**60**	200	9.6	9.6	9.7	9.7	BAB10VE1C	BAB10VE1C	BAB10VE3C	BAB10VE3C
100	**65**	200	10.1	10.1	10.7	10.7	BAB10VE1D	BAB10VE1D	BAB10VE3D	BAB10VE3D
100	**80**	200	10.7	10.7	11.2	11.2	BAB10VE1E	BAB10VE1E	BAB10VE3E	BAB10VE3E
125	**40**	280.5	9.5	9.5	-	-	BAB12VE1A	BAB12VE1A	-	-
125	**50**	290.5	11.6	11.6	12.5	12.5	BAB12VE1B	BAB12VE1B	BAB12VE3B	BAB12VE3B
125	**60**	300	12	12	12.5	12.5	BAB12VE1C	BAB12VE1C	BAB12VE3C	BAB12VE3C
125	**65**	300	12.5	12.5	13	13	BAB12VE1D	BAB12VE1D	BAB12VE3D	BAB12VE3D
125	**80**	200	12.5	12.5	13.4	13.4	BAB12VE1E	BAB12VE1E	BAB12VE3E	BAB12VE3E
125	**100**	200	13.1	13.1	14.5	14.5	BAB12VE1F	BAB12VE1F	BAB12VE3F	BAB12VE3F
150	**40**	331.5	14.2	14.2	15.2	15.2	BAB15VE1A	BAB15VE1A	BAB15VE3A	BAB15VE3A
150	**50**	341.5	14.7	14.7	15.7	15.7	BAB15VE1B	BAB15VE1B	BAB15VE3B	BAB15VE3B
150	**60**	351.6	15.1	15.1	16.7	16.7	BAB15VE1C	BAB15VE1C	BAB15VE3C	BAB15VE3C
150	**65**	351.5	15.6	15.6	15.7	15.7	BAB15VE1D	BAB15VE1D	BAB15VE3D	BAB15VE3D
150	**80**	311	15.6	15.6	16.6	16.6	BAB15VE1E	BAB15VE1E	BAB15VE3E	BAB15VE3E
150	**100**	306	15.7	15.7	17.2	17.2	BAB15VE1F	BAB15VE1F	BAB15VE3F	BAB15VE3F
150	**125**	200	16.7	16.7	18.6	18.6	BAB15VE1G	BAB15VE1G	BAB15VE3G	BAB15VE3G
200	**100**	385	22.8	22.7	24.7	25.1	BAB20VE1F	BAB20VE2F	BAB20VE3F	BAB20VE4F
200	**125**	326.5	23.1	23	25.4	25.8	BAB20VE1G	BAB20VE2G	BAB20VE3G	BAB20VE4G
200	**150**	304	23.5	23.5	26	26.4	BAB20VE1J	BAB20VE2J	BAB20VE3J	BAB20VE4J
250	**125**	370	35.8	35.4	39. 2	48	BAB25VE1G	BAB25VE2G	BAB25VE3G	BAB25VE4G
250	**150**	319	35	34.5	38	46.6	BAB25VE1J	BAB25VE2J	BAB25VE3J	BAB25VE4J
250	**200**	300	33	32.7	37	47	BAB25VE1K	BAB25VE2K	BAB25VE3K	BAB25VE4K
300	**150**	424	46	45.5	50	-	BAB30VE1J	BAB30VE2J	BAB30VE3J	-
300	**200**	323	48.8	48	53.1	73.9	BAB30VE1K	BAB30VE2K	BAB30VE3K	BAB30VE4K
300	**250**	300	52.9	51.8	58.3	-	BAB30VE1L	BAB30VE2L	BAB30VE3L	-
350	**200**	440	63.6	64.3	71.9	-	BAB35VE1KNN	BAB35VE2KNN	BAB35VE3KNN	-
350	**250**	375	60.5	61.5	70.5	-	BAB35VE1LNN	BAB35VE2LNN	BAB35VE3LNN	-
350	**300**	302	66.4	66.5	76.2	-	BAB35VE1MNN	BAB35VE2MNN	BAB35VE3MNN	-
400	**250**	447	75	78.5	70.5	-	BAB40VE1LNN	BAB40VE2LNN	BAB40VE3LNN	-
400	**300**	380	75	78.4	76.2	-	BAB40VE1MNN	BAB40VE2MNN	BAB40VE3MNN	-
400	**350**	300	79.3	84.2		-	BAB40VE1YNN	BAB40VE2YNN	BAB40VE3YNN	-
450	**300**	462	92	98	110	-	BAB45VE1MNN	BAB45VE2MNN	BAB45VE3MNN	-
450	**350**	363	92	99	114	-	BAB45VE1YNN	BAB45VE2YNN	BAB45VE3YNN	-
450	**400**	300	89	100	117	-	BAB45VE1NNN	BAB45VE2NNN	BAB45VE3NNN	-
500	**350**	600	151	165	177.1	-	BAB50VE1YNN	BAB50VE2YNN	BAB50VE3YNN	-
500	**400**	600	127.5	144.8	160	-	BAB50VE1NNN	BAB50VE2NNN	BAB50VE3NNN	-
600	**400**	600	183	212	224	-	BAB60VE1NNN	BAB60VE2NNN	BAB60VE3NNN	-
600	**450**	600	223	230	263	-	BAB60VE1PNN	BAB60VE2PNN	BAB60VE3PNN	-
600	**500**	600	173.8	212	221	-	BAB60VE1QNN	BAB60VE2QNN	BAB60VE3QNN	-

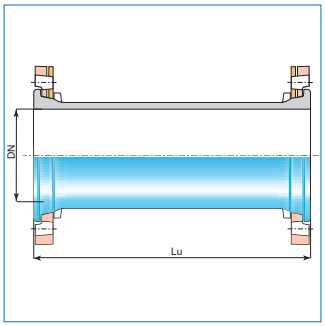
Weight : fitting only - References : fitting
Available also with fixed flanges DN 80-600 and with blue epoxy coating. For more information, please contact us.

Fittings/ Short double flanged pipe
Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





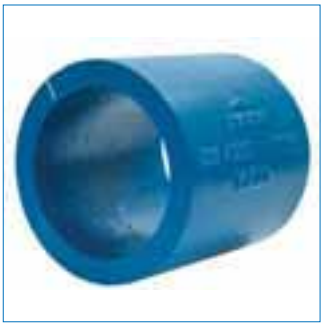
DN	Lu	Weight / kg				Reference			
	mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
60	**250**	6.6	6.6	6.6	6.6	BAA60MT1A	BAA60MT1A	BAA60MT3A	BAA60MT3A
60	**500**	10.4	10.4	9.4	9.4	BAA60MT1B	BAA60MT1B	BAA60MT3B	BAA60MT3B
65	**250**	8.4	8.4	8.6	8.6	BAA65MT1A	BAA65MT1A	BAA65MT3A	BAA65MT3A
65	**500**	11.2	11.2	11.4	11.4	BAA65MT1B	BAA65MT1B	BAA65MT3B	BAA65MT3B
80	**250**	9.8	9.8	9.8	9.8	BAA80MT1A	BAA80MT1A	BAA80MT1A	BAA80MT1A
80	**500**	13.3	13.3	13.3	13.3	BAA80MT1B	BAA80MT1B	BAA80MT1B	BAA80MT1B
100	**250**	11.5	11.5	12.5	12.5	BAB10MT1A	BAB10MT1A	BAB10MT3A	BAB10MT3A
100	**500**	13.4	13.4	14.4	14.4	BAB10MT1B	BAB10MT1B	BAB10MT3B	BAB10MT3B
125	**250**	15	15	16.7	16.7	BAB12MT1A	BAB12MT1A	BAB12MT3A	BAB12MT3A
125	**500**	20.5	20.5	21.4	21.4	BAB12MT1B	BAB12MT1B	BAB12MT3B	BAB12MT3B
150	**250**	19	19	21	21	BAB15MT1A	BAB15MT1A	BAB15MT3A	BAB15MT3A
150	**500**	26	26	28	28	BAB15MT1B	BAB15MT1B	BAB15MT3B	BAB15MT3B
200	**250**	26.5	26	29	30.1	BAB20MT1A	BAB20MT2A	BAB20MT3A	BAB20MT4A
200	**500**	36.5	36	39.5	42	BAB20MT1B	BAB20MT2B	BAB20MT3B	BAB20MT4B
250	**250**	38.5	38	43.5	64	BAB25MT1A	BAB25MT2A	BAB25MT3A	BAB25MT4A
250	**500**	54	53	59	79	BAB25MT1B	BAB25MT2B	BAB25MT3B	BAB25MT4B
300	**250**	50	49	56	80	BAB30MT1A	BAB30MT2A	BAB30MT3A	BAB30MT4A
300	**500**	69.5	68.5	75.5	106	BAB30MT1B	BAB30MT2B	BAB30MT3B	BAB30MT4B
350	**250**	69.2	70.8	83	-	BAB35MT1ANN	BAB35MT2ANN	BAB35MT3ANN	-
350	**500**	98.7	100.3	112.5	-	BAB35MT1BNN	BAB35MT2BNN	BAB35MT3BNN	-
400	**250**	69.1	77.1	95.5	-	BAB40MT1ANN	BAB40MT2ANN	BAB40MT3ANN	-
400	**500**	113.7	122.7	140.7	-	BAB40MT1BNN	BAB40MT2BNN	BAB40MT3BNN	-
450	**250**	85	98	115	-	BAB45MT1ANN	BAB45MT2ANN	BAB45MT3ANN	-
450	**500**	114.5	127.5	143.5	-	BAB45MT1BNN	BAB45MT2BNN	BAB45MT3BNN	-
500	**250**	113	118.6	147	-	BBB50MT1ANN	BBB50MT2ANN	BBB50MT3ANN	-
500	**500**	162.6	167.8	196	-	BBB50MT1BNN	BBB50MT2BNN	BBB50MT3BNN	-
600	**250**	153.8	169.9	209	-	BBB60MT1ANN	BBB60MT2ANN	BBB60MT3ANN	-
600	**500**	219.5	235.7	274	-	BBB60MT1BNN	BBB60MT2BNN	BBB60MT3BNN	-

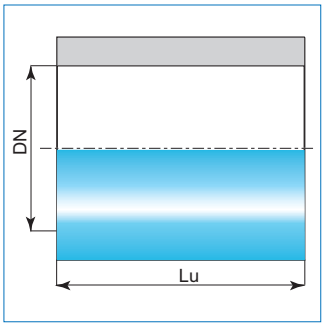
Weight : fitting only - References : fitting
Reference given in black: rotatable flange
Reference given in blue: fixed flange
For more information, please contact us.

Fittings/ Pipe block

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN	Lu	Weight	Reference
	mm	kg	
40	250	7	BBA40MR
60	250	11	BBA60MR
80	250	16	BBA80MR
100	250	19	BBB10MR
125	250	25	BBB12MR
150	250	30	BBB15MR
200	250	42	BBB20MR
250	250	55	BBB25MR
300	250	62	BBB30MR
350	250	84	BBB35MR00NN
400	250	95	BBB40MR00NN
450	250	106	BBB45MR00NN
500	250	125	BBB50MR00NN
600	250	148	BBB60MR00NN

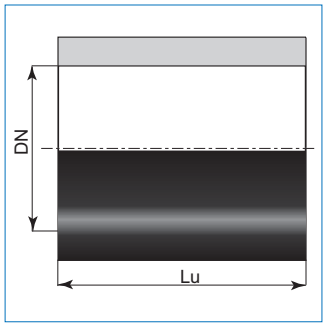
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Pipe block

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531





DN	Lu	Weight	Reference
	mm	kg	
700	250	204	BBB70MR
800	250	249	BBB80MR
900	250	278	BBB90MR
1000	250	329	BBC10MR

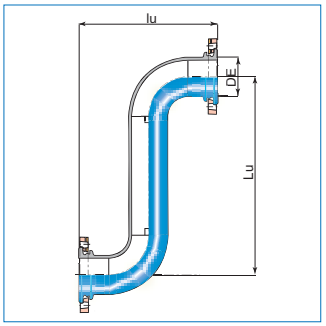
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ 'S' Height Adjustment Bend Rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531





DN	LU	Lu	DE	Weight	Reference		
	mm			kg	PN10	PN16	PN25
80	500	350	170	16	220824	220824	220824
100	500	350	118	19.5	220826	220826	-
150	500	350	274	31.6	220828	220828	-

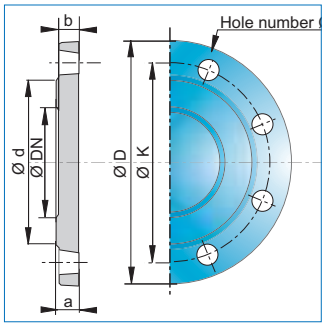
Weight : fitting only - References : fitting
For more information, please contact us.

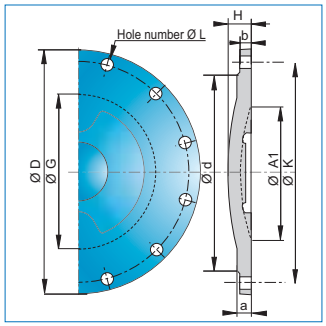
Fittings/ Blank flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531







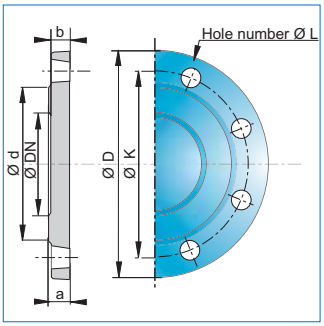
DN	Weight / kg				Reference			
	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
40	2	2	2	2	BBA40QN1	BBA40QN1	BBA40QN1	BBA40QN1
50	3	3	3	3	BBA50QN1	BBA50QN1	BBA50QN1	BBA50QN1
60	2.7	2.7	2.6	2.6	BBA60QN1	BBA60QN1	BBA60QN3	BBA60QN3
65	3.1	3.1	3	3	BBA65QN1	BBA65QN1	BBA65QN3	BBA65QN3
80	3.5	3.5	3.5	3.5	BBA80QN1	BBA80QN1	BBA80QN1	BBA80QN1
100	4.3	4.3	4.8	4.8	BBB10QN1	BBB10QN1	BBB10QN3	BBB10QN3
125	5.6	5.6	6.5	-	BBB12QN1	BBB12QN1	BBB12QN3	-
150	7.2	7.2	8.6	-	BBB15QN1	BBB15QN1	BBB15QN3	-
200	11	13.8	13.9	-	BBB20QN1	BBB20QN2	BBB20QN3	-
250	16.9	16.9	22	-	BBB25QN1	BBB25QN2	BBB25QN3	-
300	26.5	26.5	33	-	BBB30QN1	BBB30QN2	BBB30QN3	-
350	32.5	37.5	37.5	-	BBB35QN10NN	BBB35QN20NN	BBB35QN30NN	-
400	45.5	43.5	63	-	BBB40QN10NN	BBB40QN20NN	BBB40QN30NN	-
450	55	64	80	-	BBB45QN10NN	BBB45QN20NN	BBB45QN30NN	-
500	70	84	101	-	BBB50QN10NN	BBB50QN20NN	BBB50QN30NN	-
600	106	133	156	-	BBB60QN10NN	BBB60QN20NN	BBB60QN30NN	-

Weight : fitting only - References : fitting
For more information, please contact us.

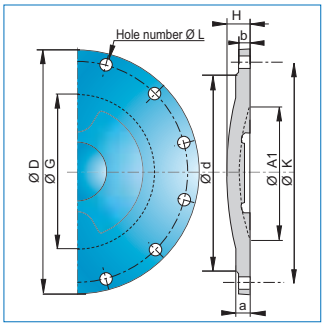
Fittings/ Blank flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



DN 40-250



DN 300-600

PFA 10

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
DN 40 to 150 see PFA 16 below										
200	340	20	17	266	-	-	8	23	295	-
250	400	22	19	319	-	-	12	23	350	
300	455	24.5	20.5	370	290	40.5	12	23	400	246
350	505	24.5	20.5	429	340	50.3	16	23	505	290
400	565	24.5	20.5	480	385	62	16	28	515	350
450	615	25.5	21.5	530	435	68.5	20	28	565	430
500	670	26.5	22.5	582	490	58	20	28	620	450
600	780	30	25	682	585	88	20	31	725	550

PFA 16

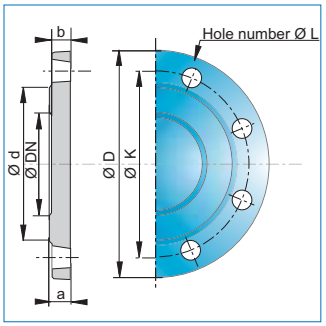
DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
40	150	19	16	84	-	-	4	19	110	-
50	165	19	16	99	-	-	4	19	125	-
60	175	19	16	108	-	-	4	19	135	-
65	185	19	16	118	-	-	4	19	145	-
80	200	19	16	132	-	-	8	19	160	-
100	220	19	16	156	-	-	8	19	180	-
125	250	19	16	184	-	-	8	19	210	-
150	285	19	16	211	-	-	8	23	240	-
200	340	20	17	266	-	-	12	23	295	-
250	400	22	19	319	-	-	12	28	355	-
300	455	24.5	20.5	370	290	40.5	12	28	410	246
350	520	26.5	22.5	429	340	52.3	16	28	470	290
400	580	28	24	480	385	64	16	31	525	350
450	640	30	26	548	435	71	20	31	585	400
500	715	31.5	27.5	609	485	77.5	20	34	650	450
600	840	36	31	720	585	91	20	37	770	550

For more information, please contact us.

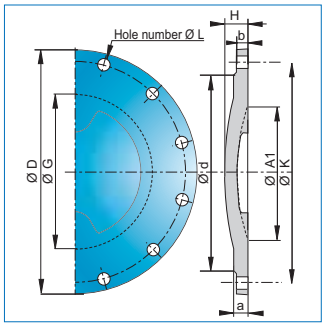
Fittings/ Blank flange

Field of use:
For drinking water mains

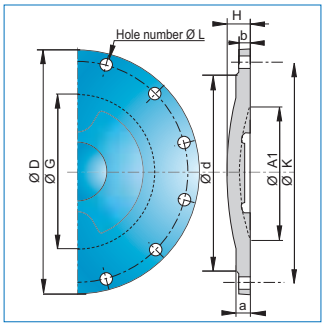
Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



DN 40 100 PN25 PN40



DN 125 250 PN25
DN 125 300 PN40



DN 300-600 PN 25

PFA 25

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
DN 40 to 150 see PFA 40 below										
200	360	22	19	274	190	39	12	28	310	180
250	425	24.5	21.5	330	240	46.5	12	31	370	230
300	485	27.5	23.5	389	290	53.5	16	31	430	250
350	555	30	26	448	335	61	16	34	490	300
400	620	32	28	503	385	68	16	37	550	350
450	670	34.5	30.5	548	435	75.5	20	37	600	400
500	730	36.5	32.5	609	485	82.5	20	37	660	450
600	845	42	37	720	585	97	20	41	770	550

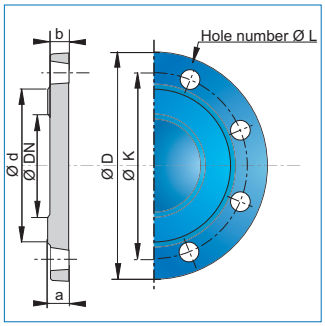
PFA 40

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
40	150	19	16	84	-	-	4	19	110	-
50	165	19	16	99	-	-	4	19	125	-
60	175	19	16	108	-	-	8	19	135	-
65	185	19	16	118	-	-	8	19	145	-
80	200	19	16	132	-	-	8	19	160	-
100	235	19	16	156	-	-	8	23	190	-
125	270	23.5	20.5	184	115	28.5	8	28	220	105
150	300	26	23	211	140	32	8	28	250	130
200	375	30	27	284	190	39	12	31	320	180
250	450	34.5	31.5	345	240	46.5	12	31	370	230
300	515	39.5	35.5	409	290	53.5	16	31	430	250

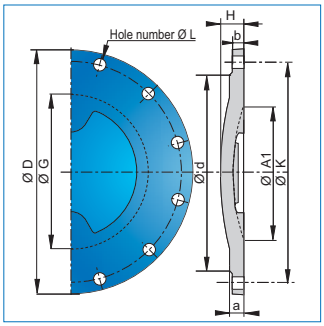
For more information, please contact us.

DRINKING WATER SUPPLY

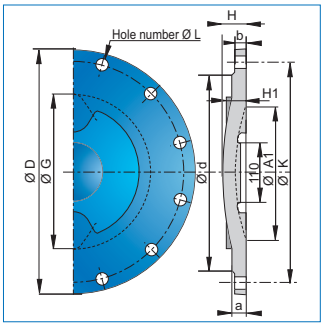
Fittings/ Blank flange



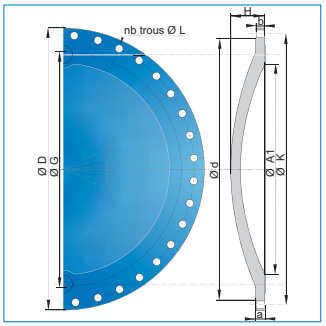
DN 40-250



DN 300-600



DN 700-1200



DN 1400-2000

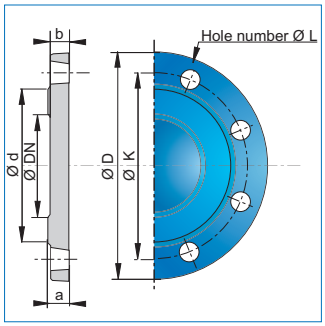
Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

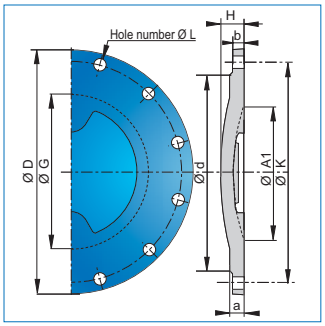
DN	Weight / kg				Reference			
	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
40	2	2	2	2	BBA40QN10TT	BBA40QN10TT	BBA40QN10TT	BBA40QN10TT
50	3	3	3	3	BBA50QN10TT	BBA50QN10TT	BBA50QN10TT	BBA50QN10TT
60	2.7	2.7	-	-	BBA60QN10TT	BBA60QN10TT	-	-
65	3.1	3.1	-	-	BBA65QN10TT	BBA65QN10TT	-	-
80	3.5	3.5	3.5	3.5	BBA80QN10TT	BBA80QN10TT	BBA80QN10TT	BBA80QN10TT
100	4.3	4.3	4.8	4.8	BBB10QN10TT	BBB10QN10TT	BBB10QN30TT	BBB10QN30TT
125	5.6	5.6	6.5	6.5	BBB12QN10TT	BBB12QN10TT	BBB12QN30TT	BBB12QN30TT
150	7.2	7.2	8.5	8.5	BBB15QN10TT	BBB15QN10TT	BBB15QN30TT	BBB15QN30TT
200	11	11	13.9	-	BBB20QN10TT	BBB20QN20TT	BBB20QN30TT	-
250	16.9	16.9	22	-	BBB25QN10TT	BBB25QN20TT	BBB25QN30TT	-
300	26.5	26.5	33	-	BBB30QN10TT	BBB30QN20TT	BBB30QN30TT	-
350	32.5	37.5	37.5	-	BBB35QN10TT	BBB35QN20TT	BBB35QN30TT	-
400	45.5	43.5	63	-	BBB40QN10TT	BBB40QN20TT	BBB40QN30TT	-
450	55	64	80	-	BBB45QN10TT	BBB45QN20TT	BBB45QN30TT	-
500	70	84	101	-	BBB50QN10TT	BBB50QN20TT	BBB50QN30TT	-
600	106	133	156	-	BBB60QN10TT	BBB60QN20TT	BBB60QN30TT	-
700	153	166	221	-	BBB70QN10TT	BBB70QN20TT	BBB70QN30TT	-
800	214	230	311	-	BBB80QN10TT	BBB80QN20TT	BBB80QN30TT	-
900	279	300	-	-	BBB90QN10TT	BBB90QN20TT	-	-
1000	367	400	540	-	BBC10QN10TT	BBC10QN20TT	BBC10QN30TT	-
1100	-	520	-	-	-	BBC11QN20TT	-	-
1200	506	662	-	-	BBC12QN10TT	BBC12QN20TT	-	-
1400	-	993	-	-	-	BBC14QN20TT	-	-
1500	-	1222	-	-	-	BBC15QN20TT	-	-
1600	-	1462	-	-	-	BBC16QN20TT	-	-
1800	1717	2016	-	-	BBC18QN10TT	BBC18QN20TT	-	-
2000	2272	2660	3350	-	BBC20QN10TT	BBC20QN20TT	BBC20QN30TT	-

Weight : fitting only - References : fitting
For more information, please contact us.

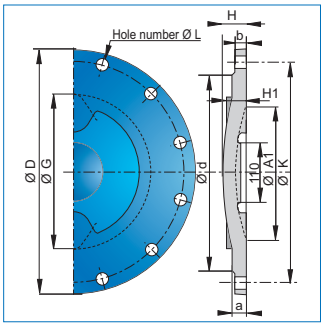
Fittings/ Blank flange



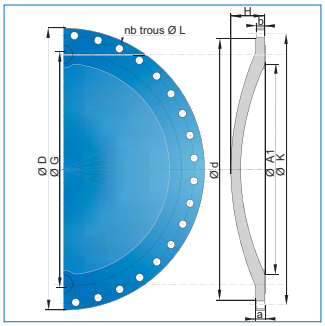
DN 40-250



DN 300-600



DN 700-1200



DN 1400-2000

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

PFA 10 DN 40 to 600

For DN 40 to 150, see PFA 16 page 520

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
200	340	20	17	266	-	-	8	23	295	-
250	400	22	19	319	-	-	12	23	350	
300	455	24.5	20.5	370	290	40.5	12	23	400	246
350	505	24.5	20.5	429	340	50.3	12	23	460	290
400	565	24.5	20.5	480	385	62	16	28	515	350
450	615	25.5	21.5	530	435	68.5	20	28	565	400
500	670	26.5	22.5	582	490	58	20	28	620	450
600	780	30	25	682	585	88	20	31	725	550

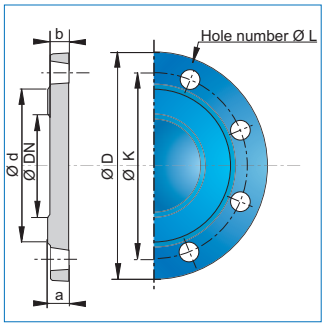
PFA 10 DN 700 to 2000

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
700	895	32.5	27.5	794	680	101	24	31	840	650
800	1015	35	30	901	785	114	24	34	950	750
900	1115	37.5	32.5	1001	885	127	28	34	1050	850
1000	1230	40	35	1112	985	140	28	37	1160	950
1100	1340	42.5	37.5	1218	1085	147.5	32	37	1270	1050
1200	1455	45	40	1328	1185	160	32	41	1380	1150
1400	1675	46	41	1530	1375	192	36	43	1590	-
1500	1785	47.5	42.5	1640	1475	205	36	43	1700	-
1600	1915	49	44	1750	1575	218	40	49	1820	-
1800	2115	52	47	1950	1775	244	44	49	2020	-
2000	2325	55	50	2150	1975	270	48	49	2230	-

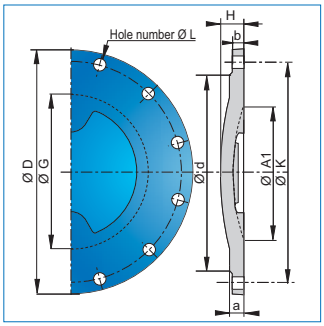
For more information, please contact us.

DRINKING WATER SUPPLY

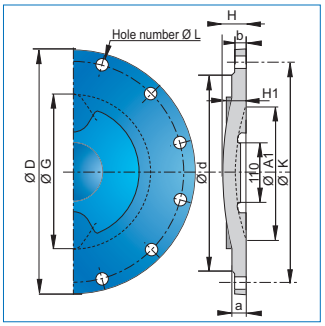
Fittings/ Blank flange



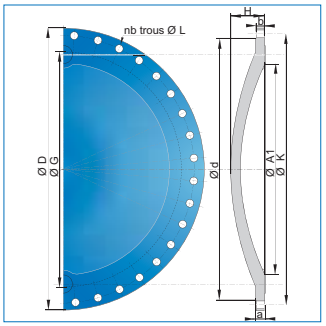
DN 40-250



DN 300-600



DN 700-1200



DN 1400-2000

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

PFA 16 DN 40 to 600

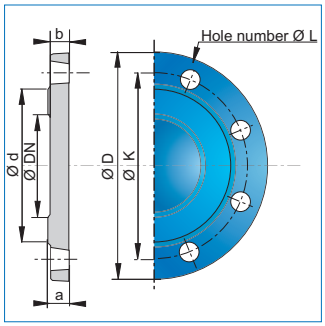
DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
40	150	19	16	84	-	-	4	19	110	-
50	165	19	16	99	-	-	4	19	125	-
60	175	19	16	108	-	-	4	19	135	-
65	185	19	16	118	-	-	4	19	145	-
80	200	19	16	132	-	-	8	19	160	-
100	220	19	16	153	-	-	8	19	180	-
125	250	19	16	184	-	-	8	19	210	-
150	285	19	16	211	-	-	8	23	240	-
200	340	20	17	266	-	-	12	23	295	-
250	400	22	19	319	-	-	12	28	355	-
300	455	24.5	20.5	370	290	40.5	12	28	410	246
350	520	26.5	22.5	429	340	52.3	16	28	470	290
400	580	28	24	480	385	64	16	31	525	350
450	640	30	26	548	435	71	20	31	585	400
500	715	31.5	27.5	609	485	77.5	20	34	650	450
600	840	36	31	720	585	91	20	37	770	550

PFA 16 DN 700 to 2000

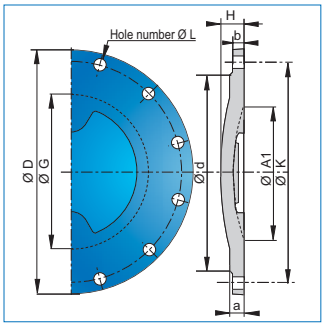
DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
700	910	39.5	34.5	794	685	112	24	37	840	650
800	1025	43	38	901	785	126	24	41	950	750
900	1125	46.5	41.5	1001	885	141	28	41	1050	850
1000	1255	50	45	1112	985	155	28	44	1170	950
1100	1355	53.5	48.5	1218	1085	170	32	44	1270	1050
1200	1485	57	52	1328	1185	184	32	50	1390	1150
1400	1685	60	55	1530	1342	199	36	50	1590	-
1500	1820	62.5	57.5	1640	1441	212.5	36	56	1710	-
1600	1930	65	60	1750	1540	226	40	57	1820	-
1800	2130	70	65	1950	1734	253	44	57	2020	-
2000	2345	75	70	2150	1930	280	48	62	2230	-

For more information, please contact us.

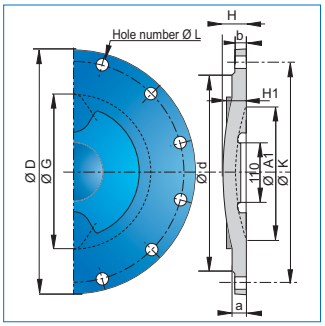
Fittings/ Blank flange



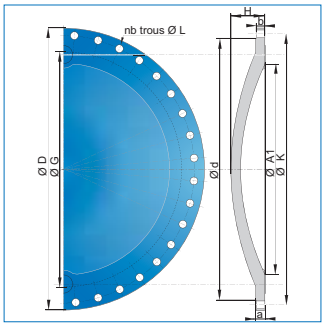
DN 40-250



DN 300-600



DN 700-1200



DN 1400-2000

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

PFA 25 DN 40 to 600

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
DN 40 to 150 see PFA 40 below										
200	360	22	19	274	190	39	12	28	310	180
250	425	24.5	21.5	330	240	46.5	12	31	370	230
300	485	27.5	23.5	389	290	53.5	16	31	430	250
350	555	30	26	448	335	61	16	34	490	300
400	620	32	28	503	385	68	16	37	550	350
450	670	34.5	30.5	548	435	75.5	20	37	600	400
500	730	36.5	32.5	609	485	82.5	20	37	660	450
600	845	42	37	720	585	97	20	41	770	550

PFA 25 DN 700 to 1600

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
700	960	46.5	41.5	820	685	112	24	44	875	650
800	1085	51	46	928	785	126	24	50	990	750
900	1185	55.5	50.5	1028	885	141	28	50	1090	850
1000	1320	60	55	1140	985	155	28	57	1210	950
1100	1420	64.5	59.5	1240	1085	170	32	57	1310	1050
1200	1530	69	64	1350	1185	184	32	57	1420	1150
1400	1755	74	69	1560	1342	213	36	62	1640	-
1600	1975	81	76	1780	1540	242	40	62	1860	-

PFA 40 DN 40 to 600

DN	Ø D	a	b	Ø d	Ø G	H	Nbr Hole	Ø L	Ø K	A1
40	150	19	16	84	-	-	4	19	110	-
50	165	19	16	99	-	-	4	19	125	-
60	175	19	16	108	-	-	8	19	135	-
65	185	19	16	118	-	-	8	19	145	-
80	200	19	16	132	-	-	8	19	160	-
100	235	19	16	156	-	-	8	23	190	-
125	270	23.5	20.5	184	115	-	8	28	220	105
150	300	26	23	211	140	-	8	28	250	140
200	375	30	27	284	190	-	12	31	320	190
250	450	34.5	31.5	343	240	-	12	34	385	230

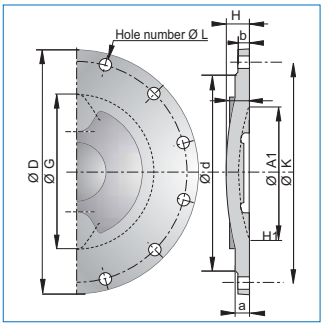
DRINKING WATER SUPPLY

Fittings/ Blank flange

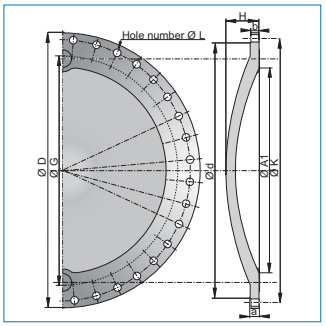
Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531





DN 700-1200



DN 1400-2000

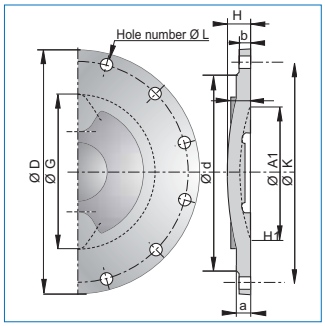
DN	Weight / kg			Reference		
	PN10	PN16	PN25	PN10	PN16	PN25
700	153	166	221	BBB70QN1	BBB70QN2	BBB70QN3
800	214	230	311	BBB80QN1	BBB80QN2	BBB80QN3
900	279	300	405	BBB90QN1	BBB90QN2	BBB90QN3
1000	367	400	540	BBC10QN1	BBC10QN2	BBC10QN3
1100	405	520	672	BBC11QN1	BBC11QN2	BBC11QN3
1200	506	662	840	BBC12QN1	BBC12QN2	BBC12QN3
1400	847	993	1284	BBC14QN1	BBC14QN2	BBC14QN3
1500	1027	1222	-	BBC15QN1	BBC15QN2	-
1600	1239	1462	-	BBC16QN1	BBC16QN2	-
1800	1717	2016	-	BBC18QN1	BBC18QN2	-
2000	2272	2660	-	BBC20QN1	BBC20QN2	-

Weight : fitting only - References : fitting
For more information, please contact us.

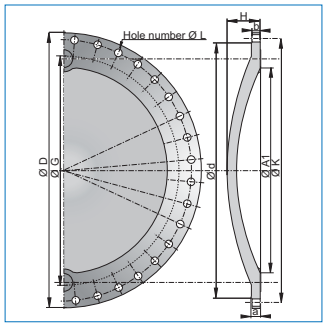
Fittings/ Blank flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis
- EN 545, ISO 2531



DN 700-1200



DN 1400-2000

PFA 10

DN	Ø D	a	b	Ø d	Ø G	H	H1	Nbr Hole	Ø L	Ø K	A1
700	895	32.5	27.5	794	680	101	55	24	31	840	650
800	1015	35	30	901	785	114	60	24	34	950	750
900	1115	37.5	32.5	1001	885	127	60	28	34	1050	850
1000	1230	40	35	1112	985	140	65	28	37	1160	950
1100	1340	42.5	37.5	1218	1085	147.5	65	32	37	1270	1050
1200	1455	45	40	1328	1185	160	75	32	41	1380	1150
1400	1675	46	41	1530	1375	192	-	36	43	1590	-
1500	1785	47.5	42.5	1640	1475	205	-	36	43	1700	-
1600	1915	49	44	1750	1575	218	-	40	49	1820	-
1800	2115	52	47	1950	1775	244	-	44	49	2020	-
2000	2325	55	50	2150	1975	270	-	48	49	2230	-

PFA 16

DN	Ø D	a	b	Ø d	Ø G	H	H1	Nbr Hole	Ø L	Ø K	A1
700	910	39.5	34.5	794	685	112	60	24	37	840	650
800	1025	43	38	901	785	126	65	24	41	950	750
900	1125	46.5	41.5	1001	885	141	65	28	41	1050	850
1000	1255	50	45	1112	985	155	75	28	44	1170	950
1100	1355	53.5	48.5	1218	1085	170	80	32	44	1270	1050
1200	1485	57	52	1328	1185	184	85	32	50	1390	1150
1400	1685	60	55	1530	1342	199	-	36	50	1590	-
1500	1820	62.5	57.5	1640	1441	212.5	-	36	56	1710	-
1600	1930	65	60	1750	1540	226	-	40	57	1820	-
1800	2130	70	65	1950	1734	253	-	44	57	2020	-
2000	2345	75	70	2150	1930	280	-	48	62	2230	-

PFA 25

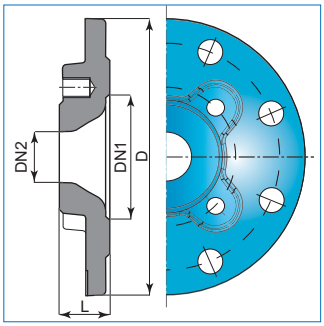
DN	Ø D	a	b	Ø d	Ø G	H	H1	Nbr Hole	Ø L	Ø K	A1
700	960	46.5	41.5	820	685	112	60	24	44	875	650
800	1085	51	46	928	785	126	65	24	50	990	750
900	1185	55.5	50.5	1028	885	141	65	28	50	1090	850
1000	1320	60	55	1140	985	155	75	28	57	1210	950
1100	1420	64.5	59.5	1240	1085	170	80	32	57	1310	1050
1200	1530	69	64	1350	1185	184	85	32	57	1420	1150
1400	1755	74	69	1560	1342	213	-	36	62	1640	-
1600	1975	81	76	1780	1540	242	-	40	62	1860	-

For more information, please contact us.

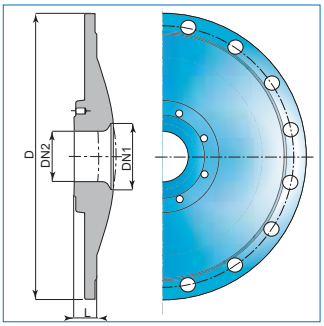
Fittings/ Reducing flange

Field of use:
For drinking water mains

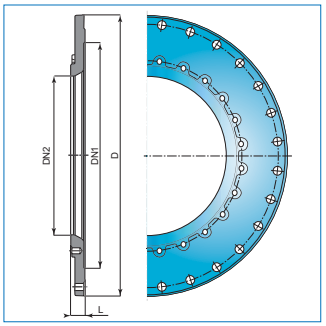
Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



Type 1



Type 2



Type 3

PN 10

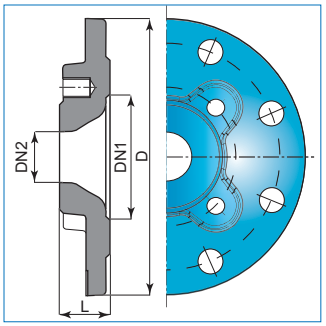
DN1	DN2	D	Type	L	Weight	Reference
		mm		mm	kg	
100	40	220	1	40	4.5	BBB10RN1ANNG
200	80	340	1	40	10.9	BBB20RN1ENNG
200	100	340	1	40	10.9	BBB20RN1FNNG
200	125	340	1	40	10.8	BBB20RN1GNNG
250	100	400	1	42	17.9	BBB25RN1FNNG
300	100	455	2	44.5	24.9	BBB30RN1FNNG
300	150	455	2	44.5	27.2	BBB30RN1JNNG
300	200	455	1	46.5	27.7	BBB30RN1KNNG
350	250	505	2	49.5	37.8	BBB35RN1LNNG
400	100	565	2	27.5	44.9	BBB40RN1FNNG
400	150	565	2	29.5	46.7	BBB40RN1JNNG
400	200	565	2	46.5	47.7	BBB40RN1KNNG
400	250	565	2	46.5	55.8	BBB40RN1LNNG
400	300	565	2	53	43.8	BBB40RN1MNNG
600	100	780	2	4	105.9	BBB60RN1FNNG
600	150	780	2	12.5	106.7	BBB60RN1JNNG
600	200	780	2	20	108.7	BBB60RN1KNNG
600	450	780	2	63	67.9	BBB60RN1PNNG

Weight : fitting only - References : fitting
For more information, please contact us.

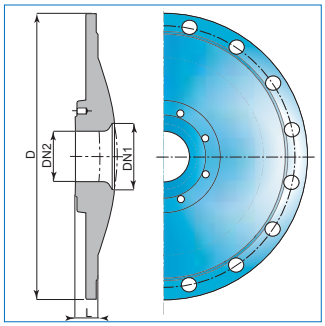
Fittings/ Reducing flange

Field of use:
For drinking water mains

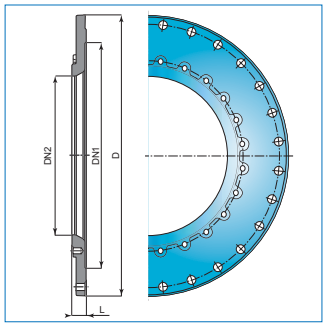
Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531



Type 1



Type 2



Type 3

PN 16

DN1	DN2	D	Type	L	Weight	Reference
		mm		mm	kg	
100	40	220	1	40	4.5	BBB10RN1ANNG
200	80	340	3	40	10.9	BBB20RN2ENNG
200	100	340	3	40	10.7	BBB20RN2FNNG
200	125	340	3	40	10.6	BBB20RN2GNNG
250	100	400	3	42	17.9	BBB25RN2FNNG
300	100	455	2	44.5	24.9	BBB30RN2FNNG
300	150	455	2	46.5	25.7	BBB30RN2JNNG
300	200	455	2	46.5	29.1	BBB30RN2KNNG
350	250	520	2	46.5	43.4	BBB35RN2LNNG
400	100	580	2	44.5	47.9	BBB40RN2FNNG
400	150	580	2	29.5	51.7	BBB40RN2JNNG
400	200	580	2	47.5	50.6	BBB40RN2KNNG
400	250	580	2	50	51.9	BBB40RN2LNNG
400	300	580	2	51.5	48.4	BBB40RN2MNNG
600	100	840	2	4	131.9	BBB60RN2FNNG
600	150	840	2	10	133.7	BBB60RN2JNNG
600	200	840	2	20	130.6	BBB60RN2KNNG
600	450	840	2	66	104	BBB60RN2PNNG

Weight : fitting only - References : fitting

PN 25

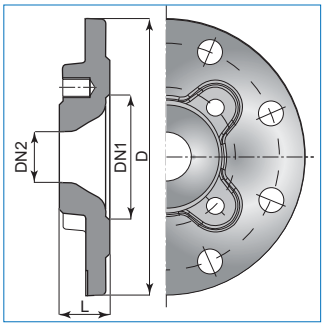
DN1	DN2	D	Type	L	Weight	Reference
		mm		mm	kg	
100	50	235	1	40	-	-
200	100	360	1	47	-	-
250	100	425	2	55.5	25.6	BBB25RN3FNNG
300	150	485	2	47.5	-	-
350	250	520	1	46.5	60	BBB35RN3LNNG
400	100	620	2	28.5	-	-
400	200	620	2	54	67.4	BBB40RN3KNNG
400	250	620	2	60	62.6	BBB40RN3LNNG
400	300	620	2	61	63.8	BBB40RN3MNNG
600	200	845	2	29	155.4	BBB60RN3KNNG

Weight : fitting only - References : fitting. For more information, please contact us.

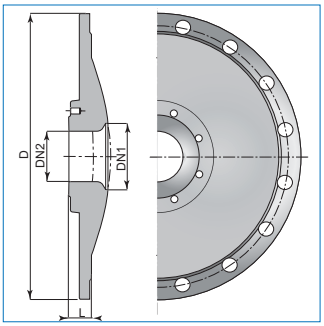
Fittings/ Reducing flange

Field of use:
For drinking water mains

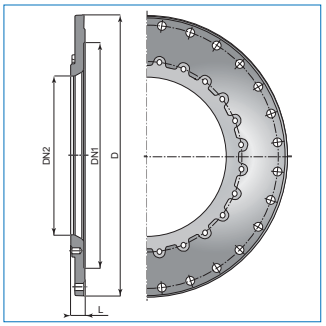
Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 all PN bituminous coating
- EN 545, ISO 2531



Type 1



Type 2



Type 3

PN 10

DN1	DN2	D	Type	L	Weight	Reference
		mm		mm	kg	
700	500	895	1	56	108.9	BBB70RN1QVVG
1000	700	1230	1	63	254.2	BBC10RN1SVVG
1000	800	1230	1	68	232.3	BBC10RN1TVVG
1400	800	1675	1	81	532.3	BBC14RN1TVVG
1400	1000	1675	1	86	463.7	BBC14RN1VVVG
1600	1200	1915	1	94	664.5	BBC16RN1BVVG

Weight : fitting only - References : fitting

PN 16

DN1	DN2	D	Type	L	Weight	Reference
		mm		mm	kg	
700	500	910	3	67	140.2	BBB70RN2QVVG
1000	700	1255	3	83	263.4	BBC10RN2SVVG
1000	800	1255	3	88	244.2	BBC10RN2TVVG

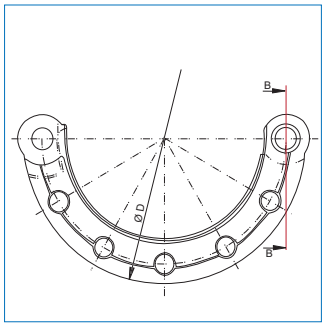
Weight : fitting only - References : fitting

PN 25

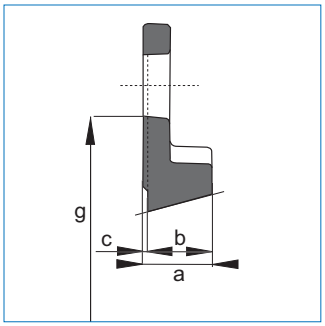
DN1	DN2	D	Type	L	Weight	Reference
		mm		mm	kg	
1000	800	1320	1	114	465.9	BBC10RN3TVVG

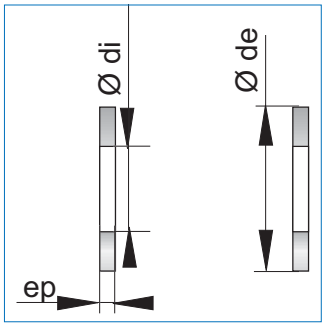
Weight : fitting only - References : fitting
For more information, please contact us.

Assembling joint with rotatable flanges

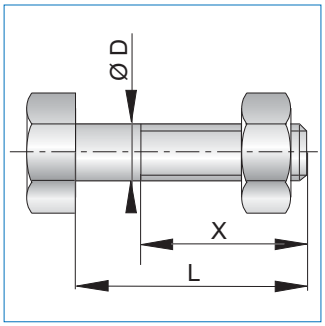


Rotatable flange





Washer



Bolt

PN 10

DN	Rotatable flange*						HM bolt					Washer				
	Ø D	Ø g	a	b	c	Reference	Ø d	L	X	Qty	Reference	Ø de	Ø di	ep	Qty	Reference
40	150	84	22	19	3	BAA40BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
50	165	99	22	19	3	BAA50BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
60	175	108	22.5	19.5	3	BAA60BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
65	185	108	22.5	19.5	3	BAA65BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
80	200	132	23	20	3	BAA80BO1	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
100	235	156	23	20	3	BAB10BO1	16	90	62	8	JXM16BM90	30	17	3	16	JXM16RQE
125	270	186	24.5	21.5	3	BAB12BO1	16	90	62	8	JXM16BM90	30	17	3	16	JXM16RQE
150	300	211	23	23	3	BAB15BO1	20	100	72	8	JXM20BM100	36	21	3	16	JXM20RQE
200	340	266	29	26	3	BAB20BO1	20	100	72	8	JXM20BM100	36	31	3	16	JXM20RQE
250	400	319	32	29	3	BAB25BO1	20	110	76	12	JXM20BM110	36	31	3	24	JXM20RQE
300	455	370	36	32	4	BAB30BO1	20	120	83	12	JXM20BM120	36	31	3	24	JXM20RQE
350	505	429	39	35	4	BAB35BO1	20	130	93	16	JXM20BM130	36	31	3	32	JXM20RQE
400	565	482	42	38	4	BAB40BQ1	24	140	103	16	JXM24BM140	45	25	4	32	JXM24RQE
450	615	527	45	41	4	BAB45BQ1	24	130	93	20	JXM24BM130	45	25	4	40	JXM24RQE
500	670	582	48	44	4	BAB50BQ1	24	150	110	20	JXM24BM150	45	25	4	40	JXM24RQE
600	780	682	55	50	5	BAB60BQ1	27	170	122	20	JXM27BM170	48	28	4	40	JXM27RQE

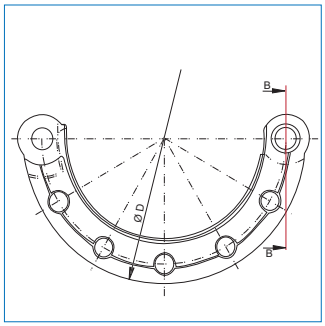
**Reference of half flange x 2 (DN 40 to 350) and reference of quarter of flange x 4 (DN 400 to 600)*

PN 16

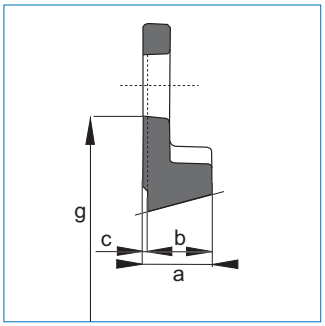
DN	Rotatable flange*						HM bolt					Washer				
	Ø D	Ø g	a	b	c	Reference	Ø d	L	X	Qty	Reference	Ø de	Ø di	ep	Qty	Reference
40	150	84	22	19	3	BAA40BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
50	165	99	22	19	3	BAA50BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
60	175	108	22.5	19.5	3	BAA60BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
65	185	108	22.5	19.5	3	BAA65BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
80	200	132	23	20	3	BAA80BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM20RQE
100	220	156	23	20	3	BAB10BO1	16	90	62	8	JXM16BM90	30	17	3	16	JXM20RQE
125	250	184	24.5	21.5	3	BAB12BO1	16	90	62	8	JXM16BM90	30	17	3	16	JXM20RQE
150	285	211	26	23	3	BAB15BO1	20	100	72	8	JXM20BM100	36	21	3	16	JXM20RQE
200	340	266	29	26	3	BAB20BO2	20	100	72	12	JXM20BM100	36	21	3	24	JXM20RQE
250	400	319	32	29	3	BAB25BO2	24	110	82	12	JXM24BM110	45	25	4	24	JXM24RQE
300	455	370	36	32	4	BAB30BO2	24	130	93	12	JXM24BM130	45	25	4	24	JXM24RQE
350	520	429	39	35	4	BAB35BO2	24	130	93	16	JXM24BM130	45	25	4	32	JXM24RQE
400	580	480	42	38	4	BAB40BQ2	27	150	105	16	JXM27BM140	48	28	4	32	JXM27RQE
450	640	527	45	41	4	BAB45BQ2	27	130	90	20	JXM27BM130	48	28	4	40	JXM27RQE
500	715	582	48	44	4	BAB50BQ2	30	160	110	20	JXM30BM160	52	31	4	40	JXM30RQE
600	840	682	55	50	5	BAB60BQ2	33	180	117	20	JXM33BM170	56	34	5	40	JXM33RQE

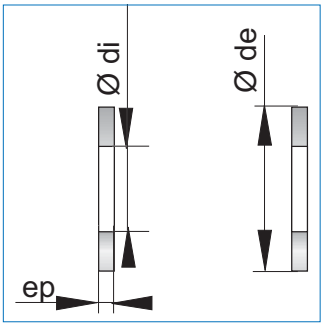
**Reference of half flange x 2 (DN 40 to 350) and reference of quarter of flange x 4 (DN 400 to 600).*

Assembling joint with rotatable flanges

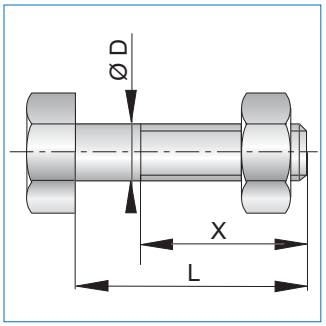


Rotatable flange





Washer



Bolt

PN 25

DN	Rotatable flange*						HM bolt					Washer				
	Ø D	Ø g	a	b	c	Reference	Ø d	L	X	Qty	Reference	Ø de	Ø di	ep	Qty	Reference
40	150	84	22	19	3	BAA40BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
50	165	99	22	19	3	BAA50BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
60	175	108	22.5	19.5	3	BAA60BO3	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
65	185	108	22.5	19.5	3	BAA65BO3	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
80	200	132	23	20	3	BAA80BO1	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
100	235	156	23	20	3	BAB10B03	20	100	72	8	JXM20BM100	36	21	3	16	JXM20RQE
125	270	186	24.5	21.5	3	BAB12BO3	24	110	82	8	JXM24BM110	45	25	4	16	JXM24RQE
150	300	211	23	23	3	BAB15BO3	24	110	82	8	JXM24BM110	45	25	4	16	JXM24RQE
200	360	266	29	26	3	BAB20BO3	24	110	82	12	JXM24BM110	45	25	4	24	JXM24RQE
250	425	319	32	29	3	BAB25BO3	27	130	90	12	JXM27BM130	48	28	4	24	JXM27RQE
300	485	370	36	32	4	BAB30BO3	27	130	90	16	JXM27BM130	48	28	4	32	JXM27RQE
350	555	429	39	35	4	BAB35BO3	30	140	93	16	JXM30BM140	56	31	4	32	JXM30RQE
400	620	482	42	38	4	BAB40BQ3	33	150	100	16	JXM33BM150	56	34	5	32	JXM33RQE
450	670	527	45	41	4	BAB45BQ3	33	150	100	20	JXM33BM150	56	34	5	40	JXM33RQE
500	730	582	48	44	4	BAB50BQ3	33	160	110	20	JXM33BM160	56	34	5	40	JXM33RQE
600	845	682	55	50	5	BAB60BQ3	36	180	110	20	JXM36BM180	60	37	5	40	JXM36RQE

**Reference of half flange x 2 (DN 40 to 350) and reference of quarter of flange x 4 (DN 400 to 600)*

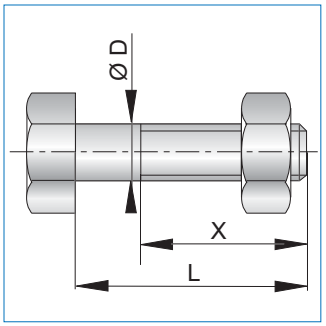
PN 40

DN	Rotatable flange*						HM bolt					Washer				
	Ø D	Ø g	a	b	c	Reference	Ø d	L	X	Qty	Reference	Ø de	Ø di	ep	Qty	Reference
40	150	84	22	19	3	BAA40BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
50	165	99	22	19	3	BAA50BO1	16	85	57	4	JXM16BM85	30	17	3	8	JXM16RQE
60	175	108	22.5	19.5	3	BAA60BO3	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
65	185	108	22.5	19.5	3	BAA65BO3	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
80	200	132	23	20	3	BAA80BO1	16	85	57	8	JXM16BM85	30	17	3	16	JXM16RQE
100	235	156	23	20	3	BAB10B03	20	100	72	8	JXM20BM100	36	21	3	16	JXM20RQE
125	270	186	24.5	21.5	3	BAB12BO3	24	110	82	8	JXM24BM110	45	25	4	16	JXM24RQE
150	300	211	23	23	3	BAB15BO3	24	110	82	8	JXM24BM110	45	25	4	16	JXM24RQE
200	375	266	32	30	3	BAB20BO4	27	130	130	12	JXM27BM110	48	28	4	24	JXM27RQE
250	450	345	37	34	3	BAB25BO4	30	140	93	12	JXM30BM140	52	31	4	24	JXM30RQE
300	515	409	42	38	4	BAB30BO4	30	140	93	16	JXM30BM140	52	31	4	32	JXM30RQE

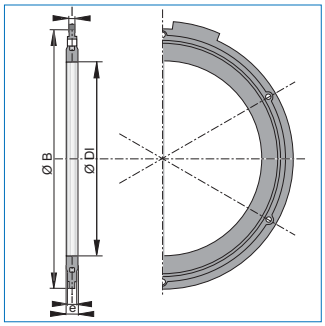
**Reference of half flange x 2.*

Flanged joint assembly for flanged pipes and fittings

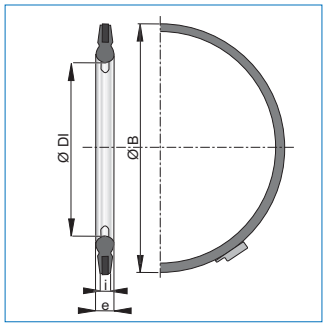
The kit includes the reinforced gasket, the steel bolts, and the washers corresponding.



Bolt



Gasket DN 40 to 300



Gasket DN 350 to 2000

DN	Kit Reference		
	PN10	PN16	PN25
40	JBA40GV1-E12	JBA40GV1-E12	JBA40GV1-E12
50	JBA50GV1-E12	JBA50GV1-E12	JBA50GV1-E12
60	JBA60GV1-E12	JBA60GV1-E12	JBA60GV1-E00
65	JBA65GV1-E12	JBA65GV1-E12	JBA65GV1-E00
80	JBA80GV1-E12	JBA80GV1-E12	JBA80GV1-E12
100	JBB10GV1-E12	JBB10GV1-E12	JBB10GV1-E00
125	JBB12GV1-E12	JBB12GV1-E12	JBB12GV1-E00
150	JBB15GV1-E12	JBB15GV1-E12	JBB15GV1-E00
200	JBB20GV1-E12	JBB20GV1-E13	JBB20GV1-E00
250	JBB25GV1-E12	JBB25GV1-E13	JBB25GV1-E00
300	JBB30GV1-E12	JBB30GV1-E13	JBB30GV1-E00
350	JBB35GV1-E12	JBB35GV1-E13	JBB35GV1-E00
400	JBB40GV1-E12	JBB40GV1-E13	JBB40GV1-E00
450	JBB45GV1-E12	JBB45GV1-E13	JBB45GV1-E00
500	JBB50GV1-E12	JBB50GV1-E13	JBB50GV1-E00
600	JBB60GV1-E12	JBB60GV1-E13	JBB60GV1-E00
700	JBB70GV1-E12	JBB70GV1-E13	JBB70GV1-E00
800	JBB80GV1-E12	JBB80GV1-E13	JBB80GV1-E00
900	JBB90GV1-E12	JBB90GV1-E13	JBB90GV1-E00
1000	JBC10GV1-E12	JBC10GV1-E13	JBC10GV1-E00
1100	JBC11GV1-E12	JBC11GV1-E13	-
1200	JBC12GV1-E12	JBC12GV1-E13	JBC12GV1-E00
1400	JBC14GV1-E12	JBC14GV1-E13	JBC14GV1-E00
1500	JBC15GV1-E12	JBC15GV1-E13	JBC15GV1-E00
1600	JBC16GV1-E12	JBC16GV1-E13	JBC16GV1-E00
1800	JBC18GV1-E12	JBC18GV1-E13	-
2000	JBC20GV1-E12	JBC20GV1-E13	-

For more information, please contact us.

DRINKING WATER SUPPLY

Flanged joint kit for flanged pipes and fittings

The flanged joint kit has a gasket with metallic inserts, bolts, nuts, and washers corresponding.



DN	Weight / kg		Reference	
	PN10	PN16	PN10	PN16
40	0.853	0.853	JBA40KV1	JBA40KV1
60	0.891	0.891	JBA60KV1	JBA60KV1
80	1.697	1.697	JBA80KV1	JBA80KV1
100	1.727	1.727	JBB10KV1	JBB10KV1
125	1.760	1.760	JBB12KV1	JBB12KV1
150	3.043	3.043	JBB15KV1	JBB15KV1
200	3.103	4.523	JBB20KV1	JBB20KV2
250	4.891	7.351	JBB25KV1	JBB25KV2
300	5.326	8.254	JBB30KV1	JBB30KV2

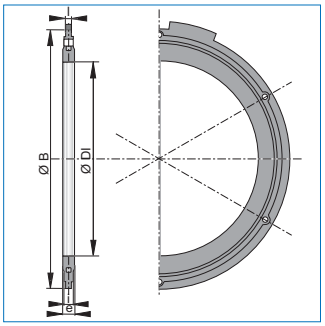
For more information, please contact us.

Gasket for rotatable flange

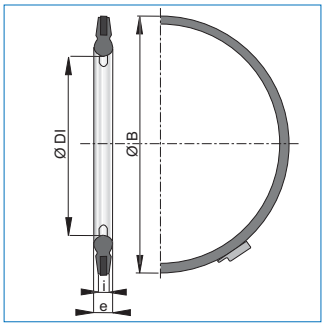
Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- EN 681.1
- High mechanical strength
- Leaktightness with lower torque





Gasket with embedded metal reinforcement from DN 40 to DN 300



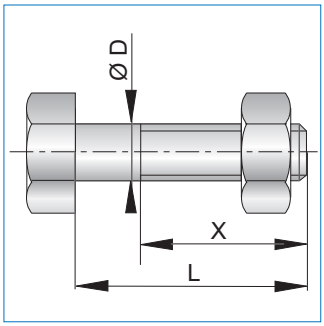
Gasket with inserted metal reinforcement

PN	DN	B	DI	i	e	Weight	Reference
bar		mm				kg	
10-40	**40**	94	53	8	10	0.069	JBA40GV1
	50	109	65	8	10	0.087	JBA50GV1
	60	120	76	8	10	0.107	JBA60GV1
	65	128	82	8	10	0.119	JBA65GV1
	80	144	95	8	10	0.129	JBA80GV1
	100	165	115	8	10	0.143	JBB10GV1
	125	195	145	8	10	0.176	JBB12GV1
	150	221	171	8	10	0.203	JBB15GV1
	200	276	226	8	10	0.263	JBB20GV1
	250	331	278	8	10	0.319	JBB25GV1
	300	380	324	8	10	0.394	JBB30GV1
10-25 (*)	**350**	439	371	9.5	16	0.890	JBB35GV1
	400	490	422	9.5	16	1.005	JBB40GV1
	450	540	472	9.5	16	1.100	JBB45GV1
	500	595	527	9.5	16	1.235	JBB50GV1
	600	697	621	9.5	16	1.800	JBB60GV1
	700	806	730	9.5	16	2.040	JBB70GV1
	800	913	827	9.5	16	2.845	JBB80GV1
	900	1013	927	9.5	16	3.155	JBB90GV1
	1000	1126	1040	9.5	16	3.500	JBC10GV1
	1100	1230	1134	9.5	16	4.540	JBC11GV1
	1200	1343	1247	9.5	16	4.945	JBC12GV1
	1400	1544	1448	9.5	16	5.610	JBC14GV1
	1500	1657	1541	9.5	16	7.990	JBC15GV1
	1600	1767	1651	9.5	16	8.535	JBC16GV1
	1800	1967	1851	9.5	16	11.854	JBC18GV1
	2000	2173	2047	9.5	16	12	JBC20GV1

(*) For PN40, please consult us.
For more information, please contact us.

DRINKING WATER SUPPLY

Bolts for pipes and fitting with rotatable flanges

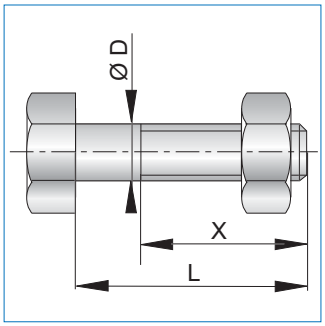


DN	Bolt for flanged joint PN 10				Bolt for flanged joint PN 16			
	Dimensions HM d L/X mm	Weight kg	Quantity	Reference	Dimensions HM d L/X mm	Weight kg	Quantity	Reference
40	HM 16 85 57	0.196	4	JXM16BM85	HM 16 85 57	0.196	4	JXM16BM85
50	HM 16 85 57	0.196	4	JXM16BM85	HM 16 85 57	0.196	4	JXM16BM85
60	HM 16 85 57	0.196	4	JXM16BM85	HM 16 85 57	0.196	4	JXM16BM85
65	HM 16 85 57	0.196	4	JXM16BM85	HM 16 85 57	0.196	4	JXM16BM85
80	HM 16 85 57	0.196	8	JXM16BM85	HM 16 85 57	0.196	8	JXM16BM85
100	HM 16 90 62	0.198	8	JXM16BM90	HM 16 90 62	0.198	8	JXM16BM90
125	HM 16 90 62	0.198	8	JXM16BM90	HM 16 90 62	0.198	8	JXM16BM90
150	HM 20 100 72	0.355	8	JXM20BM100	HM 20 100 72	0.355	8	JXM20BM100
200	HM 20 100 72	0.355	8	JXM20BM100	HM 20 100 72	0.355	12	JXM20BM100
250	HM 20 110 76	0.381	12	JXM20BM110	HM 24 110 82	0.586	12	JXM24BM110
300	HM 20 120 83	0.411	12	JXM20BM120	HM 24 130 93	0.655	12	JXM24BM130
350	HM 20 130 93	0.433	16	JXM20BM130	HM 24 130 93	0.655	16	JXM24BM130
400	HM 24 140 103	0.698	16	JXM24BM140	HM 27 150 105	0.975	16	JXM27BM150
450	HM 24 130 93	0.655	20	JXM24BM130	HM 27 130 90	0.885	20	JXM27BM130
500	HM 24 150 110	0.733	20	JXM24BM150	HM 30 160 110	1.335	20	JXM30BM160
600	HM 27 170 122	1.055	20	JXM27BM170	HM 33 180 117	1.806	20	JXM33BM180
700	HM 27 150 105	0.975	24	JXM27BM150	HM 33 150 100	1.605	24	JXM33BM150
800	HM 30 160 110	1.335	24	JXM30BM160	HM 36 160 92	2.100	24	JXM36BM160
900	HM 30 160 110	1.335	28	JXM30BM160	HM 36 160 92	2.100	28	JXM36BM160
1000	HM 33 180 117	1.806	28	JXM33BM180	HM 39 180 105	2.743	28	JXM39BM180
1100	HM 33 160 100	1.672	32	JXM33BM160	HM 39 180 105	2.743	32	JXM39BM180
1200	HM 36 180 110	2.260	32	JXM36BM180	HM 45 210 115	4.081	32	JXM45BM210
1400	HM 39 180 105	2.743	36	JXM39BM180	HM 45 210 115	4.081	36	JXM45BM210
1500	HM 39 180 105	2.743	36	JXM39BM180	HM 52 230 130	6.028	36	JXM52BM230
1600	HM 45 190 110	3.861	40	JXM45BM190	HM 52 230 130	6.028	40	JXM52BM230
1800	HM 45 190 110	3.861	44	JXM45BM190	HM 52 230 133	6.028	44	JXM52BM230
2000	HM 45 190 110	3.861	48	JXM45BM190	HM 56 260 133	7.525	48	JXM56BM260

For more information, please contact us.

DRINKING WATER SUPPLY

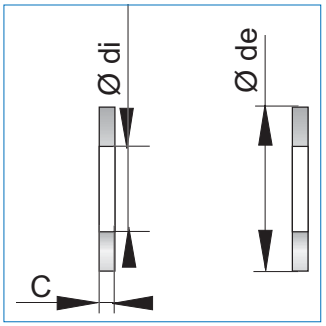
Bolts for pipes and fitting with rotatable flanges



DN	Bolt for flanged joint PN25				Bolt for flanged joint PN40			
	Dimensions HM d L/X mm	Weight kg	Quantity	Reference	Dimensions HM d L/X mm	Weight kg	Quantity	Reference
40	HM 16 85 57	0.196	4	JXM16BM85	HM 16 85 57	0.196	4	JXM16BM85
50	HM 16 85 57	0.196	4	JXM16BM85	HM 16 85 57	0.196	4	JXM16BM85
60	HM 16 85 57	0.196	8	JXM16BM85	HM 16 85 57	0.196	8	JXM16BM85
65	HM 16 85 57	0.196	8	JXM16BM85	HM 16 85 57	0.196	8	JXM16BM85
80	HM 16 85 57	0.196	8	JXM16BM85	HM 16 85 57	0.196	8	JXM16BM85
100	HM 20 100 72	0.355	8	JXM20BM100	HM 20 100 72	0.355	8	JXM20BM100
125	HM 24 110 82	0.586	8	JXM24BM110	HM 24 110 82	0.586	8	JXM24BM110
150	HM 24 110 82	0.586	8	JXM24BM110	HM 24 110 82	0.586	8	JXM24BM110
200	HM 24 110 82	0.586	12	JXM24BM110	HM 24 110 82	0.586	12	JXM24BM110
250	HM 27 130 90	0.885	12	JXM27BM130	HM 27 130 90	0.885	12	JXM27BM130
300	HM 27 130 90	0.885	16	JXM27BM130	HM 27 130 90	0.885	16	JXM27BM130
350	HM 30 140 93	1.226	16	JXM30BM140	-	-	-	-
400	HM 33 150 100	1.605	16	JXM33BM150	-	-	-	-
450	HM 33 150 100	1.605	20	JXM33BM150	-	-	-	-
500	HM 33 160 110	1.672	20	JXM33BM160	-	-	-	-
600	HM 36 180 110	2.260	20	JXM36BM180	-	-	-	-
700	HM 39 180 105	2.743	24	JXM39BM180	-	-	-	-
800	HM 45 190 110	3.861	24	JXM45BM190	-	-	-	-
900	HM 45 190 110	3.861	28	JXM45BM190	-	-	-	-
1000	HM 52 230 130	6.028	28	JXM52BM230	-	-	-	-
1100	HM 52 230 130	-	32	-		-	-	-
1200	HM 52 230 130	6.028	32	JXM52BM230	-	-	-	-
1400	HM 56 260 133	7.525	36	JXM56BM260	-	-	-	-
1500	HM 56 260 133	7.525	36	JXM56BM260	-	-	-	-
1600	HM 56 260 133	7.525	40	JXM56BM260	-	-	-	-
1800	HM 64 300 145	-	44	-	-	-	-	-
2000	HM 64 300 145	-	48	-	-	-	-	-

For more information, please contact us.

Washers for bolts used with rotatable flanges



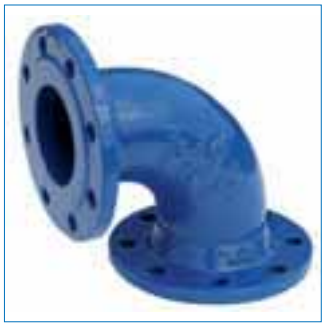
Ø de	Ø di	C	Weight	Reference
mm			kg	
30	17	3	0.010	JXM16RQE
36	21	3	0.011	JXM20RQE
45	25	4	0.020	JXM24RQE
48	28	4	0.020	JXM27RQE
52	31	4	0.021	JXM30RQE
56	34	5	0.040	JXM33RQE
60	37	5	0.043	JXM36RQE
72	42	6	0.052	JXM39RQM
85	48	8	0.067	JXM45RQM
98	56	8	0.091	JXM52RQM
105	62	10	0.106	JXM56RQM

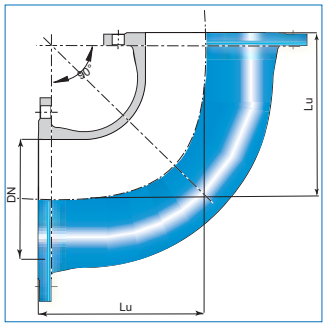
For more information, please contact us.

Fittings/ All flanged 90° bend
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



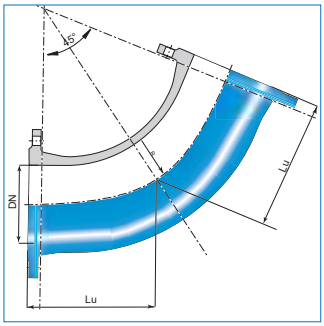


Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
90°	**50**	150	6.4	6.4	6.4	6.4	BBA50CA10TT	BBA50CA10TT	BBA50CA10TT	BBA50CA10TT
90°	**80**	165	9.7	9.7	9.7	9.7	BBA80CA10TT	BBA80CA10TT	BBA80CA10TT	BBA80CA10TT
90°	**100**	180	12	12	13	13	BBB10CA10TT	BBB10CA10TT	BBB10CA30TT	BBB10CA30TT
90°	**125**	200	15.5	15.5	-	-	BBB12CA10TT	BBB12CA10TT	-	-
90°	**150**	220	22.6	22.6	22	22	BBB15CA10TT	BBB15CA10TT	BBB15CA30TT	BBB15CA30TT
90°	**200**	260	31	31	34.5	-	BBB20CA10TT	BBB20CA20TT	BBB20CA30TT	-
90°	**250**	350	49.9	49.9	57	-	BBB25CA10TT	BBB25CA20TT	BBB30CA30TT	-
90°	**300**	400	66	69.5	74.5	-	BBB30CA10TT	BBB30CA20TT	BBB30CA30TT	-
90°	**350**	450	104	96	112.6	-	BBB35CA10TT	BBB35CA20TT	BBB35CA30TT	-
90°	**400**	500	120.9	120.9	164	-	BBB40CA10TT	BBB40CA20TT	BBB40CA30TT	-
90°	**450**	550	221	221	239	-	BBB45CA10TT	BBB45CA20TT	BBB45CA30TT	-
90°	**500**	600	265	287	287	-	BBB50CA10TT	BBB50CA20TT	BBB50CA30TT	-
90°	**600**	700	431	431		-	BBB60CA10TT	BBB60CA20TT	-	-
90°	**700**	800	564	561	-	-	BBB70CA10TT	BBB70CA20TT	-	-
90°	**800**	900	782	778	-	-	BBB80CA10TT	BBB80CA20TT	-	-
90°	**900**	1000	1030	1025	1154	-	BBB90CA10TT	BBB90CA20TT	BBB90CA30TT	-
90°	**1000**	1100	1354	1348	-	-	BBC10CA10TT	BBC10CA20TT	-	-
90°	**1200**	1355	2552	2625	-	-	BBC12CA10TT	BBC12CA20TT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged 45° bend Fixed flange

Field of use:
For drinking water mains



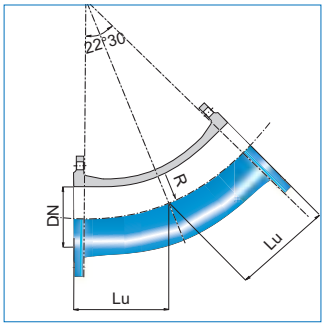
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
45°	**80**	130	10.8	10.8	10.8	10.8	BBA80CB10TT	BBA80CB10TT	BBA80CB10TT	BBA80CB10TT
45°	**100**	140	11.3	11.3	11.5	11.5	BBB10CB10TT	BBB10CB10TT	BBB10CB30TT	BBB10CB30TT
45°	**125**	150	14.6	14.6	16	16	BBB12CB10TT	BBB12CB10TT	BBB12CB30TT	BBB12CB30TT
45°	**150**	160	18.7	18.7	20.5	20.5	BBB15CB10TT	BBB15CB10TT	BBB15CB30TT	BBB15CB30TT
45°	**200**	180	29.5	27.5	30	-	BBB20CB10TT	BBB20CB20TT	BBB20CB30TT	-
45°	**250**	350	54.5	52	54	-	BBB25CB10TT	BBB25CB20TT	BBB25CB30TT	-
45°	**300**	400	80.5	74	87.2	-	BBB30CB10TT	BBB30CB20TT	BBB30CB30TT	-
45°	**350**	298	96	82	-	-	BBB35CB10TT	BBB35CB20TT	-	-
45°	**400**	326	94	102	-	-	BBB40CB10TT	BBB40CB20TT	-	-
45°	**450**	350	-	132	-	-	-	BBB45CB20TT	-	-
45°	**500**	375	145	174	-	-	BBB50CB10TT	BBB50CB20TT	-	-
45°	**600**	426	212	264	292.4	-	BBB60CB10TT	BBB60CB20TT	BBB60CB30TT	-
45°	**700**	478	341	338	-	-	BBB70CB10TT	BBB70CB20TT	-	-
45°	**800**	529	452	448	-	-	BBB80CB10TT	BBB80CB20TT	-	-
45°	**900**	581	519	587	-	-	BBB90CB10TT	BBB90CB20TT	-	-
45°	**1000**	632	670	771	-	-	BBC10CB10TT	BBC10CB20TT	-	-
45°	**1200**	746	1028	1171	-	-	BBC12CB10TT	BBC12CB20TT	-	-
45°	**1400**	782	-	-	-	-	-	-	-	-
45°	**1500**	782	-	-	-	-	-	-	-	-
45°	**1600**	843	-	2446	-	-	-	BBC16CB20TT	-	-
45°	**1800**	905	-	-	-	-	-	-	-	-
45°	**2000**	980	3574	-	-	-	BBC20CB10TT	BBC20CB20TT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged 22.30° bend
Fixed flange

Field of use:
For drinking water mains



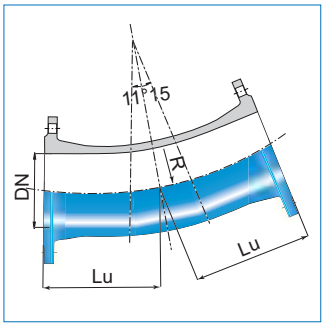
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
22°30	**80**	100	11	11	11	11	BBA80CD10TT	BBA80CD10TT	BBA80CD10TT	BBA80CD10TT
22°30	**100**	110	11	11	18	18	BBB10CD10TT	BBB10CD10TT	BBB10CD30TT	BBB10CD30TT
22°30	**150**	109	28	28	21.5	21.5	BBB15CD10TT	BBB15CD10TT	BBB15CD30TT	BBB15CD30TT
22°30	**200**	138	41	41	30	-	BBB20CD10TT	BBB20CD20TT	BBB20CD30TT	BBB20CD40TT
22°30	**250**	190	47.5	56	48.8	-	BBB25CD10TT	BBB25CD20TT	BBB25CD30TT	-
22°30	**300**	210	73	73	69.5	-	BBB30CD10TT	BBB30CD20TT	BBB30CD30TT	BBB30CD40TT
22°30	**350**	210	75	83	91.5	-	BBB35CD10TT	BBB35CD20TT	BBB35CD30TT	-
22°30	**400**	239	98.5	107	131	-	BBB40CD10TT	BBB40CD20TT	BBB40CD30TT	-
22°30	**450**	349	-	135	-	-	-	BBB45CD20TT	-	-
22°30	**500**	375	210	210	199.4	-	BBB50CD10TT	BBB50CD20TT	BBB50CD30TT	-
22°30	**600**	426	219	267	-	-	BBB60CD10TT	BBB60CD20TT	-	-
22°30	**700**	300	261	258	-	-	BBB70CD10TT	BBB70CD20TT	-	-
22°30	**800**	335	340	336	-	-	BBB80CD10TT	BBB80CD20TT	-	-
22°30	**900**	375	442	437	-	-	BBB90CD10TT	BBB90CD20TT	-	-
22°30	**1000**	410	587	581	-	-	BBC10CD10TT	BBC10CD20TT	-	-
22°30	**1200**	467.5	905	1018	-	-	BBC12CD10TT	BBC12CD20TT	-	-
22°30	**1400**	524	-	-	-	-	-	-	-	-
22°30	**1500**	524	-	-	-	-	-	-	-	-
22°30	**1600**	564	-	1836	-	-	-	BBC16CD20TT	-	-
22°30	**1800**	600	-	-	-	-	-	-	-	-
22°30	**2000**	650	-	-	-	-	-	-	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged 11.15° bend
Fixed flange

Field of use:
For drinking water main



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Angle Degree	DN	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
11°15	**80**	113	8.8	8.8	8.8	8.8	BBA80CE10TT	BBA80CE10TT	BBA80CE10TT	BBA80CE10TT
11°15	**100**	115	16	16	11.9	11.9	BBB10CE10TT	BBB10CE10TT	BBB10CE30TT	BBB10CE30TT
11°15	**150**	113	19	19	18.5	18.5	BBB15CE10TT	BBB15CE10TT	BBB15CE30TT	BBB15CE30TT
11°15	**200**	132	36	36	31.5	-	BBB20CE10TT	BBB20CE20TT	BBB20CE30TT	-
11°15	**250**	165	50	49	-	-	BBB25CE10TT	BBB25CE20TT	-	-
11°15	**300**	175	62	62	63	-	BBB30CE10TT	BBB30CE20TT	BBB30CE30TT	-
11°15	**350**	190	74	74	-	-	BBB35CE10TT	BBB35CE20TT	-	-
11°15	**400**	205	116	116	131	-	BBB40CE10TT	BBB40CE20TT	BBB40CE30TT	-
11°15	**450**	349	-	135	-	-	-	BBB45CE20TT	-	-
11°15	**500**	375	179	179	200.4	-	BBB50CE10TT	BBB50CE20TT	BBB50CE30TT	-
11°15	**600**	426	192	268	-	-	BBB60CE10TT	BBB60CE20TT	-	-
11°15	**700**	230	227	223	-	-	BBB70CE10TT	BBB70CE20TT	-	-
11°15	**800**	255	290	286	-	-	BBB80CE10TT	BBB80CE20TT	-	-
11°15	**900**	280	368	363	-	-	BBB90CE10TT	BBB90CE20TT	-	-
11°15	**1000**	310	488	482	-	-	BBC10CE10TT	BBC10CE20TT	-	-
11°15	**1200**	346	745	858	-	-	BBC12CE10TT	BBC12CE20TT	-	-
11°15	**1400**	403	-	-	-	-	-	-	-	-
11°15	**1500**	403	-	-	-	-	-	-	-	-
11°15	**1600**	433	-	1530	-	-	-	BBC16CE20TT	-	-
11°15	**1800**	463	-	-	-	-	-	-	-	-
11°15	**2000**	495	-	-	-	-	-	-	-	-

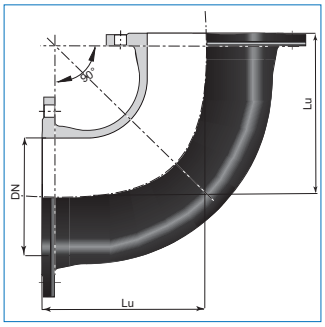
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged bend
Fixed flange

90° bend

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 bituminous coating
- EN 545, ISO 2531



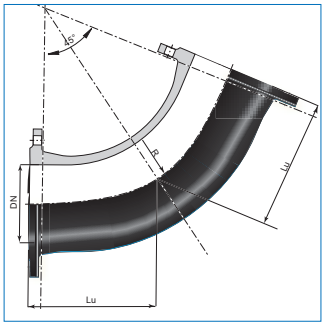
Angle Degree	DN	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
90°	**700**	800	564	561	640	BBB70CA1	BBB70CA2	BBB70CA3
90°	**800**	900	782	778	886	BBB80CA1	BBB80CA2	BBB80CA3
90°	**900**	1000	1030	1025	1154	BBB90CA1	BBB90CA2	BBB90CA3
90°	**1000**	1100	1354	1348	1522	BBC10CA1	BBC10CA2	BBC10CA3
90°	**1200**	1355	2552	2625	2745	BBC12CA1	BBC12CA2	BBC12CA3

Weight : fitting only - References : fitting
Available also with blue epoxy coating. For more information, please contact us.

45° bend

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 bituminous coating
- EN 545, ISO 2531



Angle Degree	DN	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
45°	**700**	478	341	338	414	BBB70CB1	BBB70CB2	BBB70CB3
45°	**800**	529	452	448	557	BBB80CB1	BBB80CB2	BBB80CB3
45°	**900**	581	587	582	704	BBB90CB1	BBB90CB2	BBB90CB3
45°	**1000**	632	777	771	948	BBC10CB1	BBC10CB2	BBC10CB3
45°	**1200**	746	1116	1205	1367	BBC12CB1	BBC12CB2	BBC12CB3
45°	**1400**	782	1667	1772	-	BBC14CB1	BBC14CB2	-
45°	**1500**	782	1774	1950	-	BBC15CB1	BBC15CB2	-
45°	**1600**	843	2279	2246	-	BBC16CB1	BBC16CB2	-
45°	**1800**	905	3574	3724	-	BBC18CB1	BBC18CB2	-

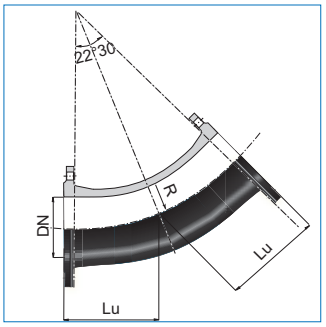
Weight : fitting only - References : fitting
Available also with blue epoxy coating. For more information, please contact us.

Fittings/ All flanged bend
Fixed flange

22.30° bend

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 bituminous coating
- EN 545, ISO 2531



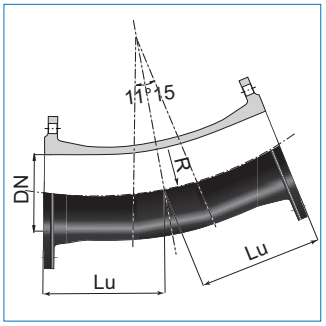
Angle Degree	DN	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
22°30	**700**	300	261	258	334	BBB70CD1	BBB70CD2	BBB70CD3
22°30	**800**	335	340	336	445	BBB80CD1	BBB80CD2	BBB80CD3
22°30	**900**	375	442	437	559	BBB90CD1	BBB90CD2	BBB90CD3
22°30	**1000**	410	587	581	758	BBC10CD1	BBC10CD2	BBC10CD3
22°30	**1200**	467.5	905	1018	1184	BBC12CD1	BBC12CD2	BBC12CD3
22°30	**1400**	524	1220	1324	-	BBC14CD1	BBC14CD2	-
22°30	**1500**	524	1326	1501	-	BBC15CD1	BBC15CD2	-
22°30	**1600**	564	1668	1836	-	BBC16CD1	BBC16CD2	-
22°30	**1800**	600	2524	2674	-	BBC18CD1	BBC18CD2	-
22°30	**2000**	650	2840	2978	-	BBC20CD1	BBC20CD2	-

Weight : fitting only - References : fitting
Available also with blue epoxy coating. For more information, please contact us.

11.15° bend

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 bituminous coating
- EN 545, ISO 2531



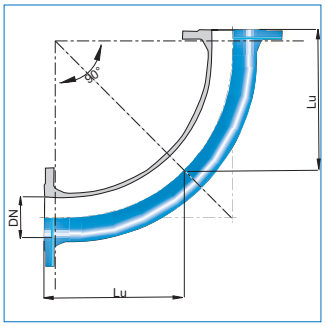
Angle Degree	DN	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
11°15	**700**	230	227	223	299	BBB70CE1	BBB70CE2	BBB70CE3
11°15	**800**	255	290	286	395	BBB80CE1	BBB80CE2	BBB80CE3
11°15	**900**	280	368	363	485	BBB90CE1	BBB90CE2	BBB90CE3
11°15	**1000**	310	488	482	659	BBC10CE1	BBC10CE2	BBC10CE3
11°15	**1200**	346	745	858	1024	BBC12CE1	BBC12CE2	BBC12CE3
11°15	**1400**	403	996	1100	-	BBC14CE1	BBC14CE2	-
11°15	**1500**	403	1102	1278	-	BBC15CE1	BBC15CE2	-
11°15	**1600**	433	1363	1530	-	BBC16CE1	BBC16CE2	-
11°15	**1800**	463	1990	2140	-	BBC18CE1	BBC18CE2	-
11°15	**2000**	495	2323	2461	-	BBC20CE1	BBC20CE2	-

Weight : fitting only - References : fitting
Available also with blue epoxy coating. For more information, please contact us.

Fittings/ All flanged long radius bend Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

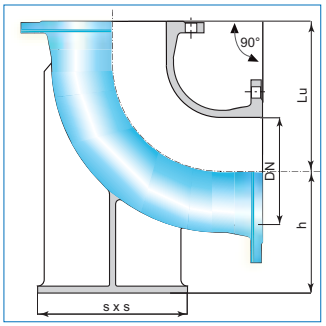


Angle Degree	DN	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
90°	**80**	380	13.8	13.8	13.8	BBA80CH10TT	BBA80CH10TT	BBA80CH10TT
90°	**100**	400	18	18	-	BBB10CH10TT	BBB10CH10TT	-
90°	**150**	450	30	30	-	BBB15CH10TT	BBB15CH10TT	-
90°	**200**	500	-	45.5	49.7	-	BBB20CH20TT	BBB20CH30TT
90°	**250**	550	-	65	-	-	BBB25CH20TT	-
90°	**300**	600	-	89.5	-	-	BBB30CH20TT	-
90°	**350**	650	-	121	-	-	BBB35CH20TT	-
90°	**400**	700	-	157	-	-	BBB40CH20TT	-
90°	**450**	750	-	197	-	-	BBB45CH20TT	-
90°	**500**	800	-	252	-	-	BBB50CH20TT	-
90°	**600**	900	-	379	-	BBB60CH10TT	BBB60CH20TT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Duckfoot all flanged 90° bend Fixed flange

Field of use:
For drinking water mains



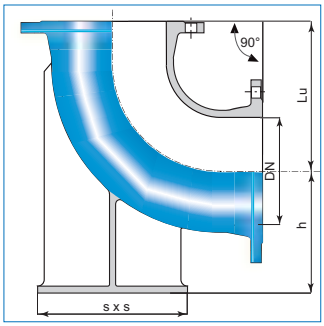
Main characteristics:
- Internal and external coating: blue cataphoresis
- EN 545, ISO 2531

Angle Degree	DN	Lu	H	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
90°	**350**	450	294	165	170	185	BAB35CF10NN	BAB35CF20NN	BAB35CF30NN
90°	**400**	500	324	218	218	242	BAB40CF10NN	BAB40CF20NN	BAB40CF30NN
90°	**450**	550	355	275	289	307	BBB45CF10NN	BBB45CF20NN	BBB45CF30NN
90°	**500**	600	389	349	371	390	BBB50CF10NN	BBB50CF20NN	BBB50CF30NN
90°	**600**	700	455	525	568	590	BBB60CF10NN	BBB60CF20NN	BBB60CF30NN

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Duckfoot all flanged 90° bend
Fixed flange

Field of use:
For drinking water mains



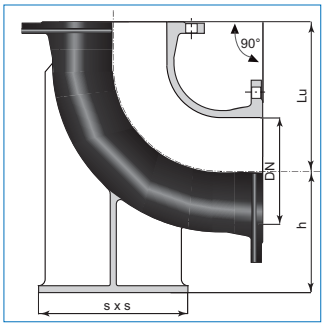
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

Angle Degree	DN	Lu	H	Weight / kg				Reference			
		mm		PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
90°	**80**	165	110	14.1	14.1	14.1	14.1	BBA80CF10TT	BBA80CF10TT	BBA80CF10TT	BBA80CF10TT
90°	**100**	180	125	16.9	16.9	18.9	18.9	BBB10CF10TT	BBB10CF10TT	BBB10CF30TT	BBB10CF30TT
90°	**125**	200	140	24	24	-	-	BBB12CF10TT	BBB12CF10TT	-	-
90°	**150**	220	160	31.5	31.5	32.5	32.5	BBB15CF10TT	BBB15CF10TT	BBB15CF30TT	BBB15CF30TT
90°	**200**	260	190	44	43.5	49.5	-	BBB20CF10TT	BBB20CF20TT	BBB20CF30TT	-
90°	**250**	350	225	71	71	80	-	BBB25CF10TT	BBB25CF20TT	BBB25CF30TT	-
90°	**300**	400	255	102	102	-	-	BBB30CF10TT	BBB30CF20TT	-	-
90°	**350**	450	294	165	165	-	-	BBB35CF10TT	BBB35CF20TT	-	-
90°	**400**	500	324	218	183	218	-	BBB40CF10TT	BBB40CF20TT	BBB40CF30TT	-
90°	**450**	550	355	275	289	-	-	BBB45CF10TT	BBB45CF20TT	-	-
90°	**500**	600	389	349	373	-	-	BBB50CF10TT	BBB50CF20TT	-	-
90°	**600**	700	455	525	569	-	-	BBB60CF10TT	BBB60CF20TT	-	-
90°	**700**	800	520	730	746	-	-	BBB70CF10TT	BBB70CF20TT	-	-
90°	**800**	900	590	1026	1003	-	-	BBB80CF10TT	BBB80CF20TT	-	-
90°	**900**	1000	645	1809	1751	-	-	BBB90CF10TT	BBB90CF20TT	-	-
90°	**1000**	1100	710	2365	2303	-	-	BBC10CF10TT	BBC10CF20TT	-	-
90°	**1200**	1355	840	4073	4146	-	-	BBC12CF10TT	BBC12CF20TT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Duckfoot all flanged 90° bend Fixed flange

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200
  PN 25 bituminous coating
- EN 545, ISO 2531

Angle Degree	DN	Lu	H	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
90°	**700**	800	520	764	746	822	BBB70CF1	BBB70CF2	BBB70CF3
90°	**800**	900	590	1026	1003	1112	BBB80CF1	BBB80CF2	BBB80CF3
90°	**900**	1000	645	1809	1751	1913	BBB90CF1	BBB90CF2	BBB90CF3
90°	**1000**	1100	710	2365	2303	2531	BBC10CF1	BBC10CF2	BBC10CF3
90°	**1200**	1355	840	4073	4146	-	BBC12CF1	BBC12CF2	-

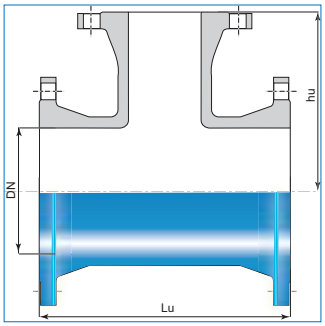
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged tee
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



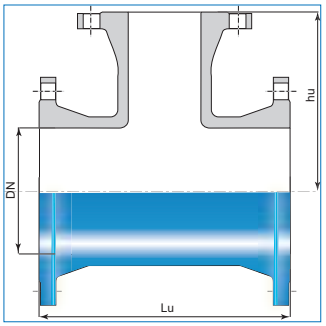


DN	dn	Lu	hu	Weight / kg				Reference			
		mm		PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
80	**50**	320	156	13.9	13.9	13.9	13.9	BBA80TE1BTT	BBA80TE1BTT	BBA80TE1BTT	BBA80TE1BTT
80	**80**	330	165	15.3	15.3	15.3	15.3	BBA80TE1ETT	BBA80TE1ETT	BBA80TE1ETT	BBA80TE1ETT
100	**50**	369	185	17.1	17.1	-	-	BBB10TE1BTT	BBB10TE1BTT	-	-
100	**80**	360	175	18.4	18.4	19.4	19.4	BBB10TE1ETT	BBB10TE1ETT	BBB10TE3ETT	BBB10TE3ETT
100	**100**	360	180	19	19	21	21	BBB10TE1FTT	BBB10TE1FTT	BBB10TE3FTT	BBB10TE3FTT
125	**80**	400	190	23	23	-	-	BBB12TE1ETT	BBB12TE1ETT	-	-
125	**100**	400	195	23.8	23.8	-	-	BBB12TE1FTT	BBB12TE1FTT	-	-
125	**125**	400	200	25	25	-	-	BBB12TE1GTT	BBB12TE1GTT	-	-
150	**50**	444	213	30.5	30.5	-	-	BBB15TE1BTT	BBB15TE1BTT	-	-
150	**80**	440	205	28.5	28.5	30.5	30.5	BBB15TE1ETT	BBB15TE1ETT	BBB15TE3ETT	BBB15TE3ETT
150	**100**	440	210	29.5	29.5	32	32	BBB15TE1FTT	BBB15TE1FTT	BBB15TE3FTT	BBB15TE3FTT
150	**125**	440	215	31	31	-	-	BBB15TE1GTT	BBB15TE1GTT	-	-
150	**150**	440	220	32.5	32.5	35.5	35.5	BBB15TE1JTT	BBB15TE1JTT	BBB15TE3JTT	BBB15TE3JTT
200	**50**	500	232	-	-	-	-	BBB20TE1BTT	-	-	-
200	**80**	520	235	44.3	32.8	37	-	BBB20TE1ETT	BBB20TE2ETT	BBB20TE3ETT	-
200	**100**	520	240	43	42.5	47	-	BBB20TE1FTT	BBB20TE2FTT	BBB20TE3FTT	-
200	**150**	520	250	46	48	47.6	-	BBB20TE1JTT	BBB20TE2JTT	BBB20TE3JTT	-
200	**200**	520	260	49.5	49.1	53	-	BBB20TE1KTT	BBB20TE2KTT	BBB20TE3KTT	-
250	**80**	700	265	67.5	66.5	52.8	-	BBB25TE1ETT	BBB25TE2ETT	BBB25TE3ETT	-
250	**100**	700	275	67	67	75	-	BBB25TE1FTT	BBB25TE2FTT	BBB25TE3FTT	-
250	**150**	700	300	72	72	62.2	-	BBB25TE1JTT	BBB25TE2JTT	BBB25TE3JTT	-
250	**200**	700	325	75	73	78	-	BBB25TE1KTT	BBB25TE2KTT	BBB25TE3KTT	-
250	**250**	700	350	81	80	92.7	-	BBB25TE1LTT	BBB25TE2LTT	BBB25TE3LTT	-
300	**80**	800	290	-	-	-	-	-	-	-	-
300	**100**	800	300	94	93	93.5	-	BBB30TE1FTT	BBB30TE2FTT	BBB30TE3FTT	-
300	**150**	800	325	98	97	80.9	-	BBB30TE1JTT	BBB30TE2JTT	BBB30TE3JTT	-
300	**200**	800	350	103	93	89.6	-	BBB30TE1KTT	BBB30TE2KTT	BBB30TE3KTT	-
300	**250**	800	380	109	108	122	-	BBB30TE1LTT	BBB30TE2LTT	BBB30TE3LTT	-
300	**300**	800	400	114	109.6	101.9	-	BBB30TE1MTT	BBB30TE2MTT	BBB30TE3MTT	-
350	**80**	850	325	-	-	-	-	-	-	-	-
350	**100**	850	325	-	122	135	-	-	BBB35TE2FTT	BBB35TE3FTT	-
350	**150**	850	325	-	123	-	-	-	BBB35TE2JTT	-	-
350	**200**	850	325	-	141.5	-	-	-	BBB35TE2KTT	-	-
350	**250**	850	325	-	132	152.5	-	-	BBB35TE2LTT	BBB35TE3LTT	-
350	**300**	850	425	-	144	-	-	-	BBB35TE2MTT	-	-
350	**350**	850	425	-	153	200	-	-	BBB35TE2YTT	BBB35TE3YTT	-

Weight : fitting only - References : fitting. For more information, please contact us.

Fittings/ All flanged tee
Fixed flange

Field of use:
For drinking water mains



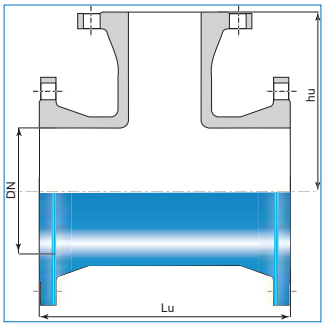
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
400	**100**	900	350	144	154	172	BBB40TE1FTT	BBB40TE2FTT	BBB40TE3FTT
400	**150**	900	350	148	155	178.1	BBB40TE1JTT	BBB40TE2JTT	BBB40TE3JTT
400	**200**	900	350	125.4	135.1	182	BBB40TE1KTT	BBB40TE2KTT	BBB40TE3KTT
400	**250**	900	350	154	161	-	BBB40TE1LTT	BBB40TE2LTT	-
400	**300**	900	450	167	177	-	BBB40TE1MTT	BBB40TE2MTT	-
400	**350**	900	450	-	201.5	-	-	BBB40TE2YTT	-
400	**400**	900	450	157.6	173.2	265	BBB40TE1NTT	BBB40TE2NTT	BBB40TE3NTT
450	**80**	950	375	-	-	-	-	-	-
450	**100**	950	375	-	188	-	-	BBB45TE2FTT	-
450	**150**	950	375	-	190	-	-	BBB45TE2JTT	-
450	**200**	950	375	-	193	-	-	BBB45TE2KTT	-
450	**250**	950	375	-	197	-	-	BBB45TE2LTT	-
450	**300**	950	475	-	213	-	-	BBB45TE2MTT	-
450	**350**	950	475	-	221	-	-	BBB45TE2YTT	-
450	**400**	950	475	-	229	-	-	BBB45TE2NTT	-
450	**450**	950	475	-	237	-	-	BBB45TE2PTT	-
500	**100**	1000	400	213	241	259	BBB50TE1FTT	BBB50TE2FTT	BBB50TE3FTT
500	**150**	1000	400	213	241	-	BBB50TE1JTT	BBB50TE2JTT	-
500	**200**	1000	400	218	246	271	BBB50TE1KTT	BBB50TE2KTT	BBB50TE3KTT
500	**250**	1000	400	222	274	-	BBB50TE1LTT	BBB50TE2LTT	-
500	**300**	1000	500	235	290	287	BBB50TE1MTT	BBB50TE2MTT	BBB50TE3MTT
500	**350**	1000	500	342	345	-	BBB50TE1YTT	BBB50TE2YTT	-
500	**400**	1000	500	244	316	-	BBB50TE1NTT	BBB50TE2NTT	-
500	**450**	1000	500	-	290	-	-	BBB50TE2PTT	-
500	**500**	1000	500	256	304	340	BBB50TE1QTT	BBB50TE2QTT	BBB50TE3QTT
600	**80**	1100	450	-	-	-	-	-	-
600	**100**	1100	450	304	350	405	BBB60TE1FTT	BBB60TE2FTT	BBB60TE3FTT
600	**150**	1100	450	307	398	-	BBB60TE1JTT	BBB60TE2JTT	-
600	**200**	1100	450	309	408	376	BBB60TE1KTT	BBB60TE2KTT	BBB60TE3KTT
600	**250**	1100		-	358	-	-	BBB60TE2LTT	-
600	**300**	1100	550	326	369	424	BBB60TE1MTT	BBB60TE2MTT	BBB60TE3MTT
600	**350**	1100	550	-	385	-	-	BBB60TE2YTT	-
600	**400**	1100	550	334	436	-	BBB60TE1NTT	BBB60TE2NTT	-
600	**450**	1100	550	-	404	-	-	BBB60TE2PTT	-
600	**500**	1100	550	345	380	-	BBB60TE1QTT	BBB60TE2QTT	-
600	**600**	1100	550	361	519	-	BBB60TE1RTT	BBB60TE2RTT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged tee
Fixed flange

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

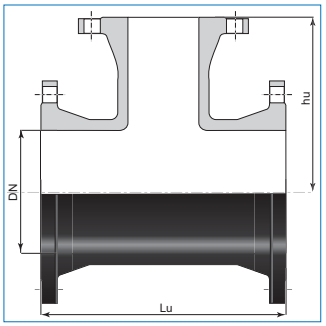
DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
700	**700**	1200	600	510	510	619	BBB70TE1STT	BBB70TE2STT	BBB70TE3STT
800	**800**	1350	675	700	734	-	BBB80TE1TTT	BBB80TE2TTT	-
900	**900**	1500	750	907	940	-	BBB90TE1UTT	BBB90TE2UTT	-
1000	**1000**	1650	830	1194	1260	-	BBC10TE1VTT	BBC10TE2VTT	-
1100	**700**	1578	900	-	-	-	-	-	-
1100	**800**	1578	915	-	-	-	-	-	-
1100	**900**	1578	930	-	-	-	-	-	-
1100	**1000**	1578	920	-	-	-	-	-	-
1100	**1100**	1578	907	-	-	-	-	-	-
1200	**600**	1250	885	-	1295	1473	-	BBC12TE2RTT	BBC12TE3RTT
1200	**700**	1665	900	1586	1711	-	BBC12TE1STT	BBC12TE2STT	-
1200	**800**	1665	915	1602	1762	-	BBC12TE1TTT	BBC12TE2TTT	-
1200	**900**	1665	930	1674	1636	-	BBC12TE1UTT	BBC12TE2UTT	-
1200	**1000**	1665	920	1577	1686	-	BBC12TE1VTT	BBC12TE2VTT	-
1200	**1100**	1900	907	-	-	-	-	-	-
1200	**1200**	1900	950	1810	1979	-	BBC12TE1BTT	BBC12TE2BTT	-
1400	**800**	2470	1010	-	-	-	-	-	-
1400	**900**	2470	1010	-	-	-	-	-	-
1400	**1000**	2470	1040	-	-	-	-	-	-
1400	**1200**	2470	1070	-	-	-	-	-	-
1400	**1400**	2470	1100	-	-	-	-	-	-
1500	**800**	2470	1010	-	-	-	-	-	-
1500	**900**	2470	1010	-	-	-	-	-	-
1500	**1000**	2470	1040	-	-	-	-	-	-
1500	**1200**	2470	1070	-	-	-	-	-	-
1500	**1400**	2470	1100	-	-	-	-	-	-
1500	**1500**	2470	1100	-	-	-	-	-	-
1600	**800**	2065	1120	-	-	-	-	-	-
1600	**1000**	2065	1150	3216	-	-	BBC16TE1VTT	-	-
1600	**1200**	2730	1180	-	-	-	-	-	-
1600	**1400**	2730	1210	-	-	-	-	-	-
1600	**1600**	2730	1240	-	3921	4900	-	BBC16TE2ETT	BBC16TE3ETT
1800	**800**	1885	1230	-	-	-	-	-	-
1800	**900**	1885	1245	3700	-		BBC18TE1UTT	-	-
1800	**1000**	3050	1260	-	-	-	-	-	-
1800	**1400**	3050	1320	-	-	-	-	-	-
1800	**1800**	3050	1380	-	-	-	-	-	-
2000	**1000**	2170	1370	4850	-	-	BBC20TE1VTT	-	-
2000	**1400**	2635	1430	-	-	-	-	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged tee
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 all PN bituminous coating
- EN 545, ISO 2531



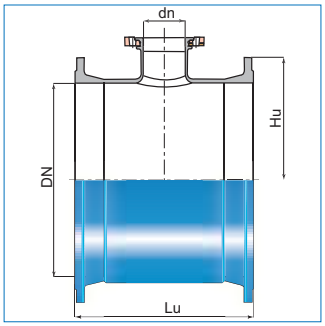
DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
700	**700**	1200	600	510	536	619	BBB70TE1S	BBB70TE2S	BBB70TE3S
800	**800**	1350	675	700	734	858	BBB80TE1T	BBB80TE2T	BBB80TE3T
900	**900**	1500	750	907	940	1083	BBB90TE1U	BBB90TE2U	BBB90TE3U
1000	**1000**	1650	830	1194	1260	1450	BBC10TE1V	BBC10TE2V	BBC10TE3V
1100	**700**	1578	900	-	-	-	-	-	-
1100	**800**	1578	915	-	-	-	-	-	-
1100	**900**	1578	930	-	-	-	-	-	-
1100	**1000**	1578	920	1366	-	-	BBC11TE1V	-	-
1100	**1100**	1578	907	1724	-	-	BBC11TE1A	-	-
1200	**600**	1250	885	-	-	-	-	-	-
1200	**700**	1665	900	-	1711	-	-	BBC12TE2S	-
1200	**800**	1665	915	1602	1762	-	BBC12TE1T	BBC12TE2T	-
1200	**900**	1665	930	1674	1806	-	BBC12TE1U	BBC12TE2U	-
1200	**1000**	1665	920	1577	1686	1930	BBC12TE1V	BBC12TE2V	BBC12TE3V
1200	**1100**	1900	907	-	-	-	-	-	-
1200	**1200**	1900	950	1810	1979	2190	BBC12TE1B	BBC12TE2B	BBC12TE3B
1400	**800**	2470	1010	-	-	-	-	-	-
1400	**900**	2470	1010	-	-	-	-	-	-
1400	**1000**	2470	1040	-	-	-	-	-	-
1400	**1200**	2470	1070	2484	2614	-	BBC14TE1B	BBC14TE2B	-
1400	**1400**	2470	1100	2676	2833	-	BBC14TE1C	BBC14TE2C	-
1500	**800**	2470	1010	-	-	-	-	-	-
1500	**900**	2470	1010	-	-	-	-	-	-
1500	**1000**	2470	1040	-	-	-	-	-	-
1500	**1200**	2470	1070	-	-	-	-	-	-
1500	**1400**	2470	1100	2684	2884	-	BBC15TE1C	BBC15TE2C	-
1500	**1500**	2470	1100	2807	3093	-	BBC15TE1D	BBC15TE2D	-
1600	**800**	2065	1120	-	-	-	-	-	-
1600	**1000**	2065	1150	3216	-	-	BBC16TE1V	-	-
1600	**1200**	2730	1180	3996	-	-	BBC16TE1B	-	-
1600	**1400**	2730	1210	3528	3528	-	BBC16TE1C	BBC16TE2C	-
1600	**1600**	2730	1240	3670	3921	-	BBC16TE1E	BBC16TE2E	-
1800	**800**	1885	1230	3290	3450	-	BBC18TE1T	BBC18TE2T	-
1800	**900**	1885	1245	3540	3700	-	BBC18TE1U	BBC18TE2U	-
1800	**1000**	3050	1260	-	-	-	-	-	-
1800	**1400**	3050	1320	-	-	-	-	-	-
1800	**1800**	3050	1380	5975	6200	-	BBC18TE1F	BBC18TE2F	-
2000	**1000**	2170	1370	4850	5000	-	BBC20TE1V	BBC20TE2V	-
2000	**1400**	2635	1430	6000	6200	-	BBC20TE1C	BBC20TE2C	-

Weight : fitting only - References : fitting
Available also with blue epoxy coating.
For more information, please contact us.

Fittings/ All flanged tee
2 fixed flanges – 1 rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
700	**150**	650	520	282	299	355	BBB70UE1JTT	BBB70UE2JTT	BBB70UE3JTT
700	**200**	650	525	-	302	359	-	BBB70UE2KTT	BBB70UE3KTT
700	**250**	650	535	-	-	-	-	-	-
700	**300**	870	530	-	335	-	-	BBB70UE2MTT	-
700	**400**	870	555	-	388	-	-	BBB70UE2NTT	-
700	**450**	1200	560	-	-	-	-	-	-
700	**500**	1200	560	-	-	-	-	-	-
700	**600**	1200	585	-	536	-	-	BBB70UE2RTT	-
800	**150**	690	580	370	392	476	BBB80UE1JTT	BBB80UE2JTT	BBB80UE3JTT
800	**200**	690	585	373	396	479	BBB80UE1KTT	BBB80UE2KTT	BBB80UE3KTT
800	**250**	690	585	-	-	-	-	-	-
800	**300**	910	585	-	435	-	-	BBB80UE2MTT	-
800	**400**	910	615	467.5	495	-	BBB80UE1NTT	BBB80UE2NTT	-
800	**450**	1350	615	-	508	-	-	BBB80UE2PTT	-
800	**600**	1350	645	654	701	787	BBB80UE1RTT	BBB80UE2RTT	BBB80UE3RTT
900	**150**	730	600	-	480	-	-	BBB90UE2JTT	-
900	**200**	730	645	-	-	-	-	-	-
900	**250**	730	640	-	-	-	-	-	-
900	**300**	950	660	545	550	-	BBB90UE1MTT	BBB90UE2MTT	-
900	**400**	950	675	572.5	598	729.2	BBB90UE1NTT	BBB90UE2NTT	BBB90UE3NTT
900	**450**	1500	680	-	630	-	-	BBB90UE2PTT	-
900	**600**	1500	705	-	885	984	-	BBB90UE2RTT	BBB90UE3RTT
1000	**150**	770	705	-	-	-	-	-	-
1000	**200**	770	705	589	633	761	BBC10UE1KTT	BBC10UE2KTT	BBC10UE3KTT
1000	**250**	770	705	-	-	-	-	-	-
1000	**300**	990	720	710	754	885	BBC10UE1MTT	BBC10UE2MTT	BBC10UE3MTT
1000	**400**	990	735	-	767	902	-	BBC10UE2NTT	BBC10UE3NTT
1000	**450**	1650	765	-	-	-	-	-	-
1000	**600**	1650	765	1086	1155	1284	BBC10UE1RTT	BBC10UE2RTT	BBC10UE3RTT

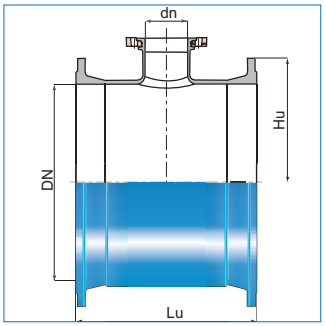
Weight : fitting only - References : fitting
For more information, please contact us.

DRINKING WATER SUPPLY

Fittings/ All flanged tee
2 fixed flanges – 1 rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



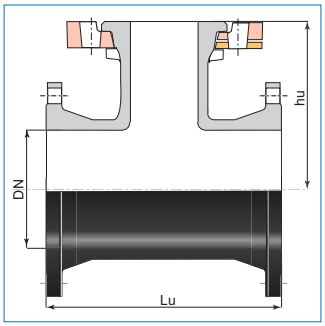
DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
1200	**200**	1245	880	1169	1259	1421	BBC12UE1KTT	BBC12UE2KTT	BBC12UE3KTT
1200	**250**	1245	873	-	-	-	-	-	-
1200	**300**	1245	838	1181	-	1428	BBC12UE1MTT	-	BBC12UE3MTT
1200	**400**	1245	835	1187	-	1433	BBC12UE1NTT	-	BBC12UE3NTT
1200	**450**	1245	855	-	-	-	-	-	-
1200	**600**	1245	885	1304	-	1468	BBC12UE1RTT	-	BBC12UE3RTT
1400	**400**	1530	960	-	-	-	-	-	-
1400	**600**	1530	980	-	-	-	-	-	-
1500	**400**	1530	960	-	-	-	-	-	-
1500	**600**	1530	980	-	-	-	-	-	-
1600	**200**	1610	1040	-	-	-	-	-	-
1600	**300**	1610	1050	-	2317	2616	-	BBC16UE2MTT	BBC16UE3MTT
1600	**400**	1610	1100	-	-	-	-	-	-
1600	**450**	1610	1080	-	-	-	-	-	-
1600	**500**	1610	1075	-	-	-	-	-	-
1600	**600**	1610	1090	2186	-	-	BBC16UE1RTT	-	-
1800	**200**	1650	1140	-	-	-	-	-	-
1800	**300**	1650	1155	-	-	-	-	-	-
1800	**400**	1650	1300	-	-	-	-	-	-
1800	**600**	1650	1200	2800	-	-	BBC18UE1RTT	-	-
2000	**300**	1700	1265	-	-	-	-	-	-
2000	**400**	1700	1280	-	-	-	-	-	-
2000	**500**	1700	1295	-	-	-	-	-	-
2000	**600**	1700	1315	3384	-	-	BBC20UE1RTT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged tee
2 fixed flanges – 1 rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 all PN bituminous coating
- EN 545, ISO 2531



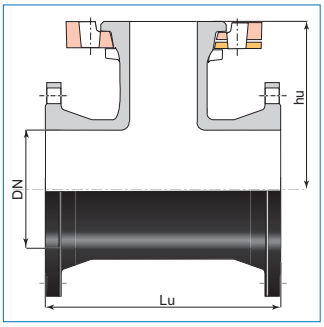
DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
700	**150**	650	520	282	299	355	BBB70UE1J	BBB70UE2J	BBB70UE3J
700	**200**	650	525	285	302	359	BBB70UE1K	BBB70UE2K	BBB70UE3K
700	**250**	650	535	-	-	-	-	-	-
700	**300**	870	530	-	-	-	-	-	-
700	**400**	870	555	366.5	388	452	BBB70UE1N	BBB70UE2N	BBB70UE3N
700	**450**	1200	560	-	-	-	-	-	-
700	**500**	1200	560	-	-	-	-	-	-
700	**600**	1200	585	494	536	594	BBB70UE1R	BBB70UE2R	BBB70UE3R
800	**150**	690	580	370	392	476	BBB80UE1J	BBB80UE2J	BBB80UE3J
800	**200**	690	585	373	396	479	BBB80UE1K	BBB80UE2K	BBB80UE3K
800	**250**	690	585	-	-	-	-	-	-
800	**300**	910	585	-	-	-	-	-	-
800	**400**	910	615	467.5	495	587	BBB80UE1N	BBB80UE2N	BBB80UE3N
800	**450**	1350	615	-	-	-	-	-	-
800	**600**	1350	645	654	701	787	BBB80UE1R	BBB80UE2R	BBB80UE3R
900	**150**	730	600	-	-	-	-	-	-
900	**200**	730	645	461	483	580	BBB90UE1K	BBB90UE2K	BBB90UE3K
900	**250**	730	640	-	-	-	-	-	-
900	**300**	950	660	545	585		BBB90UE1M	BBB90UE2M	-
900	**400**	950	675	572.5	598	729.2	BBB90UE1N	BBB90UE2N	BBB90UE3N
900	**450**	1500	680	-	-	-	-	-	-
900	**600**	1500	705	839	885	984	BBB90UE1R	BBB90UE2R	BBB90UE3R
1000	**150**	770	705	587	631	758	BBC10UE1J	BBC10UE2J	BBC10UE3J
1000	**200**	770	705	589	633	761	BBC10UE1K	BBC10UE2K	BBC10UE3K
1000	**250**	770	705	-	-	-	-	-	-
1000	**300**	990	720	710	754	-	BBC10UE1M	BBC10UE2M	-
1000	**400**	990	735	718.5	767	902	BBC10UE1N	BBC10UE2N	BBC10UE3N
1000	**450**	1650	765	-	-	-	-	-	-
1000	**600**	1650	765	1086	1155	1284	BBC10UE1R	BBC10UE2R	BBC10UE3R

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged tee
2 fixed flanges – 1 rotatable flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 all PN bituminous coating
- EN 545, ISO 2531



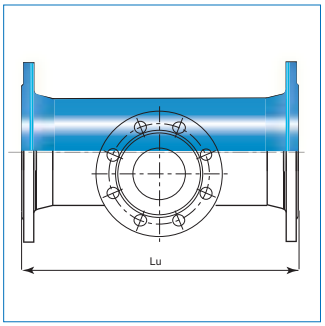
DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
1200	**200**	1245	880	1169	1259	-	BBC12UE1K	BBC12UE2K	-
1200	**250**	1245	873	-	-	-	-	-	-
1200	**300**	1245	838	1181	1269	-	BBC12UE1M	BBC12UE2M	-
1200	**400**	1245	835	1187	1263	-	BBC12UE1N	BBC12UE2N	-
1200	**450**	1245	855	-	-	-	-	-	-
1200	**600**	1245	885	1190	1304	-	BBC12UE1R	BBC12UE2R	-
1400	**400**	1530	960	-	-	-	-	-	-
1400	**600**	1530	980	1643	1773	-	BBC14UE1R	BBC14UE2R	-
1500	**400**	1530	960	-	-	-	-	-	-
1500	**600**	1530	980	1747	1950	-	BBC15UE1R	BBC15UE2R	-
1600	**200**	1610	1040	-	-	-	-	-	-
1600	**300**	1610	1050	2141	2317	-	BBC16UE1M	BBC16UE2M	-
1600	**400**	1610	1100	-	-	-	-	-	-
1600	**450**	1610	1080	-	-	-	-	-	-
1600	**500**	1610	1075	-	-	-	-	-	-
1600	**600**	1610	1090	2186	2379	-	BBC16UE1R	BBC16UE2R	-
1800	**200**	1650	1140	-	-	-	-	-	-
1800	**300**	1650	1155	-	-	-	-	-	-
1800	**400**	1650	1300	2790	2960	-	BBC18UE1N	BBC18UE2N	-
1800	**600**	1650	1200	2800	2987	-	BBC18UE1R	BBC18UE2R	-
2000	**300**	1700	1265	-	-	-	-	-	-
2000	**400**	1700	1280	-	-	-	-	-	-
2000	**500**	1700	1295	-	-	-	-	-	-
2000	**600**	1700	1315	-	-	-	-	-	-

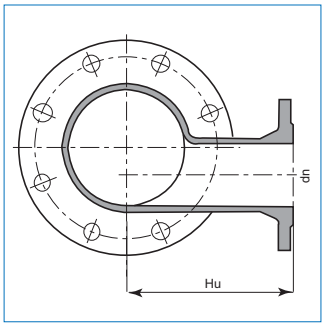
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged level invert tee
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



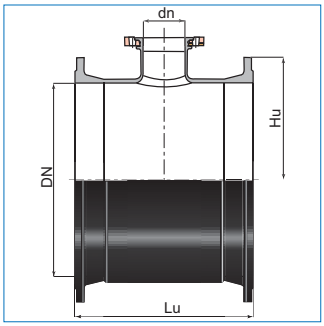


DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
100	**80**	360	195	19.5	19.5	-	BBB10TT1ETT	BBB10TT1ETT	-
150	**80**	440	220	29.5	29.5	-	BBB15TT1ETT	BBB15TT1ETT	-
150	**100**	440	220	-	-	-	-	-	-
200	**80**	520	250	-	42.5	-	-	BBB20TT2ETT	-
200	**100**	520	250	-	43.5	-	-	BBB20TT2FTT	-
250	**80**	700	275	-	66	-	-	BBB25TT2ETT	-
250	**100**	700	275	-	68.5	-	-	BBB25TT2FTT	-
250	**150**	700	275	-	70	-	-	BBB25TT2JTT	-
300	**80**	800	305	-	92	-	-	BBB30TT2ETT	-
300	**100**	800	305	-	95.5	-	-	BBB30TT2FTT	-
300	**150**	800	305	-	99	-	-	BBB30TT2JTT	-
350	**80**	850	340	-	-	-	-	-	-
350	**100**	850	340	-	-	-	-	-	-
350	**150**	850	340	-	128	-	-	BBB35TT2JTT	-
400	**80**	900	365	-	153	-	-	BBB40TT2ETT	-
400	**100**	900	365	-	156	156	-	BBB40TT2FTT	BBB40TT3FTT
400	**150**	900	365	162	162	-	BBB40TT1JTT	BBB40TT2JTT	-
400	**200**	900	365	-	167	-	-	BBB40TT2KTT	-
450	**100**	950	380	-	189	-	-	BBB45TT2FTT	-
450	**150**	950	380	-	197	-	-	BBB45TT2JTT	-
500	**80**	1000	400	-	-	-	-	-	-
500	**100**	1000	400	-	241	-	-	BBB50TT2FTT	-
500	**150**	1000	400	248	248	-	BBB50TT1JTT	BBB50TT2JTT	-
600	**80**	1100	435	-	-	-	-	-	-
600	**100**	1100	435	-	171	-	-	BBB60TT2FTT	-
600	**150**	1100	450	320	360	-	BBB60TT1JTT	BBB60TT2JTT	-
600	**200**	1100	450	370	396	-	BBB60TT1KTT	BBB60TT2KTT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged washout tee 2 fixed flange – 1 rotatable flange

Field of use:
For drinking water mains



Main characteristics:

- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 1600 all PN bituminous coating
- EN 545, ISO 2531

DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
700	**250**	650	535	292	309	311.9	BBB70UV1L	BBB70UV2L	BBB70UV3L
800	**250**	690	585	379	401	486	BBB80UV1L	BBB80UV2L	BBB80UV3L
900	**250**	730	640	462	482	581	BBB90UV1L	BBB90UV2L	BBB90UV3L
1000	**250**	770	705	590	695	763	BBC10UV1L	BBC10UV2L	BBC10UV3L
1200	**250**	1292	873	1188	1277	-	BBC12UV1L	BBC12UV2L	-
1400	**400**	1530	960	1619	1727.5	-	BBC14UV1N	BBC14UV2N	-
1500	**400**	1530	960	1725	1905.5	-	BBC15UV1N	BBC15UV2N	-
1600	**400**	1610	1100	2166	2346.5	-	BBC16UV1N	BBC16UV2N	-

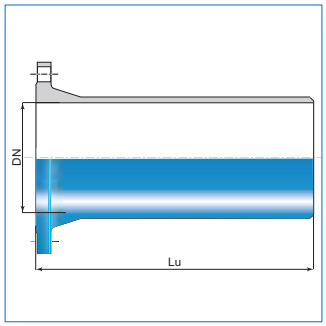
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Flanged spigot
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



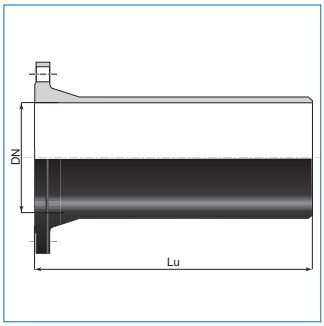


DN	Lu	Weight / kg				Reference			
	mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
80	**350**	7.8	7.8	7.8	7.8	BBA80BU10TT	BBA80BU10TT	BBA80BU10TT	BBA80BU10TT
100	**360**	9.7	9.7	10.2	10.2	BBB10BU10TT	BBB10BU10TT	BBB10BU30TT	BBB10BU30TT
125	**370**	12.5	12.5	-	-	BBB12BU10TT	BBB12BU10TT	-	-
150	**380**	15.6	15.6	16.6	16.6	BBB15BU10TT	BBB15BU10TT	BBB15BU30TT	BBB15BU30TT
200	**400**	23	23	24.6	-	BBB20BU10TT	BBB20BU20TT	BBB20BU30TT	-
250	**420**	32	31.5	35.4	-	BBB25BU10TT	BBB25BU20TT	BBB25BU30TT	-
300	**440**	43.2	42.7	47.5	-	BBB30BU10TT	BBB30BU20TT	BBB30BU30TT	-
350	**460**	62	57.5	-	-	BBB35BU10TT	BBB35BU20TT	-	-
400	**480**	64.5	70	81	-	BBB40BU10TT	BBB40BU20TT	BBB40BU30TT	-
450	**500**	-	86	-	-	-	BBB45BU20TT	-	-
500	**520**	95	109	132.4	-	BBB50BU10TT	BBB50BU20TT	BBB50BU30TT	-
600	**560**	133	159	168	-	BBB60BU10TT	BBB60BU20TT	BBB60BU30TT	-
700	**600**	189	187	225	-	SEB70BU10TT	SEB70BU20TT	SEB70BU30TT	-
800	**600**	239	250	291	-	SEB80BU10TT	SEB80BU20TT	SEB80BU30TT	-
900	**600**	287	298	346	-	SEB90BU10TT	SEB90BU20TT	SEB90BU30TT	-
1000	**600**	354	376	439	-	SEC10BU10TT	SEC10BU20TT	SEC10BU30TT	-
1100	**600**	-	438	-	-	-	SEC11BU20TT	-	-
1200	**600**	469	526	603	-	SEC12BU10TT	SEC12BU20TT	SEC12BU30TT	-
1400	**710**	-	-	855	-	-	-	SSC14BU30TT	-
1500	**750**	-	-	-	-	-	-	-	-
1600	**780**	-	1019	1026	-	-	SSC16BU20TT	SSC16BU30TT	-
1800	**845**	-	1359	-	-	-	SSC18BU20TT	-	-
2000	**885**	1643	1749	207.5	-	SSC20BU10TT	SSC20BU20TT	SSC20BU30TT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Flanged spigot Fixed flange

Field of use:
For drinking water mains



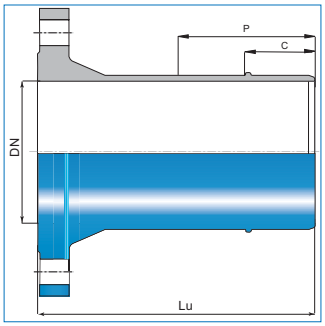
Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 1600 all PN bituminous coating
- EN 545, ISO 2531

DN	Lu	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
700	**600**	189	187	225	SEB70BU1	SEB70BU2	SEB70BU3
800	**600**	239	250	291	SEB80BU1	SEB80BU2	SEB80BU3
900	**600**	287	298	346	SEB90BU1	SEB90BU2	SEB90BU3
1000	**600**	354	376	439	SEC10BU1	SEC10BU2	SEC10BU3
1100	**600**	400	438	513	SEC11BU1	SEC11BU2	SEC11BU3
1200	**600**	469	526	603	SEC12BU1	SEC12BU2	SEC12BU3
1400	**710**	674	726	855	SSC14BU1	SSC14BU2	SSC14BU3
1500	**750**	802	890	-	SSC15BU1	SSC15BU2	-
1600	**780**	935	1019	-	SSC16BU1	SSC16BU2	-
1800	**845**	1256	1359	-	SSC18BU1	SSC18BU2	-
2000	**885**	1643	1749	-	SSC20BU1	SSC20BU2	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Anchored flanged spigot
Fixed flange

Field of use:
For drinking water mains



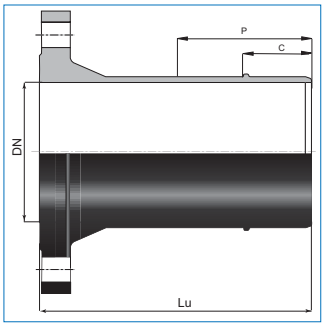
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	Lu	P	C	Weight / kg			Reference		
	mm			PN10	PN16	PN25	PN10	PN16	PN25
700	600	330	158	189	187	225	SSB70BV10TT	SSB70BV20TT	SSB70BV30TT
800	600	330	148	239	250	-	SSB80BV10TT	SSB80BV20TT	-
900	600	330	155	287	-	346	SSB90BV10TT	-	SSB90BV30TT
1000	600	330	165	439	-	-	SSC10BV10TT	-	-
1100	600	330	165	-	-	-	-	-	-
1200	600	330	170	469	526	-	SSC12BV10TT	SSC12BV20TT	-
1400	710	390	170	-	-	-	-	-	-
1500	750	410	180	-	-	-	-	-	-
1600	780	430	195	-	1019	-	-	SPC16BU20TT	-
1800	845	470	222	-	-	-	-	-	-
2000	885	500	243	-	-	-	-	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Anchored flanged spigot
Fixed flange

Field of use:
For drinking water mains



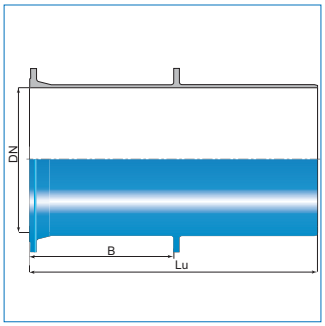
Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 all PN bituminous coating
- EN 545, ISO 2531

DN	Lu	P	C	Weight / kg			Reference		
	mm			PN10	PN16	PN25	PN10	PN16	PN25
700	**600**	330	158	189	187	225	SSB70BV1	SSB70BV2	SSB70BV3
800	**600**	330	148	239	250	291	SSB80BV1	SSB80BV2	SSB80BV3
900	**600**	330	155	287	298	346	SSB90BV1	SSB90BV2	SSB90BV3
1000	**600**	330	165	354	376	439	SSC10BV1	SSC10BV2	SSC10BV3
1100	**600**	330	165	-	438	-	-	SSC11BV20DD	-
1200	**600**	330	170	470	526	603	SSC12BV10DD	SSC12BV20DD	SSC12BV30DD
1400	**710**	390	170	684.8	726	-	SPC14BV1	SPC14BV2	-
1500	**750**	410	180	802	890	-	SPC15BV1	SPC15BV2	-
1600	**780**	430	195	-	-	-	-	-	-
1800	**845**	470	222	-	1359	-	-	SPC18BU2	-
2000	**885**	500	243	-	1761	-	-	SPC20BU2	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Flanged spigot anchoring pipe with puddle flange Fixed flange

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	Lu	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
250	1000	93	93.2	-	BBB25ME1CTT	BBB25ME2CTT	-
300	1000	120	119.8	-	BBB30ME1CTT	BBB30ME2CTT	-
350	1000	150	146	155	BBB35ME1CTT	BBB35ME2CTT	BBB35ME3CTT
400	1000	-	117	-	-	BBB40ME2CTT	-
450	1000	220	214	-	BBB45ME1CTT	BBB45ME2CTT	-
500	1000	254	256	-	BBB50ME1CTT	BBB50ME2CTT	-
600	1000	341	349	-	BBB60ME1CTT	BBB60ME2CTT	-
600	2000	474	-	-	BBB60ME1ETT	-	-
1000	1500	-	-	1220	-	-	BBC10ME3CTT
1200	2000	1766	1799	-	BBC12ME1ETT	BBC12ME2ETT	-
2000	3000	6145	-	-	BBC20ME1GTT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

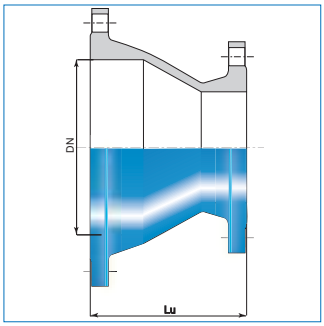
DRINKING WATER SUPPLY

Fittings/ All flanged taper Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



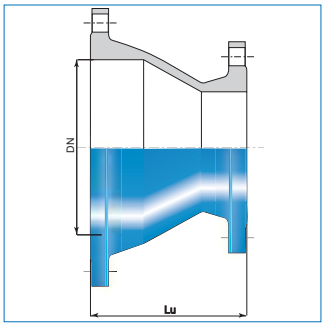


DN	dn	Lu	Weight / kg				Reference			
		mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
80	**40**	-	6.6	6.6	6.6	6.6	BBA80VE1ATT	BBA80VE1ATT	BBA80VE1ATT	BBA80VE1ATT
80	**50**	200	8.7	8.7	8.7	8.7	BBA80VE1BTT	BBA80VE1BTT	BBA80VE1BTT	BBA80VE1BTT
80	**65**	-	7.9	7.9	7.9	7.9	BBA80VE1DTT	BBA80VE1DTT	BBA80VE1DTT	BBA80VE1DTT
100	**40**	-	11.5	11.5	-	-	BBB10VE1ATT	BBB10VE1ATT	-	-
100	**50**	200	8.6	8.6	-	-	BBB10VE1BTT	BBB10VE1BTT	-	-
100	**65**	205	8.7	8.7	-	-	BBB10VE1DTT	BBB10VE1DTT	-	-
100	**80**	200	9.3	9.3	9.8	9.8	BBB10VE1ETT	BBB10VE1ETT	BBB10VE3ETT	BBB10VE3ETT
125	**80**	200	10.5	10.5	-	-	BBB12VE1ETT	BBB12VE1ETT	-	-
125	**100**	200	24	24	-	-	BBB12VE1FTT	BBB12VE1FTT	-	-
150	**80**	200	16.2	16.2	15.4	15.4	BBB15VE1ETT	BBB15VE1ETT	BBB15VE3ETT	BBB15VE3ETT
150	**100**	200	14.9	14.9	15.7	15.7	BBB15VE1FTT	BBB15VE1FTT	BBB15VE3FTT	BBB15VE3FTT
150	**125**	200	31	31	-	-	BBB15VE1GTT	BBB15VE1GTT	-	-
200	**80**	300	18	18	21.5	-	BBB20VE1ETT	BBB20VE2ETT	BBB20VE3ETT	-
200	**100**	300	36.2	36.2	40.2	-	BBB20VE1FTT	BBB20VE2FTT	BBB20VE3FTT	-
200	**125**	-	20.5	20.5	-	-	BBB20VE1GTT	BBB20VE2GTT	-	-
200	**150**	300	21.8	21.8	25	-	BBB20VE1JTT	BBB20VE2JTT	BBB20VE3JTT	-
250	**80**	600	23	23	-	-	BBB25VE1ETT	BBB25VE2ETT	-	-
250	**100**	300	40	40	-	-	BBB25VE1FTT	BBB25VE2FTT	-	-
250	**150**	300	40	52	33.7	-	BBB25VE1JTT	BBB25VE2JTT	BBB25VE3JTT	-
250	**200**	300	47	47	35.5	-	BBB25VE1KTT	BBB25VE2KTT	BBB25VE3KTT	-
300	**80**	700	-	43	-	-	-	BBB30VE2ETT	-	-
300	**100**	300	29.5	41	-	-	BBB30VE1FTT	BBB30VE2FTT	-	-
300	**150**	300	60.7	60.7	48.6	-	BBB30VE1JTT	BBB30VE2JTT	BBB30VE3JTT	-
300	**200**	300	35.9	58	63.5	-	BBB30VE1KTT	BBB30VE2KTT	BBB30VE3KTT	-
300	**250**	300	72	72	-	-	BBB30VE1LTT	BBB30VE2LTT	-	-
350	**200**	600	50	50	-	-	BBB35VE1KTT	BBB35VE2KTT	-	-
350	**250**	300	58	58	-	-	BBB35VE1LTT	BBB35VE2LTT	-	-
350	**300**	300	64.4	52.5	65.9	-	BBB35VE1MTT	BBB35VE2MTT	BBB35VE3MTT	-
400	**200**	300	45.5	71	84.4	-	BBB40VE1KTT	BBB40VE2KTT	BBB40VE3KTT	-
400	**250**	300	84	84	69.5	-	BBB40VE1LTT	BBB40VE2LTT	BBB40VE3LTT	-
400	**300**	300	113.5	113.5	113.5	-	BBB40VE1MTT	BBB40VE2MTT	BBB40VE3MTT	-
400	**350**	300	59	67	-	-	BBB40VE1YTT	BBB40VE2YTT	-	-
450	**250**	600	-	87.5	-	-	-	BBB45VE2LTT	-	-
450	**300**	600	-	95	-	-	-	BBB45VE2MTT	-	-
450	**350**	600	-	104	-	-	-	BBB45VE2YTT	-	-
450	**400**	300	-	81	-	-	-	BBB45VE2NTT	-	-
500	**250**	700	-	114	-	-	-	BBB50VE2LTT	-	-
500	**300**	600	111	112.5	111	-	BBB50VE1MTT	BBB50VE2MTT	BBB50VE3MTT	-
500	**350**	600	132.9	132.9	-	-	BBB50VE1YTT	BBB50VE2YTT	-	-
500	**400**	600	127	152	-	-	BBB50VE1NTT	BBB50VE2NTT	-	-
500	**450**	600	-	189	216	-	-	BBB50VE2PTT	BBB50VE3PTT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged taper Fixed flange

Field of use:
For drinking water mains



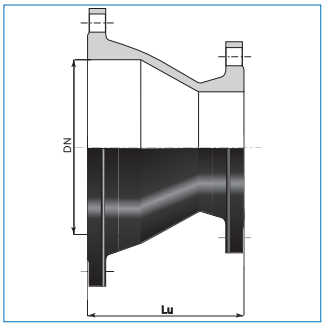
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	dn	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
600	**300**	800	-	171	-	-	BBB60VE2MTT	-
600	**350**	700	-	167	-	-	BBB60VE2YTT	-
600	**400**	600	135	164	247	BBB60VE1NTT	BBB60VE2NTT	BBB60VE3NTT
600	**450**	600	223	230	263	BBB60VE1PTT	BBB60VE2PTT	BBB60VE3PTT
600	**500**	600	149	232	221	BBB60VE1QTT	BBB60VE2QTT	BBB60VE3QTT
700	**400**	600	220	186	186	BBB70VE1NTT	BBB70VE2NTT	BBB70VE3NTT
700	**450**	700	-	285	-	-	BBB70VE2PTT	-
700	**500**	600	281	266	-	BBB70VE1QTT	BBB70VE2QTT	-
700	**600**	600	218	243	246	BBB70VE1RTT	BBB70VE2RTT	BBB70VE3RTT
800	**500**	800	500	480.5	-	BBB80VE1QTT	BBB80VE2QTT	-
800	**600**	600	345	354	-	BBB80VE1RTT	BBB80VE2RTT	-
800	**700**	600	272	269	-	BBB80VE1STT	BBB80VE2STT	-
900	**700**	600	440	414	-	BBB90VE1STT	BBB90VE2STT	-
900	**800**	600	337	359	448	BBB90VE1TTT	BBB90VE2TTT	BBB90VE3TTT
1000	**800**	600	570	520	-	BBC10VE1TTT	BBC10VE2TTT	-
1000	**900**	600	415	447	-	BBC10VE1UTT	BBC10VE2UTT	-
1100	**1000**	600	-	-	-	-	-	-
1200	**600**	1490	-	-	-	-	-	-
1200	**1000**	860	689	717	886	BBC12VE1VTT	BBC12VE2VTT	BBC12VE3VTT
1400	**1200**	760	-	-	-	-	-	-
1500	**1200**	760	-	-	-	-	-	-
1500	**1400**	570	-	-	-	-	-	-
1600	**1200**	1085	1194	-	1561	BBC16VE1BTT	-	BBC16VE3BTT
1600	**1400**	890	-	-	1586	-	-	BBC16VE3CTT
1600	**1500**	890	-	-	-	-	-	-
1800	**1200**	1445	-	-	-	-	-	-
1800	**1400**	1250	-	-	-	-	-	-
1800	**1500**	1250	-	-	-	-	-	-
1800	**1600**	970	1626	-	-	-	-	-
2000	**1200**	1825	-	-	-	-	-	-
2000	**1400**	1630	-	-	-	-	-	-
2000	**1500**	1630	-	-	-	-	-	-
2000	**1600**	1350	-	-	-	-	-	-
2000	**1800**	1030	2049	-	-	BBC20VE1FTT	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All flanged taper Fixed flange

Field of use:
For drinking water mains



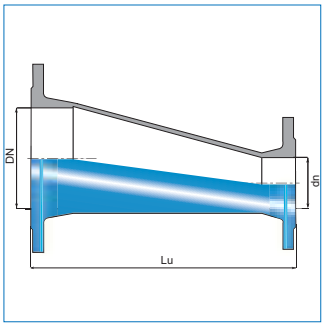
Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 and DN 1400 to 2000 all PN bituminous coating
- EN 545, ISO 2531

DN	dn	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
700	**450**	700	-	-	-	-	-	-
700	**500**	600	281	266	328	BBB70VE1Q	BBB70VE2Q	BBB70VE3Q
700	**600**	600	218	243	246	BBB70VE1R	BBB70VE2R	BBB70VE3R
800	**500**	800	500	480.5	618	BBB80VE1Q	BBB80VE2Q	BBB80VE3Q
800	**600**	600	345	354	415	BBB80VE1R	BBB80VE2R	BBB80VE3R
800	**700**	600	272	269	368	BBB80VE1S	BBB80VE2S	BBB80VE3S
900	**700**	600	440	414	518	BBB90VE1S	BBB90VE2S	BBB90VE3S
900	**800**	600	337	359	448	BBB90VE1T	BBB90VE2T	BBB90VE3T
1000	**800**	600	570	520	693	BBC10VE1T	BBC10VE2T	BBC10VE3T
1000	**900**	600	415	447	559	BBC10VE1U	BBC10VE2U	BBC10VE3U
1100	**1000**	600	-	713	-	-	BBC11VE2V	-
1200	**600**	1490	-	-	-	BBC12VE1R	BBC12VE2R	BBC12VE3R
1200	**1000**	860	689	717	886	BBC12VE1V	BBC12VE2V	BBC12VE3V
1400	**1200**	760	846	955	-	BBC14VE1B	BBC14VE2B	-
1500	**1200**	760	886	1032	-	BBC15VE1B	BBC15VE2B	-
1500	**1400**	570	825	966	-	BBC15VE1C	BBC15VE2C	-
1600	**1200**	1085	1194	-	-	BBC16VE1B	-	-
1600	**1400**	890	1259	1309	-	BBC16VE1C	BBC16VE2C	-
1600	**1500**	890	1169	1344	-	BBC16VE1D	BBC16VE2D	-
1800	**1200**	1445	-	-	-	-	-	-
1800	**1400**	1250	-	-	-	-	-	-
1800	**1500**	1250	-	-	-	-	-	-
1800	**1600**	970	1626	1740	-	BBC18VE1E	BBC18VE2E	-
2000	**1200**	1825	-	-	-	-	-	-
2000	**1400**	1630	-	-	-	-	-	-
2000	**1500**	1630	-	-	-	-	-	-
2000	**1600**	1350	2301	2458	-	BBC20VE1E	BBC20VE2E	BBC20VE3E
2000	**1800**	1030	2049	2281	-	BBC20VE1F	BBC20VE2F	-

Weight : fitting only - References : fitting
Available also with DN 700 - 2000 in blue epoxy coating. Please contact us.
For more information, please contact us.

Fittings/ Flat flanged taper
Fixed flange

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	dn	Lu	Weight / kg			Reference		
		mm	PN10	PN16	PN25	PN10	PN16	PN25
80	**50**	200	7.3	7.3	7.3	BBA80VT1BTT	BBA80VT1BTT	BBA80VT1BTT
100	**50**	300	9.4	9.4	-	BBB10VT1BTT	BBB10VT1BTT	-
100	**80**	200	9	9	9.4	BBB10VT1ETT	BBB10VT1ETT	BBB10VT3ETT
150	**80**	400	16.1	16.1	-	BBB15VT1ETT	BBB15VT1ETT	-
150	**100**	300	15	15	-	BBB15VT1FTT	BBB15VT1FTT	-
200	**80**	600	-	25.5	-	-	BBB20VT2ETT	-
200	**100**	600	-	27	-	-	BBB20VT2FTT	-
200	**150**	300	22	22	-	BBB20VT1JTT	BBB20VT2JTT	-
250	**100**	600	-	34	-	-	BBB25VT2FTT	-
250	**150**	600	-	38	-	-	BBB25VT2JTT	-
250	**200**	300	-	29.5	-	-	BBB25VT2KTT	-
300	**150**	600	-	46	-	-	BBB30VT2JTT	-
300	**200**	600	57	51	-	BBB30VT1KTT	BBB30VT2KTT	-
300	**250**	300	-	39.5	-	-	BBB30VT2LTT	-
350	**200**	600	-	60.5	-	-	BBB35VT2KTT	-
350	**250**	600	-	67	-	-	BBB35VT2LTT	-
350	**300**	300	-	52	-	-	BBB35VT2MTT	-
400	**200**	600	65.6	71	-	BBB40VT1KTT	BBB40VT2KTT	-
400	**250**	600	-	77	-	-	BBB40VT2LTT	-
400	**300**	600	84	84	-	BBB40VT1MTT	BBB40VT2MTT	-
400	**350**	300	-	67	-	-	BBB40VT2YTT	-
600	**500**	600	-	190	-	-	BBB60VT2QTT	-

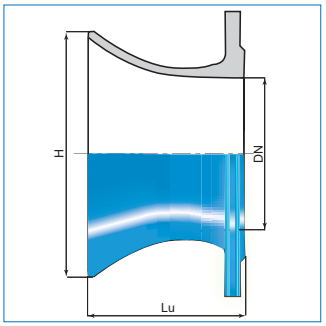
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Flanged Bellmouth Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531





DN	Lu	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
80	135	5.2	5.2	5.2	BBA80BP10TT	BBA80BP10TT	BBA80BP10TT
100	140	6.3	6.3	-	BBB10BP10TT	BBB10BP10TT	-
150	155	10	10	-	BBB15BP10TT	BBB15BP10TT	-
200	170	15	14.7	-	BBB20BP10TT	BBB20BP20TT	-
250	190	21.4	21	-	BBB25BP10TT	BBB25BP20TT	-
300	210	29	29	-	BBB30BP10TT	BBB30BP20TT	-
350	225	-	39	-	-	BBB35BP20TT	-
400	250	-	51	-	-	BBB40BP20TT	-
450	260	60	63	-	BBB45BP10TT	BBB45BP20TT	-
500	300	83	83	-	BBB50BP10TT	BBB50BP20TT	-
600	300	122	122	-	BBB60BP10TT	BBB60BP20TT	-
700	500	-	259	-	-	BBB70BP20TT	-
800	380	283	203	-	BBB80BP10TT	BBB80BP20TT	-
900	390	-	239	-	-	BBB90BP20TT	-
1200	470	460	-	-	BBC12BP10TT	-	-

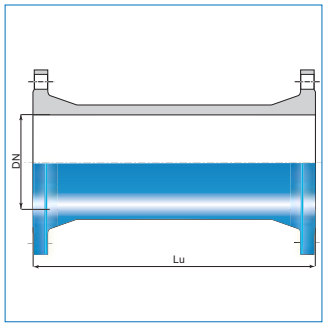
Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Short double flanged pipe
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531



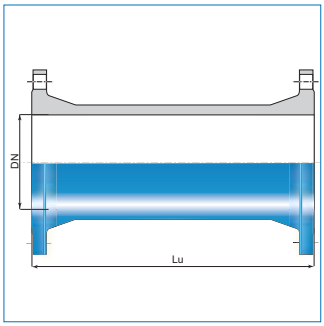


DN	Lu	Weight / kg				Reference			
	mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
50	250	6.5	6.5	6.5	6.5	BBA50MT1ATT	BBA50MT1ATT	BBA50MT1ATT	BBA50MT1ATT
50	500	-	-	-	-	-	-	-	-
80	100	7.2	7.2	7.2	7.2	BBA80MT1UTT	BBA80MT1UTT	BBA80MT1UTT	BBA80MT1UTT
80	200	8.8	8.8	8.8	8.8	BBA80MT1VTT	BBA80MT1VTT	BBA80MT1VTT	BBA80MT1VTT
80	250	9.6	9.6	9.6	9.6	BBA80MT1ATT	BBA80MT1ATT	BBA80MT1ATT	BBA80MT1ATT
80	300	10.4	10.4	10.4	10.4	BBA80MT1WTT	BBA80MT1WTT	BBA80MT1WTT	BBA80MT1WTT
80	400	12	12	12	12	BBA80MT1XTT	BBA80MT1XTT	BBA80MT1XTT	BBA80MT1XTT
80	500	-	-	-	-	-	-	-	-
80	600	13.7	13.7	13.7	13.7	BBA80MT1QTT	BBA80MT1QTT	BBA80MT1QTT	BBA80MT1QTT
80	700	-	-	-	-	-	-	-	-
80	800	-	-	-	-	-	-	-	-
100	100	8.3	8.3	-	-	BBB10MT1UTT	BBB10MT1UTT	-	-
100	200	10.1	10.1	-	-	BBB10MT1VTT	BBB10MT1VTT	-	-
100	250	11	11	11.9	11.9	BBB10MT1ATT	BBB10MT1ATT	BBB10MT3ATT	BBB10MT3ATT
100	300	12.7	12.7	16	16	BBB10MT1WTT	BBB10MT1WTT	BBB10MT3WTT	BBB10MT3WTT
100	400	15	15	-	-	BBB10MT1XTT	BBB10MT1XTT	-	-
100	500	15.1	15.1	-	-	BBB10MT1BTT	BBB10MT1BTT	-	-
100	600	-	-		-	-	-	-	-
100	700	-	-	-	-	-	-	-	-
100	800	-	-	-	-	-	-	-	-
100	900	-	-	-	-	-	-	-	-
150	200	16.5	16.5	22	22	BBB15MT1VTT	BBB15MT1VTT	BBB15MT3VTT	BBB15MT3VTT
150	250	16.7	16.7	18.7	18.7	BBB15MT1ATT	BBB15MT1ATT	BBB15MT3ATT	BBB15MT3ATT
150	300	19.7	19.7	20.1	20.1	BBB15MT1WTT	BBB15MT1WTT	BBB15MT3WTT	BBB15MT3WTT
150	400	23.5	23.5	-	-	BBB15MT1XTT	BBB15MT1XTT	-	-
150	500	-	-	-	-	-	-	-	-
150	600	-	-	-	-	-	-	-	-
150	700	-	-	-	-	-	-	-	-
150	800	-	-	-	-	-	-	-	-
200	100	-	-	-	-	-	-	-	-
200	200	-	21.1	-	-	-	BBB20MT2VTT	-	-
200	250	-	23.1	-	-	-	BBB20MT2ATT	-	-
200	300	-	25	28	-	-	BBB20MT2WTT	BBB20MT3WTT	-
200	400	-	31.5	-	-	-	BBB20MT2XTT	-	-
200	500	-	-	-	-	-	-	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ Short double flanged pipe
Fixed flange

Field of use:
For drinking water mains



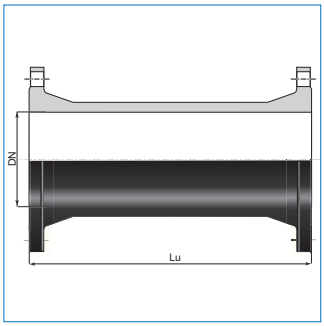
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	Lu	Weight / kg				Reference			
	mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
250	**250**	-	31.5	-	-	-	BBB25MT2ATT	-	-
250	**300**	-	34.2	-	-	-	BBB25MT2WTT	-	-
250	**500**	-	43.8	-	-	-	BBB25MT2BTT	-	-
300	**200**	-	45	-	-	-	BBB30MT2VTT	BBB30MT3VTT	-
300	**250**	-	41.4	53	-	-	BBB30MT2ATT	BBB30MT3ATT	-
300	**300**	-	44.8	73.5	-	-	BBB30MT2WTT	BBB30MT3WTT	-
300	**400**	-	-	-	-	-	-	-	-
300	**500**	-	58	-	-	-	BBB30MT2BTT	-	-
300	**600**	-	-	-	-	-	-	-	-
400	**300**	-	-	-	-	-	-	-	-
400	**400**	-	-	-	-	-	-	-	-
400	**500**	-	-	-	-	-	-	-	-
400	**600**	-	-	-	-	-	-	-	-
400	**700**	-	134	-	-	-	BBB40MT2RTT	-	-
450	**250**	-	82.8	-	-	-	BBB45MT2ATT	-	-
500	**250**	86	-	-	-	BBB50MT1ATT	-	-	-
500	**500**	162.6	167.8	-	-	BBB50MT1BTT	BBB50MT2BTT	-	-
500	**600**	182	-	-	-	BBB50MT1QTT	-	-	-
600	**250**	-	169.9	-	-	-	BBB60MT2ATT	-	-
600	**300**	-	-	-	-	-	-	-	-
600	**400**	-	-	-	-	-	-	-	-
600	**500**	219.5	235.7	274	-	BBB60MT1BTT	BBB60MT2BTT	BBB60MT3BTT	-
700	**250**	-	-	-	-	-	-	-	-
700	**500**	-	-	-	-	-	-	-	-
800	**250**	-	-	-	-	-	-	-	-
800	**300**	-	-	-	-	-	-	-	-
800	**400**	-	-	-	-	-	-	-	-
800	**500**	373.2	329	-	-	BBB80MT1BTT	BBB80MT2BTT	-	-
800	**700**	-	-	-	-	-	-	-	-
800	**800**	-	-	-	-	-	-	-	-
900	**250**	-	-	426	-	-	-	BBB90MT3ATT	-
900	**300**	-	-	-	-	-	-	-	-
900	**500**	-	-	-	-	-	-	-	-
900	**700**	-	-	-	-	-	-	-	-
1000	**250**	-	-	-	-	-	-	-	-
1000	**500**	549.6	-	711	-	BBC10MT1BTT	-	BBC10MT3BTT	-
1200	**500**	-	-	-	-	-	-	-	-

Weight : fitting only - References : fitting. For more information, please contact us.

Fittings/ Short double flanged pipe
Fixed flange

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: black cataphoresis, except DN 1200 PN 25 bituminous coating
- EN 545, ISO 2531

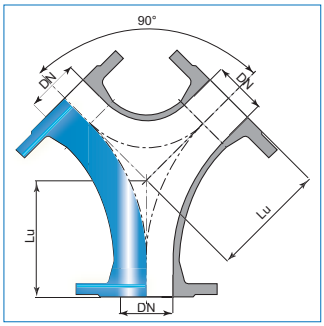
DN	Lu	Weight / kg				Reference			
	mm	PN10	PN16	PN25	PN40	PN10	PN16	PN25	PN40
700	**250**	204	189.6	265	-	BBB70MT1A	BBB70MT2A	BBB70MT3A	-
700	**500**	289	274	350	-	BBB70MT1B	BBB70MT2B	BBB70MT3B	-
800	**250**	267	223	352	-	BBB80MT1A	BBB80MT2A	BBB80MT3A	-
800	**500**	373.2	329	458	-	BBB80MT1B	BBB80MT2B	BBB80MT3B	-
900	**250**	318	364	426	-	BBB90MT1A	BBB90MT2A	BBB90MT3A	-
900	**500**	447.5	393	556	-	BBB90MT1B	BBB90MT2B	BBB90MT3B	-
1000	**250**	395	340	556	-	BBC10MT1A	BBC10MT2A	BBC10MT3A	-
1000	**500**	549.6	495	711	-	BBC10MT1B	BBC10MT2B	BBC10MT3B	-
1200	**250**	-	-	-	-	-	-	-	-
1200	**500**	684.7	696.7	-	-	BBC12MT1B	BBC12MT2B	-	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All Flanged Y
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

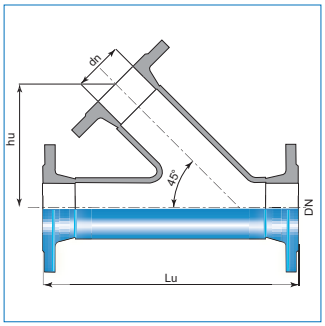


DN	Lu	Weight / kg			Reference		
	mm	PN10	PN16	PN25	PN10	PN16	PN25
80	165	15.6	15.6	15.6	BBA80YN10TT	BBA80YN10TT	BBA80YN10TT
100	180	19.3	19.3	-	BBB10YN10TT	BBB10YN10TT	-
150	220	32.5	32.5	-	BBB15YN10TT	BBB15YN10TT	-
200	260	48.4	49	-	BBB20YN10TT	BBB20YN20TT	-
250	350	-	81	-	-	BBB25YN20TT	-
300	400	-	115	-	-	BBB30YN20TT	-
400	500	-	220	-	-	BBB40YN20TT	-
450	550	-	280	-	-	BBB45YN20TT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All Flanged 45° tee
Fixed flange

Field of use:
For drinking water mains



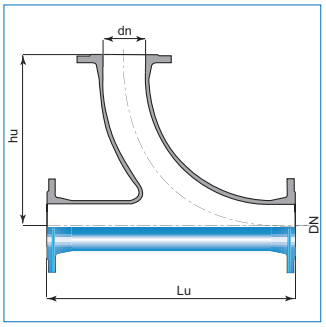
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
80	**80**	400	195	21	21	21	BBA80TU1ETT	BBA80TU1ETT	BBA80TU1ETT
100	**80**	430	215	-	-	-	-	-	-
100	**100**	430	215	27	27	-	BBB10TU1FTT	BBB10TU1FTT	-
150	**100**	530	270	-	-	-	-	-	-
150	**150**	530	270	47	47	-	BBB15TU1JTT	BBB15TU1JTT	-
200	**100**	600	321	-	-	-	-	-	-
200	**150**	600	321	-	-	-	-	-	-
200	**200**	600	321	71.4	71	-	BBB20TU1KTT	BBB20TU2KTT	-
250	**150**	700	363	-	-	-	-	-	-
250	**200**	700	363	-	-	-	-	-	-
250	**250**	700	363	106.2	105	-	BBB25TU1LTT	BBB25TU2LTT	-
300	**200**	800	412	-	-	-	-	-	-
300	**250**	800	412	-	-	-	-	-	-
300	**300**	800	412	-	149.2	-	-	BBB30TU2MTT	-
400	**300**	960	472	-	-	-	-	-	-
400	**400**	960	512	-	215	-	-	BBB40TU2NTT	-

Weight : fitting only - References : fitting
For more information, please contact us.

Fittings/ All Flanged radial tee Fixed flange

Field of use:
For drinking water mains



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
80	**80**	545	380	23	23	23	BBA80TW1ETT	BBA80TW1ETT	BBA80TW1ETT
100	**100**	580	400	29.5	29.5	-	BBB10TW1FTT	BBB10TW1FTT	BBB10TW1FTT
150	**150**	670	450	48.5	48.5	-	BBB15TW1JTT	BBB15TW1JTT	BBB15TW1JTT
200	**200**	760	500	-	72.5	-	-	BBB20TW2KTT	-
250	**250**	900	550	-	106	-	-	BBB25TW2LTT	-
300	**300**	1000	600	-	146	-	-	BBB30TW2MTT	-
350	**350**	1100	650	-	204	-	-	BBB35TW2YTT	-
400	**400**	1200	700	-	278	-	-	BBB40TW2NTT	-
450	**450**	1300	750	-	368	-	-	BBB45TW2PTT	-
500	**500**	1400	800	-	526	-	-	BBB50TW2QTT	-
600	**600**	1600	900	-	-	-	-	-	-

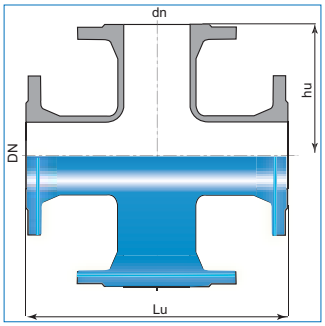
Weight : fitting only - References : fitting
For more information, please contact us.

Raccords / All flanged cross
Fixed flange

Field of use:
For drinking water mains

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- EN 545, ISO 2531

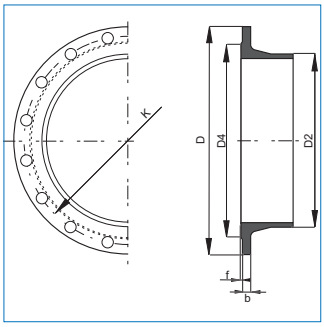




DN	dn	Lu	hu	Weight / kg			Reference		
		mm		PN10	PN16	PN25	PN10	PN16	PN25
80	**80**	330	165	22	22	22	BBA80XN1ETT	BBA80XN1ETT	BBA80XN1ETT
100	**100**	360	180	25	25	-	BBB10XN1FTT	BBB10XN1FTT	-
150	**100**	440	210	38	38	-	BBB15XN1FTT	BBB15XN1FTT	-
150	**150**	440	220	45	45	-	BBB15XN1JTT	BBB15XN1JTT	-
200	**100**	520	240	54	48	-	BBB20XN1FTT	BBB20XN2FTT	-
200	**150**	520	250	57	61	-	BBB20XN1JTT	BBB20XN2JTT	-
200	**200**	520	260	62	67	-	BBB20XN1KTT	BBB20XN2KTT	-
250	**250**	700	350	104	110.5	-	BBB25XN1LTT	BBB25XN2LTT	-
300	**300**	800	400	145	148	-	BBB30XN1MTT	BBB30XN2MTT	-
400	**400**	900	450	214	234	-	BBB40XN1NTT	BBB40XN2NTT	-
500	**500**	1000	500	390	361	-	BBB50XN1QTT	BBB50XN2QTT	-
600	**600**	1100	550	424	523	-	BBB60XN1RTT	BBB60XN2RTT	-

Weight : fitting only - References : fitting
For more information, please contact us.

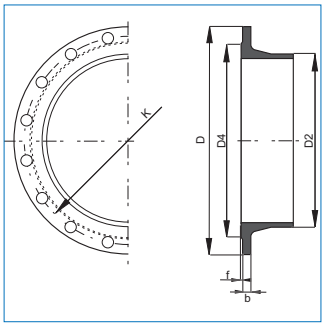
Fittings/ Fixed flange for pipes and fittings



PN 10

DN	D	D2	D4	K	b	f
	mm					
80	200	98	132	160	16	3
100	220	118	156	180	16	3
125	250	144	184	210	16	3
150	285	170	211	240	16	3
200	340	222	266	295	17	3
250	400	274	319	350	19	3
300	455	326	370	400	20.5	4
350	505	378	429	460	20.5	4
400	565	429	480	515	20.5	4
450	615	480	530	565	21.5	4
500	670	532	582	620	22.5	4
600	780	635	682	725	25	4
700	895	738	794	840	27.5	5
800	1015	842	901	950	30	5
900	1115	945	1001	1050	32.5	5
1000	1230	1048	1112	1160	35	5
1100	1340	1152	1218	1270	37.5	5
1200	1455	1255	1328	1380	40	5
1400	1675	1462	1530	1590	41	5
1500	1785	1565	1640	1700	42.5	5
1600	1915	1668	1750	1820	44	5
1800	2115	1875	1950	2020	47	5
2000	2325	2082	2150	2230	50	5

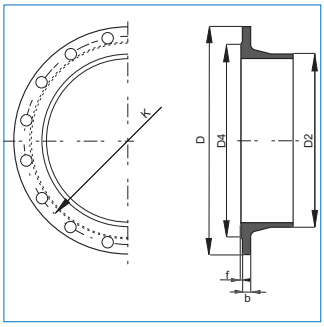
Fittings/ Fixed flange for pipes and fittings



PN 16

DN	D	D2	D4	K	b	f
	mm					
80	200	98	132	160	16	3
100	220	118	156	180	16	3
125	250	144	184	210	16	3
150	285	170	211	240	16	3
200	340	222	266	295	17	3
250	400	274	319	355	19	3
300	455	326	370	410	20.5	4
350	520	378	429	470	22.5	4
400	580	429	480	525	24	4
450	640	480	548	585	26	4
500	715	532	609	650	27.5	4
600	840	635	720	770	31	4
700	910	738	794	840	34.5	5
800	1025	842	901	950	38	5
900	1125	945	1001	1050	41.5	5
1000	1255	1048	1112	1170	45	5
1100	1355	1152	1218	1270	48.5	5
1200	1485	1255	1328	1390	52	5
1400	1685	1462	1530	1590	55	5
1500	1820	1565	1640	1710	57.5	5
1600	1930	1668	1750	1820	60	5
1800	2130	1875	1950	2020	65	5
2000	2345	2082	2150	2230	70	5

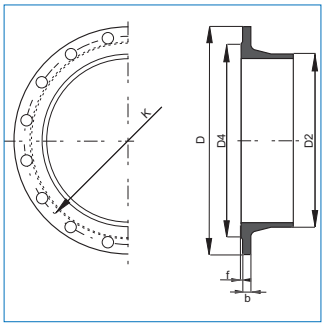
Fittings/ Fixed flange for pipes and fittings



PN 25

DN	D	D2	D4	K	b	f
	mm					
80	200	98	132	160	16	3
100	235	118	156	190	16	3
125	270	144	184	220	16	3
150	300	170	211	250	17	3
200	360	222	274	310	19	3
250	425	274	330	370	21.5	3
300	485	326	389	430	23.5	4
350	555	378	448	490	26	4
400	620	429	503	550	28	4
450	670	480	548	600	30.5	4
500	730	532	609	660	32.5	4
600	845	635	720	770	37	4
700	960	738	820	875	41.5	5
800	1085	842	928	990	46	5
900	1185	945	1028	1090	50.5	5
1000	1320	1048	1140	1210	55	5
1100	1420	1152	1240	1310	59.5	5
1200	1530	1255	1350	1420	64	5
1400	1755	1462	1560	1640	69	5
1500	1865	1565	1678	1750	72.5	5
1600	1975	1668	1780	1860	76	5
1800	2195	1875	1985	2070	83	5
2000	2425	2082	2210	2300	90	5

Fittings/ Fixed flange for pipes and fittings

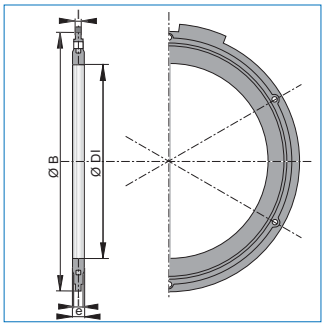


PN 40

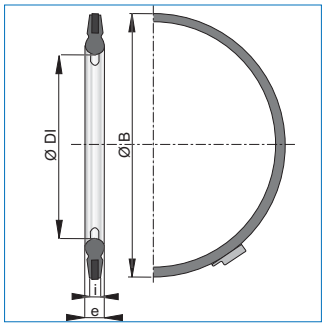
DN	D	D2	D4	K	b	f
	mm					
80	200	98	132	160	16	3
100	235	118	156	190	16	3
125	270	144	184	220	20.5	3
150	300	170	211	250	17	3
200	375	222	284	320	27	3
250	450	274	345	385	31.5	3
300	515	326	409	450	35.5	4
350	580	378	465	510	40	4
400	660	429	535	585	44	4
450	685	480	560	610	45	4
500	755	532	615	670	48	4
600	890	635	735	795	53	4

DRINKING WATER SUPPLY

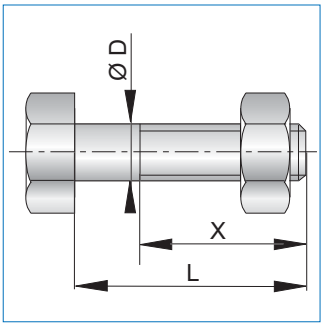
Assembling joint with fixed flanges



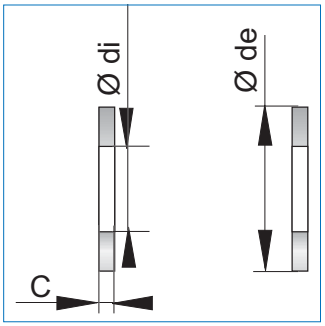
Gasket with embedded metal reinforcement
DN 40 to 300



Gasket with metallic inserts
DN 350 to 2000



Bolt



Washer

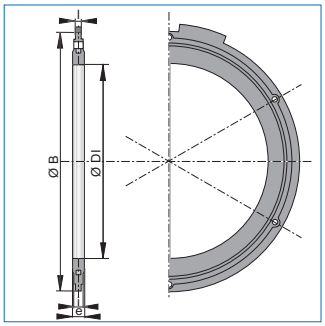
The flanged joint assembly has a gasket with metallic inserts, hot galvanized steel bolts (thickness mini 70μm) and nuts.

DN	Assembly reference PN10	Assembly reference PN16	Assembly reference PN25
40	JBA40GV1-E06	JBA40GV1-E06	JBA40GV1-E06
50	JBA50GV1-E06	JBA50GV1-E06	JBA50GV1-E06
60	JBA60GV1-E06	JBA60GV1-E06	JBA60GV1-E06
65	JBA65GV1-E06	JBA65GV1-E06	JBA65GV1-E06
80	JBA80GV1-E06	JBA80GV1-E06	JBA80GV1-E06
100	JBB10GV1-E06	JBB10GV1-E06	JBB10GV1-E08
125	JBB12GV1-E06	JBB12GV1-E06	JBB12GV1-E08
150	JBB15GV1-E06	JBB15GV1-E06	JBB15GV1-E08
200	JBB20GV1-E06	JBB20GV1-E07	JBB20GV1-E08
250	JBB25GV1-E06	JBB25GV1-E07	JBB25GV1-E08
300	JBB30GV1-E06	JBB30GV1-E07	JBB30GV1-E08
350	JBB35GV1-E06	JBB35GV1-E07	JBB35GV1-E08
400	JBB40GV1-E06	JBB40GV1-E07	JBB40GV1-E08
450	JBB45GV1-E06	JBB45GV1-E07	JBB45GV1-E08
500	JBB50GV1-E06	JBB50GV1-E07	JBB50GV1-E08
600	JBB60GV1-E06	JBB60GV1-E07	JBB60GV1-E08
700	JBB70GV1-E06	JBB70GV1-E07	JBB70GV1-E08
800	JBB80GV1-E06	JBB80GV1-E07	JBB80GV1-E08
900	JBB90GV1-E06	JBB90GV1-E07	JBB90GV1-E08
1000	JBC10GV1-E06	JBC10GV1-E07	JBC10GV1-E08
1100	JBC11GV1-E06	JBC11GV1-E07	JBC11GV1-E08
1200	JBC12GV1-E06	JBC12GV1-E07	JBC12GV1-E08
1400	JBC14GV1-E06	JBC14GV1-E07	JBC14GV1-E08
1500	JBC15GV1-E06	JBC15GV1-E07	JBC15GV1-E08
1600	JBC16GV1-E06	JBC16GV1-E07	JBC16GV1-E08
1800	JBC18GV1-E06	JBC18GV1-E07	JBC18GV1-E08
2000	JBC20GV1-E06	JBC20GV1-E07	JBC20GV1-E08

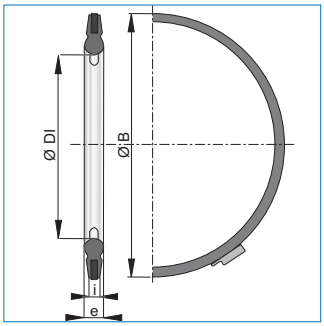
Flanged gasket for flanged joint

Field of use:
For drinking water mains

Main characteristics:
- Material: EPDM
- EN 681.1
- High mechanical strength
- Leaktightness with lower torque



Gasket with embedded metal reinforcement from DN 40 to 300

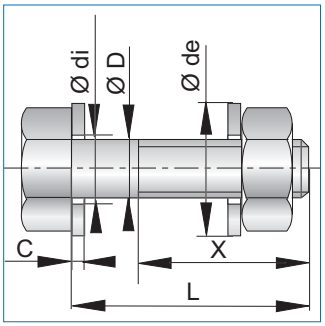


Gasket with inserted metal reinforcement from DN 350 to 2000

PN	DN	B	DI	i	e	Weight	Reference
bar		mm				kg	
10-40	**40**	94	53	8	10	0.069	JBA40GV1
	50	109	65	8	10	0.087	JBA50GV1
	60	120	76	8	10	0.107	JBA60GV1
	65	128	82	8	10	0.119	JBA65GV1
	80	144	95	8	10	0.129	JBA80GV1
	100	165	115	8	10	0.143	JBB10GV1
	125	195	145	8	10	0.176	JBB12GV1
	150	221	171	8	10	0.203	JBB15GV1
	200	276	226	8	10	0.263	JBB20GV1
	250	331	278	8	10	0.319	JBB25GV1
	300	380	324	8	10	0.394	JBB30GV1
10-25 (*)	**350**	439	371	9.5	16	0.890	JBB35GV1
	400	490	422	9.5	16	1.005	JBB40GV1
	450	540	472	9.5	16	1.100	JBB45GV1
	500	595	527	9.5	16	1.235	JBB50GV1
	600	697	621	9.5	16	1.800	JBB60GV1
	700	806	730	9.5	16	2.040	JBB70GV1
	800	913	827	9.5	16	2.845	JBB80GV1
	900	1013	927	9.5	16	3.155	JBB90GV1
	1000	1126	1040	9.5	16	3.500	JBC10GV1
	1100	1230	1134	9.5	16	4.540	JBC11GV1
	1200	1343	1247	9.5	16	4.945	JBC12GV1
	1400	1544	1448	9.5	16	5.610	JBC14GV1
	1500	1657	1541	9.5	16	7.990	JBC15GV1
	1600	1767	1651	9.5	16	8.535	JBC16GV1
	1800	1967	1851	9.5	16	11.854	JBC18GV1
	2000	2173	2047	9.5	16	12	JBC20GV1

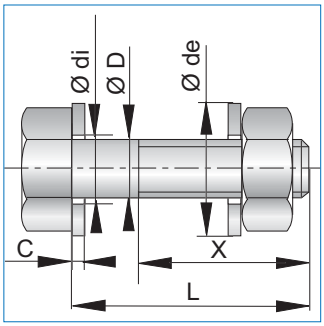
(*) For PN40, please consult us.

Galvanized steel bolts for flanged joint



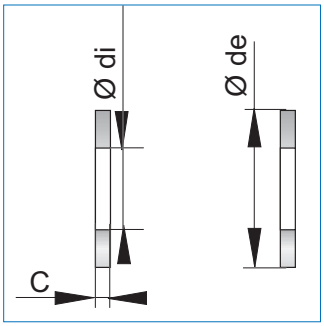
DN	Bolt for flanged joint PN 10				Bolt for flanged joint PN16			
	Dimensions	Weight	Quantity	Reference	Dimensions	Weight	Quantity	Reference
	HM d L/X mm	kg			HM d L/X mm	kg		
40	HM 16 85 57	0.196	4	JXM16BG85	HM 16 85 57	0.196	4	JXM16BG85
50	HM 16 85 57	0.196	4	JXM16BG85	HM 16 85 57	0.196	4	JXM16BG85
60	HM 16 85 57	0.196	4	JXM16BG85	HM 16 85 57	0.196	4	JXM16BG85
65	HM 16 85 57	0.196	4	JXM16BG85	HM 16 85 57	0.196	4	JXM16BG85
80	HM 16 85 57	0.196	8	JXM16BG85	HM 16 85 57	0.196	8	JXM16BG85
100	HM 16 90 62	0.198	8	JXM16BG90	HM 16 90 62	0.198	8	JXM16BG90
125	HM 16 90 62	0.198	8	JXM16BG90	HM 16 90 62	0.198	8	JXM16BG90
150	HM 20 100 72	0.355	8	JXM20BG100	HM 20 100 72	0.355	8	JXM20BG100
200	HM 20 100 72	0.355	8	JXM20BG100	HM 20 100 72	0.355	12	JXM20BG100
250	HM 20 110 76	0.381	12	JXM20BG110	HM 24 110 82	0.586	12	JXM24BG110
300	HM 20 120 83	0.411	12	JXM20BG120	HM 24 130 93	0.655	12	JXM24BG130
350	HM 20 130 93	0.433	16	JXM20BG130	HM 24 130 93	0.655	16	JXM24BG130
400	HM 24 140 103	0.698	16	JXM24BG140	HM 27 150 105	0.975	16	JXM27BG150
450	HM 24 130 93	0.655	20	JXM24BG130	HM 27 130 90	0.885	20	JXM27BG130
500	HM 24 150 110	0.733	20	JXM24BG150	HM 30 160 110	1.335	20	JXM30BG160
600	HM 27 170 122	1.055	20	JXM27BG170	HM 33 180 117	1.806	20	JXM33BG180
700	HM 27 150 105	0.975	24	JXM27BG150	HM 33 150 100	1.605	24	JXM33BG150
800	HM 30 160 110	1.335	24	JXM30BG160	HM 36 160 92	2.100	24	JXM36BG160
900	HM 30 160 110	1.335	28	JXM30BG160	HM 36 160 92	2.100	28	JXM36BG160
1000	HM 33 180 117	1.806	28	JXM33BG180	HM 39 180 105	2.743	28	JXM39BG180
1100	HM 33 160 100	1.672	32	JXM33BG160	HM 39 180 105	2.743	32	JXM39BG180
1200	HM 36 180 110	2.260	32	JXM36BG180	HM 45 210 115	4.081	32	JXM45BG210
1400	HM 39 180 105	2.743	36	JXM39BG180	HM 45 210 115	4.081	36	JXM45BG210
1500	HM 39 180 105	2.743	36	JXM39BG180	HM 52 230 130	6.028	36	JXM52BG230
1600	HM 45 190 110	3.861	40	JXM45BG190	HM 52 230 130	6.028	40	JXM52BG230
1800	HM 45 190 110	3.861	44	JXM45BG190	HM 52 230 133	6.028	44	JXM52BG230
2000	HM 45 190 110	3.861	48	JXM45BG190	HM 56 260 133	7.525	48	JXM56BG260

Galvanized steel bolts for flanged joint



DN	Bolt for flanged joint PN25				Bolt for flanged joint PN40			
	Dimensions	Weight	Quantity	Reference	Dimensions	Weight	Quantity	Reference
	HM d L/X mm	kg			HM d L/X mm	kg		
40	HM 16 85 57	0.196	4	JXM16BG85	HM 16 85 57	0.196	4	JXM16BG85
50	HM 16 85 57	0.196	4	JXM16BG85	HM 16 85 57	0.196	4	JXM16BG85
60	HM 16 85 57	0.196	8	JXM16BG85	HM 16 85 57	0.196	8	JXM16BG85
65	HM 16 85 57	0.196	8	JXM16BG85	HM 16 85 57	0.196	8	JXM16BG85
80	HM 16 85 57	0.196	8	JXM16BG85	HM 16 85 57	0.196	8	JXM16BG85
100	HM 20 100 72	0.355	8	JXM20BG100	HM 20 100 72	0.355	8	JXM20BG100
125	HM 24 110 82	0.586	8	JXM24BG110	HM 24 110 82	0.586	8	JXM24BG110
150	HM 24 110 82	0.586	8	JXM24BG110	HM 24 110 82	0.586	8	JXM24BG110
200	HM 24 110 82	0.586	12	JXM24BG110	HM 24 110 82	0.586	12	JXM24BG110
250	HM 27 130 90	0.885	12	JXM27BG130	HM 27 130 90	0.885	12	JXM27BG130
300	HM 27 130 90	0.885	16	JXM27BG130	HM 27 130 90	0.885	16	JXM27BG130
350	HM 30 140 93	1.226	16	JXM30BG140	-	-	-	-
400	HM 33 150 100	1.605	16	JXM33BG150	-	-	-	-
450	HM 33 150 100	1.605	20	JXM33BG150	-	-	-	-
500	HM 33 160 110	1.672	20	JXM33BG160	-	-	-	-
600	HM 36 180 110	2.260	20	JXM36BG180	-	-	-	-
700	HM 39 180 105	2.743	24	JXM39BG180	-	-	-	-
800	HM 45 190 110	3.861	24	JXM45BG190	-	-	-	-
900	HM 45 190 110	3.861	28	JXM45BG190	-	-	-	-
1000	HM 52 230 130	6.028	28	JXM52BG230	-	-	-	-
1100	HM 52 230 130	-	32	-	-	-	-	-
1200	HM 52 230 130	6.028	32	JXM52BG230	-	-	-	-
1400	HM 56 260 133	7.525	36	JXM56BG260	-	-	-	-
1500	HM 56 260 133	7.525	36	JXM56BG260	-	-	-	-
1600	HM 56 260 133	7.525	40	JXM56BG260	-	-	-	-
1800	HM 64 300 145	-	44	-	-	-	-	-
2000	HM 64 300 145	-	48	-	-	-	-	-

Galvanized steel washers for bolts

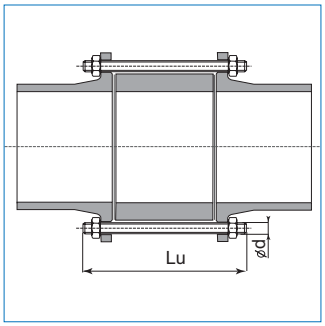


Ø de	Ø di	C	Weight	Reference
mm			kg	
30	17	3	0.010	JXM16RGE
36	21	3	0.011	JXM20RGE
45	25	4	0.020	JXM24RGE
48	28	4	0.020	JXM27RGE
52	31	4	0.021	JXM30RGE
56	34	5	0.040	JXM33RGE
60	37	5	0.043	JXM36RGE
72	42	6	0.052	JXM39RGM
85	48	8	0.067	JXM45RGM
98	56	8	0.091	JXM52RGM
105	62	10	0.106	JXM56RGM

Tie bars

Field of use:
For drinking water mains

Main characteristics:
- Connection of a block pipe between 2 flanges
- EN 545, ISO 2531



DN	PN10			PN16			PN25			Reference
	Quantity	L	d	Quantity	L	d	Quantity	L	d	
		mm			mm			mm		
40	4	340	16	4	340	16	4	340	16	JXM16FQ340
60	4	340	16	4	340	16	8	340	16	JXM16FQ340
80	8	340	16	8	340	16	8	340	16	JXM16FQ340
100	8	340	16	8	340	16	8	340	20	JXM16FQ340
125	8	340	16	8	340	16	8	340	24	JXM16FQ340
150	8	365	20	8	365	20	8	340	24	JXM20FQ365
200	8	365	20	12	365	20	12	340	24	JXM20FQ365
250	12	365	20	12	350	20	12	365	27	JXM20FQ365
300	12	365	20	12	350	24	16	365	27	JXM20FQ365
350	16	365	20	16	350	24	16	375	30	JXM20FQ365
400	16	380	24	16	370	27	16	380	33	JXM24FQ380
450	20	380	24	20	370	27	20	390	33	JXM24FQ380
500	20	380	24	20	380	30	20	390	33	JXM24FQ380
600	20	400	27	20	400	33	20	410	36	JXM27FQ400
700	24	400	27	24	400	33	24	430	39	JXM27FQ400
800	24	430	30	24	420	36	24	450	45	JXM30FQ430
900	28	430	30	28	420	36	28	460	45	JXM30FQ430
1000	28	440	33	28	430	39	28	480	52	JXM33FQ440



DN 80, 100 and 150

KAMELEO range

Fittings - Joints – Accessories

KAMELEO range DN 80 - 100 - 150

TABLE SHOWING THE VERSIONS OF THE KAMELEO FITTING	
Fitting body only	From 0° to 45°
KAMELEO variable angle bend	KAMELEO STANDARD
	KAMELEO STANDARD Vi
	KAMELEO EXPRESS
	KAMELEO EXPRESS Vi
	KAMELEO Flanged
KAMELEO variable angle flanged socket	KAMELEO STANDARD
	KAMELEO STANDARD Vi
	KAMELEO EXPRESS
	KAMELEO EXPRESS Vi
	KAMELEO EXPRESS sliding
KAMELEO sliding sleeve	KAMELEO EXPRESS
	KAMELEO EXPRESS Vi "Special Insertion"
KAMELEO kits	KAMELEO Flanged kit
	KAMELEO EXPRESS Vi kit
	KAMELEO EXPRESS kit
	KAMELEO EXPRESS Vi "Special Insertion" kit

KAMELEO range

KAMELEO is a variable angle fitting designed to connect water supply pipelines. It consists of a main component which can take a complete range of accessories sold in kits in order to produce various types of junction.

Advantages

- Pre-assembled outside the trench.
- Inserted by hand.
- Reduced number of bolts whilst guaranteeing leaktightness.
- Easily implemented to find the required bend thanks to its variable angle design.
- Different angles can be obtained with the same KAMELEO fitting. It replaces several traditional parts which would have been required on site.

Field of use

Potable water supply networks

For new works

- The KAMELEO fitting can cope with an angular fault that is too small or too large for traditional fittings.
- Creation of complex angles which would have previously required two bends.
- Extension of a pipe.
- Connection of a new pipeline.
- Extension for congested sites or tunnels.

For maintenance and repairs

In its flanged socket and sleeve with mechanical junction versions, KAMELEO slides along the pipe completely. Repair of anchored pipelines and small damaged pipe sections by replacing two sleeves and a pipe section: the KAMELEO EXPRESS Vi "Special Insertion" kit is used to anchor junctions on a static spigot.

Main characteristics

- Central junction perfectly sealed by O-ring
- Longevity: the fitting is protected by a blue epoxy coating in compliance with EN 14901, with hot-galvanized nuts and bolts.
- Safety: reduced number of bolts whilst guaranteeing leaktightness.
- Resistance to pressure: allowable operating pressure (PFA) of 16 bar.



DRINKING WATER SUPPLY

KAMELEO range



Ergonomic handle.
Fitting with continuously variable angle in 0° position



Fitting with continuously variable angle in 45° position



Continuously variable angle



Angle blocked by tightening the central junction

Polyvalent and modular

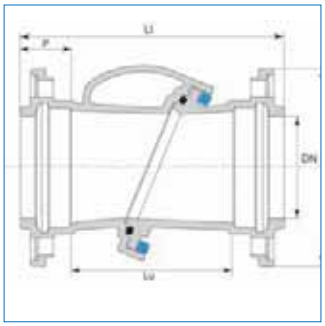
	Junctions				
	STANDARD	**STANDARD Vi**	**Flange**	**EXPRESS type**	**EXPRESS Vi type**
Collar					
Flanged socket			KAMELEO		
Bend					

Compliance with standards and regulations

- Joints made from EPDM quality elastomers.
- PECB 250 μm internal-external coating, in compliance with EN 14901.
- Galvanized steel nuts and bolts.
- Type tests in compliance with EN 545.

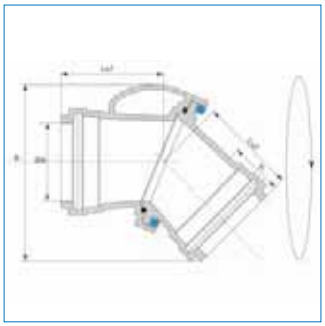
KAMELEO Body without accessories at 0°





KAMELEO Body without accessories at 45°



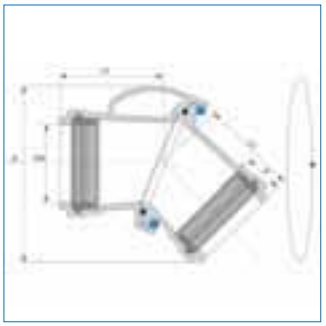


DN	Weight	B at 0°	Lt (0°)	Lu	B at 45°	Lu1	Lu2	P mini	PFA	Reference
	kg	mm							bar	
80	10.8	210	280	140	245	140	140	70	16	SZA80CV00TT
100	13.9	220	300	150	270	150	150	75	16	SZB10CV00TT
150	24.1	295	340	180	345	170	170	80	16	SZB15CV00TT

Weight: fitting alone - References: fitting

KAMELEO STANDARD variable angle bend

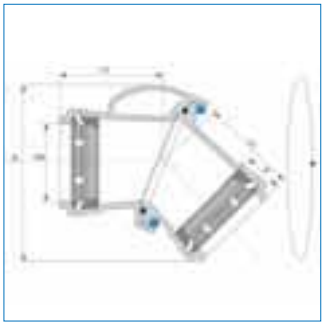




STANDARD
* Plan 2 extra STANDARD joints

KAMELEO STANDARD Vi variable angle bend





STANDARD Vi
* Plan 2 extra STANDARD Vi joints

KAMELEO EXPRESS variable angle bend





EXPRESS
* Plan 2 extra
KAMELEO EXPRESS kits

KAMELEO EXPRESS Vi variable angle bend

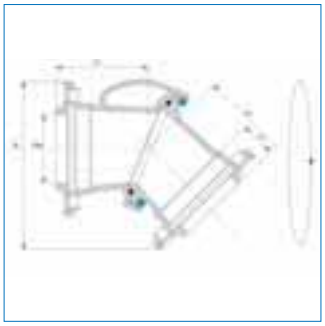




EXPRESS Vi
* Plan 2 extra KAMELEO
EXPRESS Vi kits

KAMELEO Flanged variable angle bend

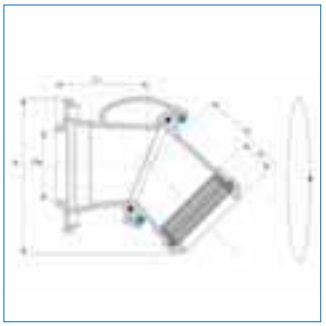




* Plan 2 extra KAMELEO
flanged kits

KAMELEO STANDARD variable angle flanged socket

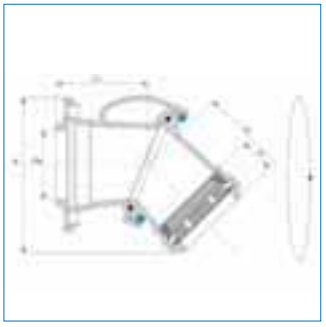




STANDARD
* Plan 1 extra STANDARD joint and 1 extra KAMELEO Flanged kit

KAMELEO STANDARD Vi variable angle flanged socket

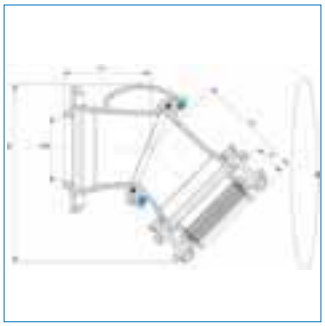




STANDARD Vi
* Plan 1 extra STANDARD Vi joint and 1 extra KAMELEO Flanged kit

KAMELEO EXPRESS variable angle flanged socket

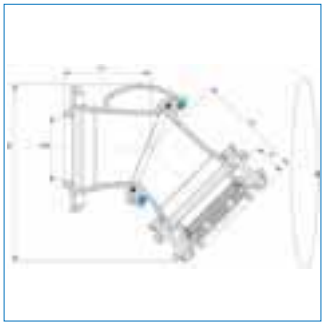




EXPRESS
* Plan 1 extra KAMELEO EXPRESS kit and 1 extra KAMELEO Flanged kit

KAMELEO EXPRESS Vi variable angle flanged socket

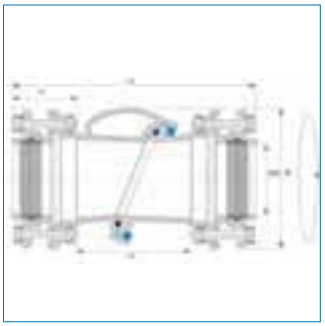




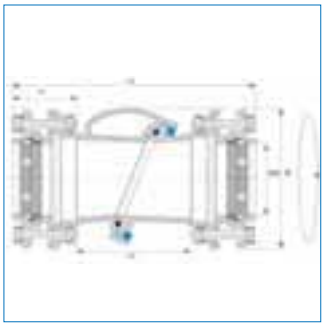
EXPRESS
* Plan 1 extra KAMELEO EXPRESS Vi kit and 1 extra KAMELEO Flanged kit

KAMELEO EXPRESS and EXPRESS Vi sliding sleeve





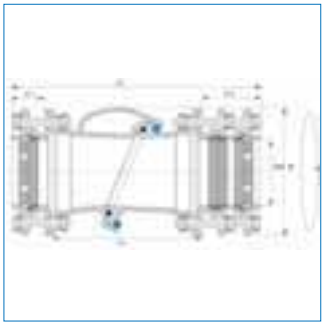
EXPRESS
* Plan 2 extra KAMELEO EXPRESS kits



EXPRESS Vi
* Plan 2 extra KAMELEO EXPRESS Vi kits

KAMELEO EXPRESS Vi "Special Insertion" sleeve





EXPRESS Vi
* Plan 2 extra KAMELEO EXPRESS Vi kits

Standard joint gasket for KAMELEO Range

The STANDARD joint gasket is compatible with all STANDARD sockets in the KAMELEO range.

The STANDARD joint is a push-in joint. Watertightness is produced by compression of the elastomer joint gasket, obtained during assembly by simply introducing the spigot in the socket.

Field of use:
For drinking water supply networks

DN	L	A	B	Weight	Reference
	mm			kg	
80	29.8	127.5	135.7	0.148	JSA80BA
100	29.8	148.6	158.6	0.196	JSB10BA
150	30.6	202.1	212.1	0.285	JSB15BA

Main characteristics:
- Elastomer quality: EPDM
- Quick and easy installation
- Possibility of gap
- Significant safety margin beyond the PFA
- High angular deflection accepted

Standard Vi joint gasket for KAMELEO Range

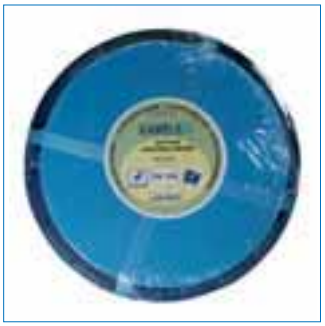
The STANDARD Vi anchored joint gasket (with inserts) and the STANDARD joint gasket have the same shape and fit in the same socket. In addition, the STANDARD Vi gasket has metal inserts which hook onto the spigot of the adjacent pipe (or fitting), after assembly.

Field of use:
For drinking water supply networks

DN	L	A	B	Weight	Reference
	mm			kg	
80	27.2	122.9	131.7	0.210	JSA80CA
100	27.1	143.8	154.8	0.280	JSB10CA
150	28.8	197.7	208.5	0.407	JSB15CA

Main characteristics:
- Elastomer quality: EPDM
- Quick and easy installation
- Possibility of gap
- Significant safety margin beyond the PFA
- High angular deflection accepted

KAMELEO Flanged kit





DN	Weight kg	Reference
80	2.60	JZA80KB
100	2.84	JZB10KB
150	3.90	JZB15KB

Kit composition

Composition	DN 80	DN 100	DN 150
Bolts	2 P	2 P	2 P
Threaded rod	2 P	2 P	2 P
Nut on rod	4 P	4 P	4 P
Washers	8 P	8 P	8 P
Gasket with centering ears	1 P	1 P	1 P
Rotatable flange	1 P	1 P	1 P

KAMELEO EXPRESS kit





DN	Weight kg	References
80	3.63	JZA80KE
100	3.89	JZB10KE
150	6.64	JZB15KE

Kit composition

Composition	DN 80	DN 100	DN 150
Bolts	4 P	4 P	4 P
Washers	8 P	8 P	8 P
EXPRESS NEW joint	1 P	1 P	1 P
KAMELEO gland	1 P	1 P	1 P
KAMELEO rotatable flange	1 P	1 P	1 P

KAMELEO EXPRESS Vi kit





DN	Weight kg	References
80	3.66	JZA80KL
100	3.93	JZB10KL
150	6.71	JZB15KL

Kit composition

Composition	DN 80	DN 100	DN 150
Bolts	4 P	4 P	4 P
Washers	8 P	8 P	8 P
EXPRESS NEW Vi joint	1 P	1 P	1 P
KAMELEO gland	1 P	1 P	1 P
KAMELEO rotatable flange	1 P	1 P	1 P

KAMELEO EXPRESS Vi "Special Insertion" kit





DN	Weight kg	References
80	5.48	JZA80KM
100	5.97	JZB10KM
150	10.71	JZB15KM

Kit composition

Composition	DN 80	DN 100	DN 150
Threaded rod	4 P	4 P	4 P
Nut on rod	4 P	4 P	4 P
Nut	4 P	4 P	4 P
Washers	12 P	12 P	12 P
EXPRESS NEW joint	1 P	1 P	1 P
EXPRESS NEW Vi joint	1 P	1 P	1 P
KAMELEO gland	2 P	2 P	2 P
KAMELEO rotatable flange	1 P	1 P	1 P

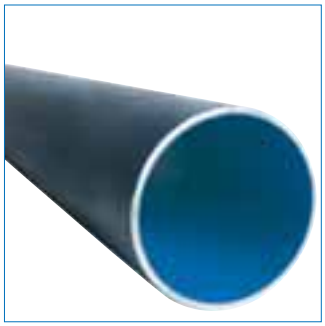
DN 90, 110 and 125

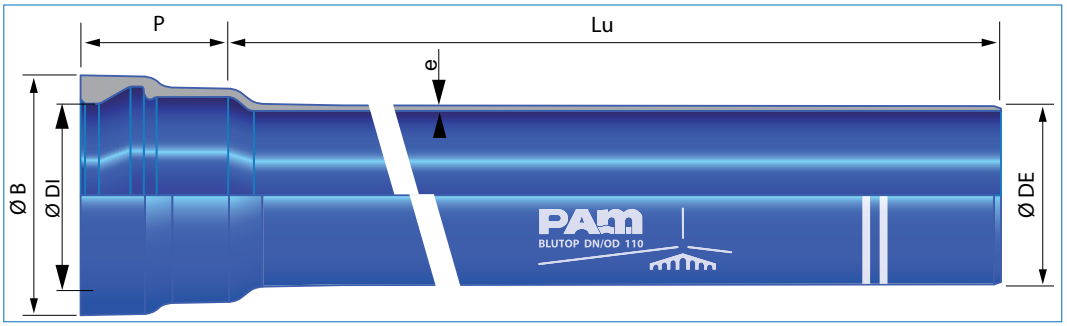
BLUTOP range

Pipes - Fittings - Joints - Accessories

DRINKING WATER SUPPLY

Pipes DN 90, 110 and 125 / BLUTOP pipe





Field of use:
For drinking water supply and distribution networks

DN	Lu mm	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
90	6	25	3.0	90.0	92.7	86.0	128.0	6.1	KXL90H60
110	6	25	3.0	110.0	112.8	89.0	148.0	7.5	KXM11H60
125	6	25	3.0	125.0	128.0	98.5	163.0	8.6	KXM12H60

Main characteristics:
- ZINALIUM external coating
- DUCTAN internal lining
- CSTB technical approval, currently under examination
- Sanitary Conformity Certificate (ACS)

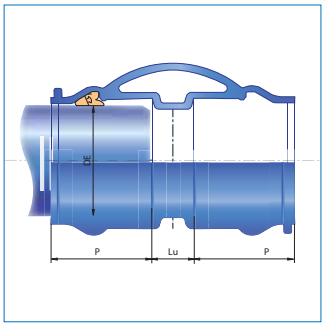


Fittings / BLUTOP sleeve

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





DN / OD (DE)	Lu	P	Weight	Reference
	mm		kg	
90	40	93.0	3.86	KXL90MN
110	40	99.0	4.91	KXM11MN
125	40	104.0	5.70	KXM12MN

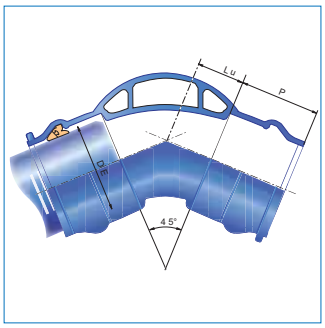
Weight: fitting alone - References: fitting

Fittings / BLUTOP bend

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





Angle Degree	DN / OD (DE)	Lu	P	Weight kg	Reference
		mm			
90°	90	75.0	92.5	4.80	KXL90CA
90°	110	85.0	99.0	6.39	KXM11CA
90°	125	110.0	104.0	7.88	KXM12CA
45°	90	50.0	92.5	4.53	KXL90CB
45°	110	60.0	99.0	6.12	KXM11CB
45°	125	65.0	104.0	7.13	KXM12CB
22°30	90	30.0	92.5	4.06	KXL90CD
22°30	110	30.0	99.0	5.22	KXM11CD
22°30	125	30.0	104.0	5.93	KXM12CD
11°15	90	30.0	92.5	3.90	KXL90CE
11°15	110	30.0	99.0	5.23	KXM11CE
11°15	125	30.0	104.0	5.90	KXM12CE

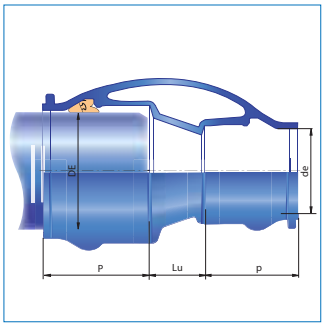
Weight: fitting alone - References: fitting

Fittings / BLUTOP taper

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





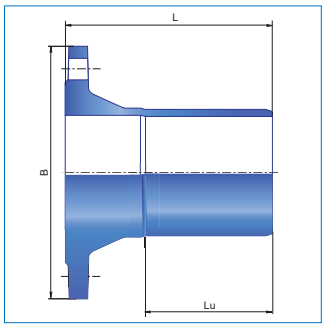
DN / OD (DE)	dn (de)	Lu	P	p	Weight	Reference
		mm			kg	
110	90	50.5	99	92.5	4.59	KXM11VE0D
125	90	50.0	104	92.5	4.99	KXM12VE0D
125	110	45.0	104	99.0	5.40	KXM12VE0E

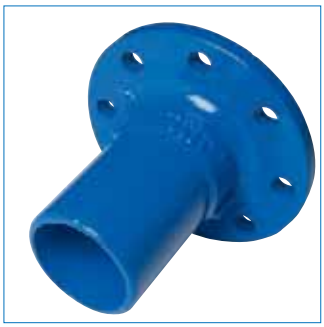
Weight: fitting alone - References: fitting

Fittings / BLUTOP flanged spigot

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





DN / OD (DE)	PN bar	Lu	L	B	Weight kg	Reference
		mm				
90	10-16	102	167	200	4.96	KXL90BU1E
110	10-16	110	180	220	6.48	KXM11BU1F
125	10-16	114	188	250	8.33	KXM12BU1G

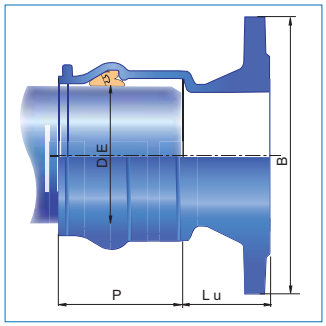
Weight: fitting alone - References: fitting

Fittings / BLUTOP flanged socket

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





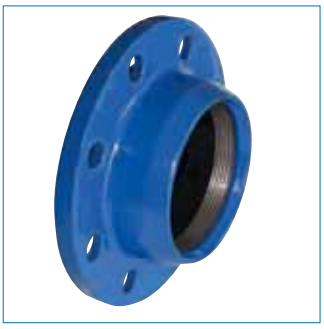
DN / OD (DE)	PN bar	Lu	P	B	Weight kg	Reference
		mm				
90	10-16	68	92.5	200	5.44	KXL90BE1E
110	10-16	68	99.0	220	6.96	KXM11BE1F
125	10-16	68	104.0	250	8.65	KXM12BE1G

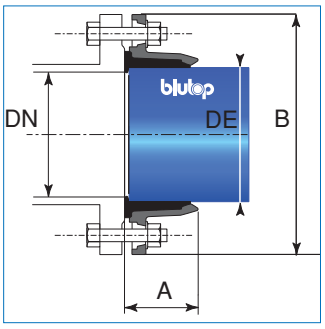
Weight: fitting alone - References: fitting

Fittings / BLUTOP flange adaptor

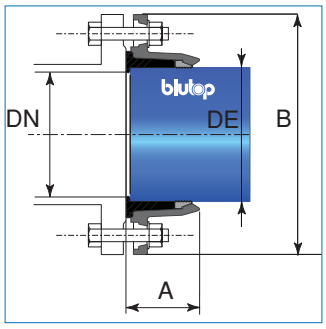
Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





Non-anchored



Anchored

				Non-anchored		Anchored	
DN	DE	A	B	Weight kg	Reference	Weight kg	Reference
80	90	62	200	2,60	MAL90DACH	2,80	216901
100	110	68	220	3,10	160754	3,40	216902
125	125	73	250	4,10	160755	4,30	216906

Weight: fitting alone - References: fitting

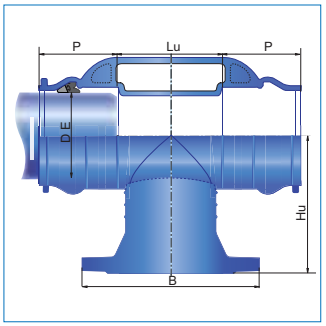
DRINKING WATER SUPPLY

Fittings / BLUTOP double socket tee with flanged branch

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





DN / OD (DE)	PN bar	P	Lu	Hu	B	Weight kg	Reference
		mm					
90X40	10-16	92.5	65.0	135.0	150.0	6.43	KXL90TD1A
90X60	10-16	92.5	90.0	155.0	175.0	7.97	KXL90TD1C
90X65*	10-16	92.5	90.0	155.0	175.0	8.20	KXL90TD1D
90X80	10-16	92.5	105.0	160.0	200.0	9.22	KXL90TD1E
110X40	10-16	99.0	65.0	145.0	150.0	7.52	KXM11TD1A
110X60	10-16	99.0	90.0	165.0	175.0	9.13	KXM11TD1C
110X65*	10-16	99.0	90.0	165.0	175.0	9.13	KXM11TD1D
110X80	10-16	99.0	105.0	170.0	200.0	10.41	KXM11TD1E
110X100	10-16	99.0	125.0	170.0	220.0	11.94	KXM11TD1F
125X40	10-16	104.0	65.0	160.0	150.0	8.43	KXM12TD1A
125X60	10-16	104.0	90.0	160.0	175.0	9.93	KXM12TD1C
125X65*	10-16	104.0	90.0	160.0	175.0	10.00	KXM12TD1D
125X80	10-16	104.0	105.0	170.0	200.0	11.26	KXM12TD1E
125X100	10-16	104.0	125.0	180.0	220.0	12.95	KXM12TD1F
125X125	10-16	104.0	150.0	180.0	250.0	14.86	KXM12TD1G

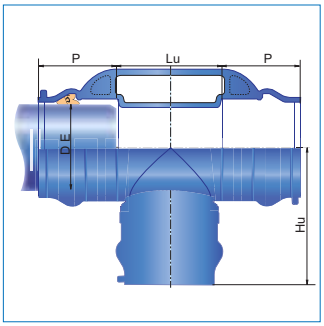
** upon request*
Weight: fitting alone - References: fitting

Fittings / BLUTOP all socket tee

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842





DN / OD (DE)	Lu	P	Hu	p	Weight	Reference
	mm				kg	
90x90	105	92.5	56	92.5	6.53	KXL90TE0D
110x90	105	99.0	67	92.5	7.82	KXM11TE0D
110x110	134	99.0	67	99.0	8.70	KXM11TE0E
125x90	105	104.0	74	93.0	8.74	KXM12TE0D
125x110	125	104.0	74	99.0	9.59	KXM12TE0E
125x125	105	104.0	74	104.0	10.36	KXM12TE0G

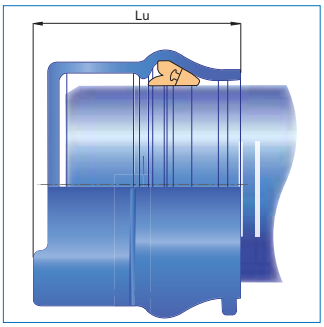
Weight: fitting alone - References: fitting

BLUTOP plug

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- Blue epoxy in compliance with EN 14901
- EN 12842



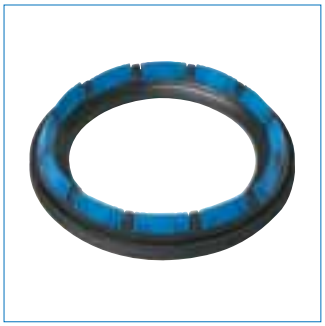


DN / OD (DE)	Lu mm	Weight kg	Reference
90	107	1.96	KXL90BH
110	113	2.55	KXM11BH
125	118	3.02	KXM12BH

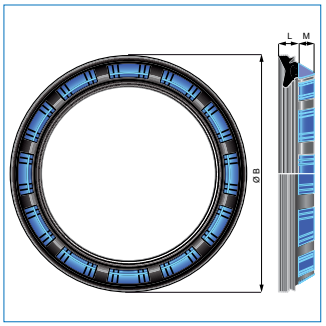
BLUTOP non-anchored joint

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- EPDM washer
- POM sector
- Sanitary Conformity Certificate (ACS)





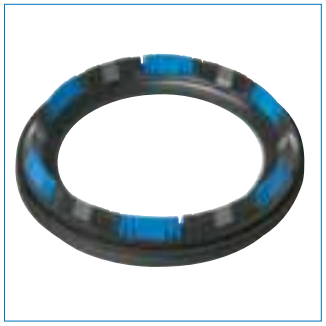


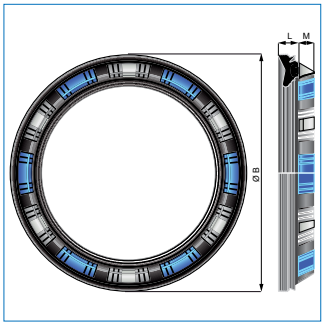
DN	PFA bar	Weight kg	Reference
90	25	0.060	JXL90BA
110	25	0.075	JXM11BA
125	25	0.090	JXM12BA

BLUTOP anchored joint

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- EPDM washer
- POM sector
- Stainless steel insert
- Sanitary Conformity Certificate (ACS)





DN	PFA bar	Weight kg	Reference
90	16	0.095	JXL90CA
110	16	0.115	JXM11CA
125	16	0.130	JXM12CA

BLUTOP repair product



Designation	Weight kg	Reference
Eurokote 438 RAL 5002	1	213686

BLUTOP lubricating paste



Designation	Weight kg	Reference
BLUTOP lubricating paste	0.85	214611

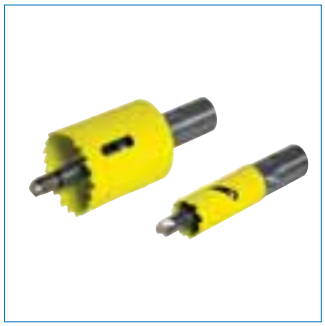
DRINKING WATER SUPPLY

Pipe drilling machine



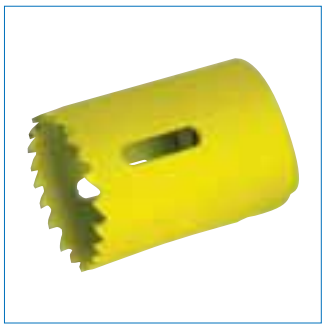
Designation	Weight kg	Reference
Pipe drilling machine for service connection	16	215439

Complete drilling tool for BLUTOP pipes



Designation	Weight kg	Reference
20 (19 mm)	0.19	214191
25 (24 mm)	0.20	214193
32 (30 mm)	0.26	214195
40 (38 mm)	0.27	214196

Multi-tooth milling cutter alone for BLUTOP (spare part)



Designation	Weight kg	Reference
20 (19 mm)	0.10	215444
25 (24 mm)	0.12	215445
32 (30 mm)	0.17	215446
40 (38 mm)	0.24	215447

DN 63 to 225

KLIKSO range

Fittings - Joints - Accessories for PVC or HDPE pipelines

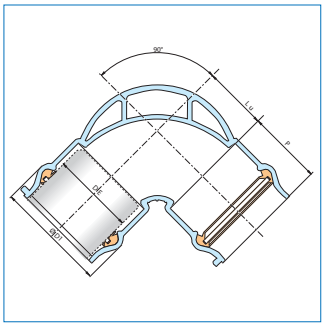
Fittings / KLIKSO double socket bend

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 63 to 225

Caution:
Do not use on BLUTOP pipes

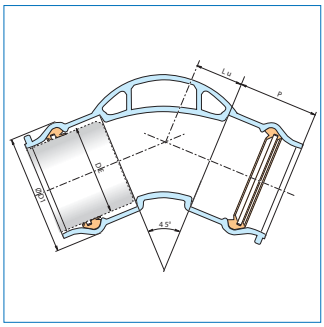




Angle / degree	**DN** / mm	**Lu**	**Weight** / kg	**Reference**
90°	**63**	65	3.30	KZL63CA
90°	**75**	70	4.12	KZL75CA
90°	**90**	75	5.22	KZL90CA
90°	**110**	85	6.70	KZM11CA
90°	**125**	110	8.31	KZM12CA
90°	**140**	110	9.50	KZM14CA
90°	**160**	130	11.69	KZM16CA
90°	**200**	160	16.42	KZM20CA
90°	**225**	170	19.40	KZM22CA

Weight: fitting alone - References: fitting





Angle / degree	**DN** / mm	**Lu**	**Weight** / kg	**Reference**
45°	**63**	65	3.07	KZL63CB
45°	**75**	70	3.84	KZL75CB
45°	**90**	75	4.88	KZL90CB
45°	**110**	85	6.40	KZM11CB
45°	**125**	110	7.40	KZM12CB
45°	**140**	110	8.65	KZM14CB
45°	**160**	130	10.10	KZM16CB
45°	**200**	160	13.26	KZM20CB
45°	**225**	170	16.01	KZM22CB

Weight: fitting alone - References: fitting

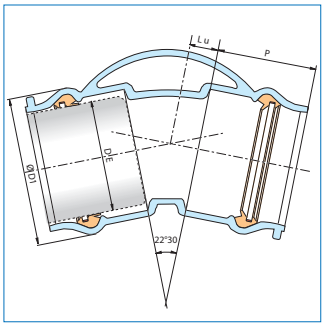
Fittings / KLIKSO double socket bend

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 63 to 225

Caution:
Do not use on BLUTOP pipes





Angle / degree	**DN** / mm	**Lu**	**Weight** / kg	**Reference**
22°30	**63**	65	2.57	KZL63CD
22°30	**75**	70	3.25	KZL75CD
22°30	**90**	75	4.17	KZL90CD
22°30	**110**	85	5.25	KZM11CD
22°30	**125**	110	6.06	KZM12CD
22°30	**140**	110	6.97	KZM14CD
22°30	**160**	130	8.44	KZM16CD
22°30	**200**	160	11.42	KZM20CD
22°30	**225**	170	13.67	KZM22CD

Weight: fitting alone - References: fitting

DRINKING WATER SUPPLY

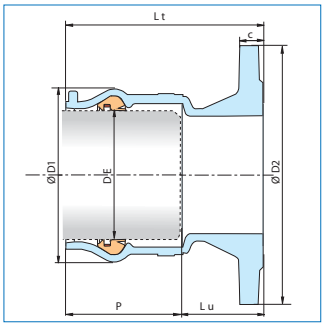
Fittings / KLIKSO flanged socket

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 63 to 225

Caution:
Do not use on BLUTOP pipes





DN / mm	**dn** / mm	**PN**	**Lu**	**Weight** / kg	**Reference**
63	60*	10-16	57	3.88	KZL63BE1C
75	60*	10-16	58	4.17	KZL75BE1C
90	80	10-16	68	5.44	KZL90BE1E
110	100	10-16	68	6.96	KZM11BE1F
125	125	10-16	66	8.65	KZM12BE1G
140	125	10-16	68	9.15	KZM14BE1G
160	150	10-16	68	11.22	KZM16BE1J
200	200	10	72	15.18	KZM20BE1K
200	200	16	72	15.18	KZM20BE2K
225	200	10	75	16.38	KZM22BE1K
225	200	16	75	16.38	KZM22BE2K

Weight: fitting alone - References: fitting
** DN 65 flange upon request*

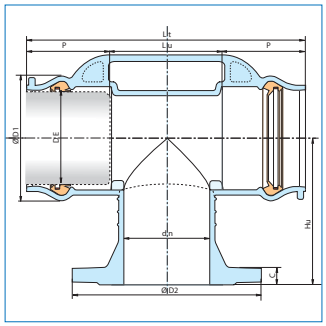
Fittings / KLIKSO double socket tee with flanged branch

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 63 to 225

Caution:
Do not use on BLUTOP pipes





DN pipe mm	DN flange kg	PN flange	Useful length		Weight kg	Reference
			Lu	Hu		
63	40	10-16	70	140	5.14	KZL63TD1A
	60*	10-16	70	140	6.20	KZL63TD1C
75	40	10-16	60	130	5.58	KZL75TD1A
	60*	10-16	85	140	7.02	KZL75TD1C
90	40	10-16	65	135	6.43	KZL90TD1A
	60*	10-16	90	155	7.97	KZL90TD1C
	80	10-16	105	160	9.22	KZL90TD1E
110	40	10-16	65	145	7.52	KZM11TD1A
	60*	10-16	90	165	9.13	KZM11TD1C
	80	10-16	105	170	10.41	KZM11TD1E
	100	10-16	125	170	11.94	KZM11TD1F
125	40	10-16	65	160	8.43	KZM12TD1A
	60*	10-16	90	160	9.93	KZM12TD1C
	80	10-16	105	170	11.26	KZM12TD1E
	100	10-16	125	180	12.95	KZM12TD1F
	125	10-16	150	180	14.86	KZM12TD1G
140	40	10-16	65	160	9.34	KZM14TD1A
	60*	10-16	90	180	11.04	KZM14TD1C
	80	10-16	105	185	12.35	KZM14TD1E
	100	10-16	125	195	14.03	KZM14TD1F
	125	10-16	150	200	16.28	KZM14TD1G
160	40	10-16	65	170	10.60	KZM16TD1A
	60*	10-16	90	190	12.35	KZM16TD1C
	80	10-16	105	200	13.73	KZM16TD1E
	100	10-16	125	205	15.40	KZM16TD1F
	125	10-16	150	210	17.74	KZM16TD1G
	150	10-16	175	220	20.16	KZM16TD1J
200	40	10-16	100	195	14.32	KZM20TD1A
	60*	10-16	125	210	16.27	KZM20TD1C
	80	10-16	140	225	17.74	KZM20TD1E
	100	10-16	160	230	19.67	KZM20TD1F
	125	10-16	185	240	22.05	KZM20TD1G
	150	10-16	210	245	24.54	KZM20TD1J
	200	10	260	250	29.09	KZM20TD1K
	200	16	260	250	29.09	KZM20TD2K
225	60*	10-16	125	215	18.23	KZM22TD1C
	80	10-16	140	225	19.71	KZM22TD1E
	100	10-16	160	230	21.75	KZM22TD1F
	150	10-16	210	245	26.67	KZM22TD1J
	200	10	260	260	31.62	KZM22TD1K
	200	16	260	260	31.62	KZM22TD2K

Weight: fitting alone - References: fitting
** DN 65 flange upon request*

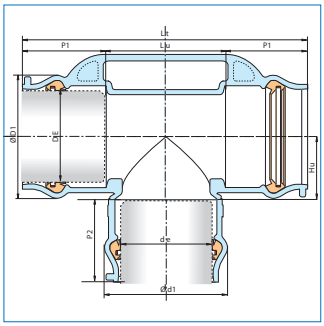
Fittings / KLIKSO all socket tee

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 90 to 160

Caution:
Do not use on BLUTOP pipes





DN pipe mm	DN branch kg	Useful length		Weight kg	Reference
		Lu	Hu		
90	90	105	56	6.53	KZL90TE0D
110	90	125	74	7.82	KZM11TE0D
110	110	134	67	8.70	KZM11TE0E
125	90	105	74	8.74	KZM12TE0D
125	110	105	67	9.59	KZM12TE0E
125	125	150	74	10.36	KZM12TE0G
140	110	125	82	10.55	KZM14TE0E
140	125	150	82	11.46	KZM14TE0G
140	140	155	82	11.90	KZM14TE0H
160	110	125	92	11.93	KZM16TE0E
160	125	140	92	12.66	KZM16TE0G
160	140	150	92	13.25	KZM16TE0H

Weight: fitting alone - References: fitting

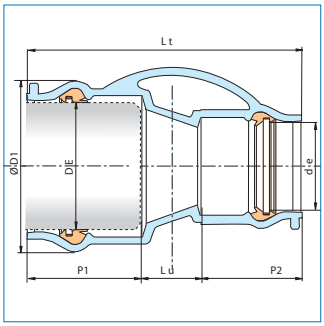
Fittings / KLIKSO double socket taper

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 75 to 225

Caution:
Do not use on BLUTOP pipes





DN	dn	Useful length Lu	Weight kg	Reference
75	63	40	2.89	KZL75VE0B
90	63	40	3.30	KZL90VE0B
90	75	40	3.56	KZL90VE0C
110	63	50	3.96	KZM11VE0B
110	75	50	4.21	KZM11VE0C
110	90	50	4.59	KZM11VE0D
125	90	50	4.99	KZM12VE0D
125	110	45	5.40	KZM12VE0E
140	90	50	5.51	KZM14VE0D
140	110	45	5.91	KZM14VE0E
140	125	45	6.29	KZM14VE0G
160	75	65	6.02	KZM16VE0C
160	90	60	6.37	KZM16VE0D
160	110	55	6.72	KZM16VE0E
160	125	50	7.01	KZM16VE0G
160	140	50	7.43	KZM16VE0H
200	125	75	8.97	KZM20VE0G
200	140	70	9.28	KZM20VE0H
200	160	70	9.87	KZM20VE0J
225	110	85	9.94	KZM22VE0E
225	140	75	10.50	KZM22VE0H
225	160	70	10.96	KZM22VE0J
225	200	60	11.94	KZM22VE0K

Weight: fitting alone - References: fitting

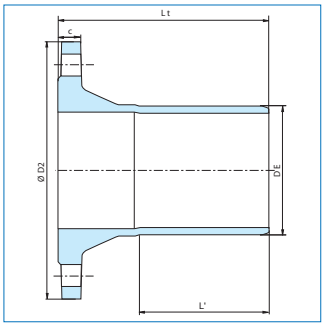
Fittings / KLIKSO flanged spigot

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 63 to 225

Caution:
Do not use on BLUTOP pipes





DN	DN flange mm	Useful length Lu	Weight kg	Reference
63	60*	10-16	153	KZL63BU1C
75	60*	10-16	158	KZL75BU1C
90	80	10-16	167	KZL90BU1E
110	100	10-16	180	KZM11BU1F
125	125	10-16	188	KZM12BU1G
140	125	10-16	190	KZM14BU1G
160	150	10-16	197	KZM16BU1J
200	200	10	218	KZM20BU1K
200	200	16	218	KZM20BU2K
225	225	10	226	KZM22BU1K
225	225	16	226	KZM22BU2K

Weight: fitting alone - References: fitting
** DN 65 flange upon request*

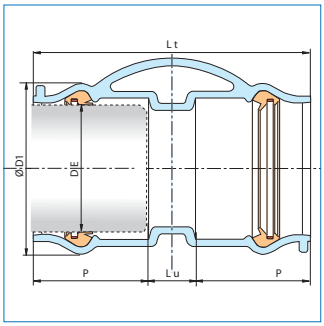
Fittings / KLIKSO sleeve

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 63 to 225

Caution:
Do not use on BLUTOP pipes





DN	Useful length Lu	Weight kg	Reference
63	40	2.56	KZL63MN
75	40	3.10	KZL75MN
90	40	3.86	KZL90MN
110	40	4.91	KZM11MN
125	40	5.70	KZM12MN
140	40	6.61	KZM14MN
160	50	8.02	KZM16MN
200	60	10.93	KZM20MN
225	60	12.88	KZM22MN

Weight: fitting alone - References: fitting

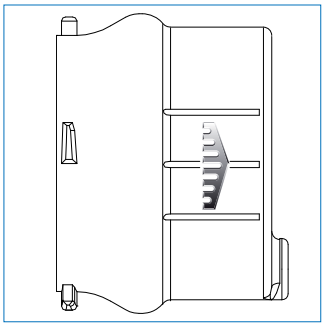
Fittings / KLIKSO plug

Field of use:
For drinking water supply and distribution networks

Main characteristics:
- For PVC networks in compliance with standard EN 1452, or HDPE networks in compliance with EN 12021
- In compliance with standard EN 12842
- Joint ring in compliance with standard EN 681-1
- DN 90 to 160

Caution:
Do not use on BLUTOP pipes





DN mm	Weight kg	Reference
90	1.96	KZL90BH
110	2.55	KZM11BH
125	3.02	KZM12BH
140	3.51	KZM14BH
160	4.24	KZM16BH

Weight: fitting alone - References: fitting

Fittings / KLIKSO anchoring kit







DN / mm		Weight / kg	Reference
63	PVC - PE	1.56	JZL63VX
75		1.76	JZL75VX
90		2.10	JZL90VX
110		2.33	JZM11VX
125		2.57	JZM12VX
140		2.80	JZM14VX
160		3.10	JZM16VX
200		4.18	JZM20VX
225		4.64	JZM22VX

If anchoring is used, constructive measures must be taken to absorb, if necessary, the expansions of PE or PVC pipes.

Lubricating paste

Packing	Reference
0.850 kg tin	158128

IRRIGAL range

Pipes - Fittings - Joints - Accessories

Ranges for irrigation

PAM *products suitable for irrigation are:*

- *Pipes – IRRIGAL range from DN 100 to 1000 dedicated specifically to irrigation*

The following ranges are also suitable for irrigation, especially for the fittings and accessories:

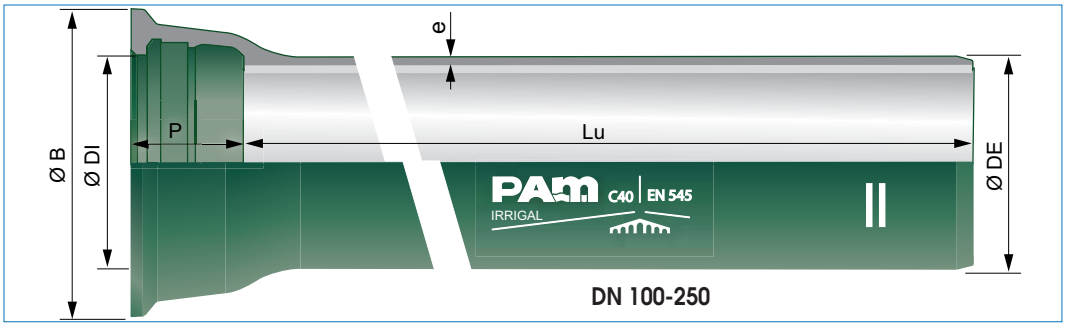
- *NATURAL from DN 60 to 600*
- *CLASSIC from DN 700 to 2000*
- *FLANGED from DN 40 to 2000*
- *BLUTOP in DN 90, 110 and 125*
- *KLIKSO from DN 63 to 225*

IRRIGAL pipe with Standard joint

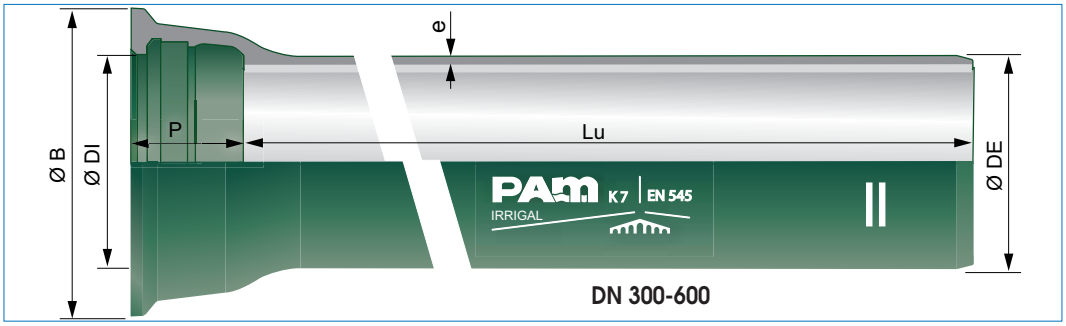
Field of use:
For irrigation networks

Main characteristics:

- External coating: zinc (200 g/m²) + green epoxy finishing layer in DN 100 to 600 and black epoxy finishing layer in DN 700 to 1000
- Internal lining: centrifuged cement mortar
- Joints made from EPDM quality elastomer
- EN 545

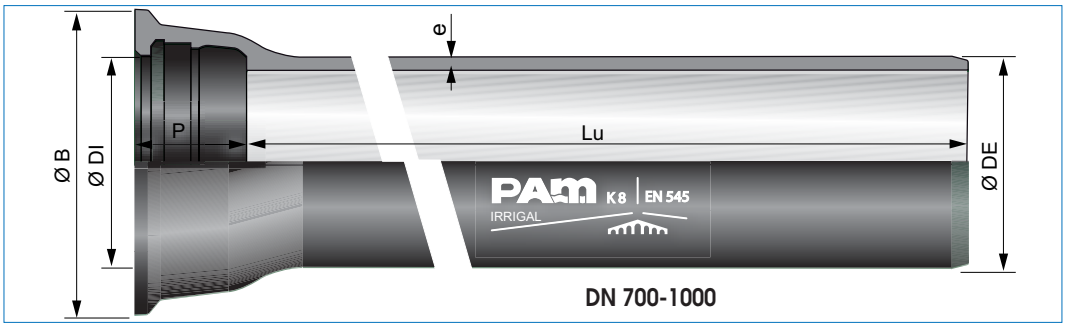


DN 100-250



DN 300-600

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
100	6	C40	4.8	118	121.4	94.5	188	15.7	ISB10F60
125	6	C40	4.8	144	147.4	97.5	215	19.4	ISB12F60
150	6	C40	5.0	170	173.4	100.5	242	23.9	ISB15F60
200	6	C40	5.4	222	225.2	106.5	295	33.4	ISB20F60
250	6	C40	5.8	274	276.8	105.5	352	43.9	ISB25F60
300	6	K7	6.0	326	328.8	107.5	409.2	54.2	ISB30S60
350	6	K7	6.0	378	380.9	110.5	464.2	65.5	ISB35S60
400	6	K7	6.3	429	431.9	112.5	516.2	77.4	ISB40S60
450	6	K7	6.7	480	483.0	115.5	574.2	91.6	ISB45S60
500	6	K7	7.0	532	535.0	117.5	629.2	105.3	ISB50S60
600	6	K7	7.7	635	638.1	132.5	738.5	136.8	ISB60S60



DN 700-1000

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
700	6.960	K8	9.6	738	741.7	192	863	198.8	ISB70E69
800	6.950	K8	10.4	842	845.8	197	974	243.4	ISB80E69
900	6.950	K8	11.2	945	948.9	200	1082	291.3	ISB90E69
1000	6.960	K8	12.0	1048	1052	203	1191	342.9	ISC10E69



DEDICATED APPLICATIONS

Artificial snow and very high pressures

ALPINAL range

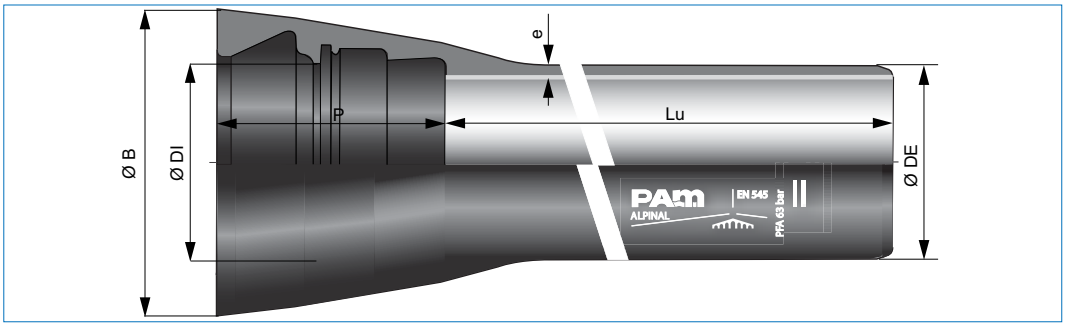
Pipes - Fittings - Joints - Accessories

DEDICATED APPLICATIONS

ALPINAL UNIVERSAL pipe

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:

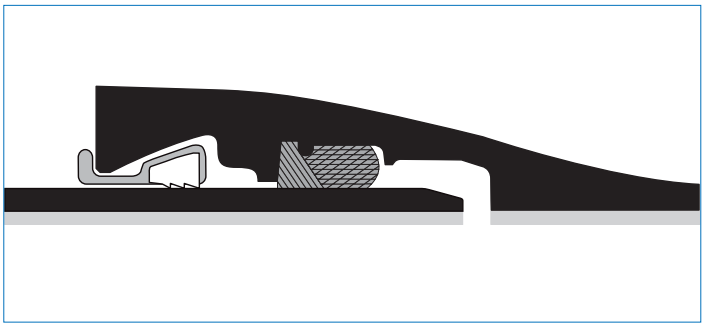
- Internal lining: centrifuged blast furnace cement mortar
- External coating: zinc (200 g /m²) + bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
80**	6	K10	6	98	100.5	112	159	15.8	ANA80T60
100**	6	K12	7.2	118	120.5	140	188	21.3	ANB10W60
125**	6	K12	7.5	144	146.5	139.9	215	27.3	ANB12W60
150**	6	K12	7.8	170	172.5	148	230	33.5	ANB15W60
200**	6	K12	8.4	222	224.5	155	290	47.5	ANB20W60
250**	6	K12	9	274	276.5	166	350	63.1	ANB25W60
300**	6	K12	9.6	326	328.5	180	408	80.3	ANB30W60
400*	5.97	K12	10.8	429	431.9	176	510	122.7	ASB40W60
500*	5.97	K12	12	532	535.0	200	625	169.7	ASB50W60

** STANDARD joint*
*** TYTON joint*

Junction:

- Non-anchored UNIVERSAL joint from DN 80 to 500
- UNIVERSAL Vi joint from DN 80 to 150

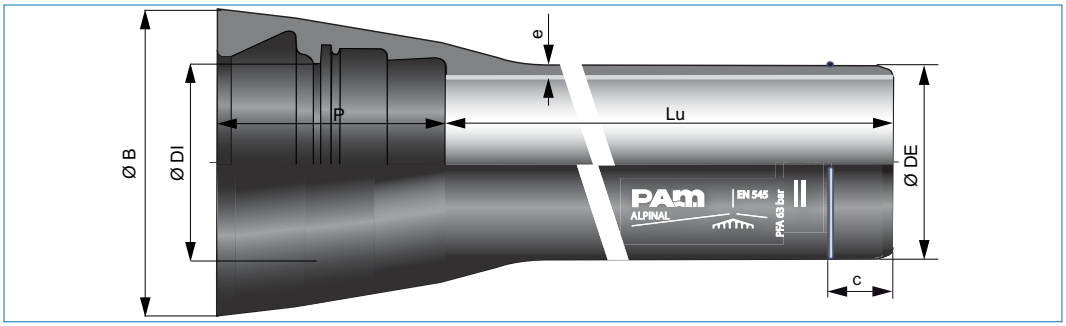


DEDICATED APPLICATIONS

ALPINAL UNIVERSAL Ve pipe

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:

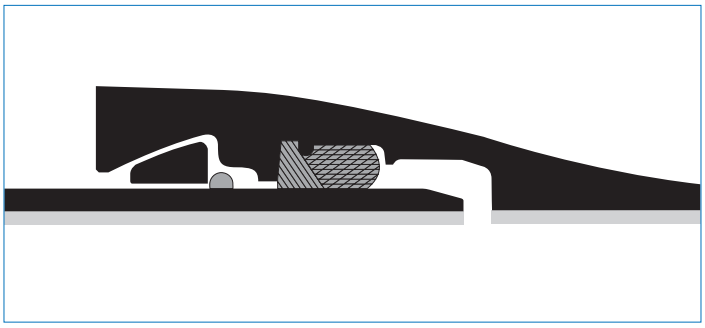
- Internal lining: centrifuged blast furnace cement mortar
- External coating: zinc (200 g /m²) + bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
150**	6	K12	7.8	170	172.5	148	230	95	33.5	AKB15W60
200**	6	K12	8.4	222	224.5	155	290	100	47.5	AKB20W60
250**	6	K12	9	274	276.5	166	350	110	63.1	AKB25W60
300**	6	K12	9.6	326	328.	180	408	115	80.3	AKB30W60
400*	5.97	K12	10.8	429	431.9	176	510	113	122.7	AFB40W60
500*	5.97	K12	12	532	535.0	200	625	125	169.7	AFB50W60

** STANDARD joint*
*** TYTON joint*

Junction:

- UNIVERSAL Ve joint from DN 150 to 500

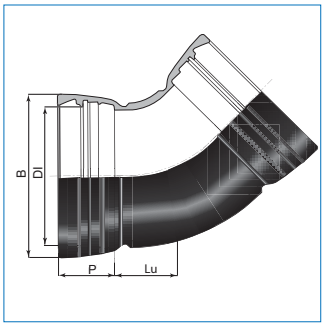


DEDICATED APPLICATIONS

Fittings / ALPINAL bend

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:

- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

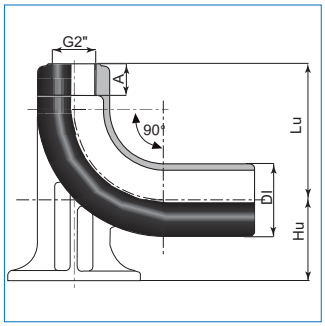
Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
	mm						
45°	80	55.5	116	100.5	149	9.5	ANA80CB
30°	80	43.8	116	100.5	149	6.8	ANA80CC
22°30	80	38.3	116	100.5	149	6.7	ANA80CD
11°15	80	30.3	116	100.5	149	9	ANA80CE
45°	100	64.4	139	120.5	177	14.5	ANB10CB
30°	100	49.8	139	120.5	177	14.5	ANB10CC
22°30	100	42.9	139	120.5	177	14	ANB10CD
11°15	100	32.9	139	120.5	177	13.5	ANB10CE
45°	125	-	139.9	146.5	208	19.5	ANB12CB
30°	125	-	139.9	146.5	208	20	ANB12CC
22°30	125	-	139.9	146.5	208	20	ANB12CD
11°15	125	-	139.9	146.5	208	18.5	ANB12CE
45°	150	86.6	145.8	172.5	230	23	ANB15CB
30°	150	64.7	145.8	172.5	230	23	ANB15CC
22°30	150	54.3	145.8	172.5	230	22.5	ANB15CD
11°15	150	39.3	145.8	172.5	230	21	ANB15CE
45°	200	108.8	154	224.5	290	33	ANB20CB
30°	200	79.6	154	224.5	290	35	ANB20CC
22°30	200	65.8	154	224.5	290	36	ANB20CD
11°15	200	45.7	154	224.5	290	36	ANB20CE
45°	250	131.1	160.6	276.5	347	52	ANB25CB
30°	250	94.5	160.6	276.5	347	49	ANB25CC
22°30	250	77.2	160.6	276.5	347	47	ANB25CD
11°15	250	52.1	160.6	276.5	347	44	ANB25CE
45°	300	153.3	173.5	328.5	406	61	ANB30CB
30°	300	109.4	173.5	328.5	406	65	ANB30CC
22°30	300	88.7	173.5	328.5	406	68	ANB30CD
11°15	300	58.6	173.5	328.5	406	73	ANB30CE

Weight: fitting alone - References: fitting

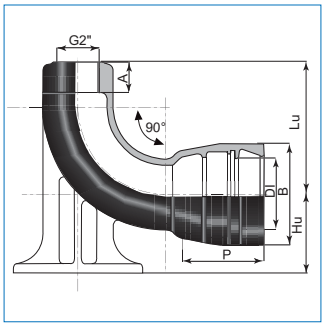
Fittings / ALPINAL duckfoot bend

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



With spigot threaded 2" gas



With socket threaded 2" gas

Main characteristics:

- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DN	Lu	H	P	DI	B	A	Weight kg	Reference
			mm					
With spigot								
80	185	110	-	98	-	43	25	102926
With socket								
80	185	110	114.7	100.5	141	43	25	ANA80CF0L

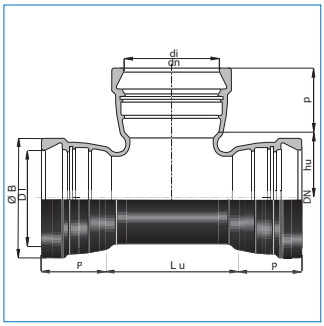
Weight: fitting alone - References: fitting

DEDICATED APPLICATIONS

Fittings / ALPINAL all socket tee

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:

- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DN	dn	Lu	P	DI	B	hu	p	di	Weight	Reference
mm									kg	
80	80	-	116	100.5	149	-	116	100.5	15.5	ANA80TE0E
100	80	170	139	120.5	177	95	116	100.5	20	ANB10TE0E
100	100	190	139	120.5	177	95	139	120.5	23.5	ANB10TE0F
125	80	-	139.9	146.5	208	-	116	100.5	22	ANB12TE0E
125	100	-	139.9	146.5	208	-	139	120.5	23 .5	ANB12TE0F
125	125	-	139.9	146.5	208	-	139.9	146.5	30	ANB12TE0G
150	80	170	145.8	172.5	230	120	116	100.5	30 .5	ANB15TE0E
150	100	195	145.8	172.5	230	120	139	120.5	32.6	ANB15TE0F
150	150	255	145.8	172.5	230	125	145.8	172.5	37	ANB15TE0J
200	80	175	154	224.5	290	145	116	100.5	42.9	ANB20TE0E
200	100	200	154	224.5	290	145	139	120.5	45.9	ANB20TE0F
200	150	255	154	224.5	290	150	145.8	172.5	51	ANB20TE0J
200	200	315	154	224.5	290	155	154	224.5	62.9	ANB20TE0K
250	80	180	160.6	276.5	347	170	116	100.5	54	ANB25TE0E
250	100	200	160.6	276.5	347	170	139	120.5	58.4	ANB25TE0F
250	150	260	160.6	276.5	347	175	145.8	172.5	65.9	ANB25TE0J
250	200	315	160.6	276.5	347	180	154	224.5	73	ANB25TE0K
250	250	375	160.6	276.5	347	190	160.6	276.5	83.4	ANB25TE0L
300	80	180	173.5	328.5	406	195	116	100.5	73.8	ANB30TE0E
300	100	205	173.5	328.5	406	195	139	120.5	77.8	ANB30TE0F
300	150	260	173.5	328.5	406	200	145.8	172.5	86	ANB30TE0J
300	200	320	173.5	328.5	406	205	154	224.5	96.1	ANB30TE0K
200	250	435	173.5	328.5	406	215	160.6	276.5	99	ANB30TE0L
300	300	435	173.5	328.5	406	220	173.5	328.5	116	ANB30TE0M

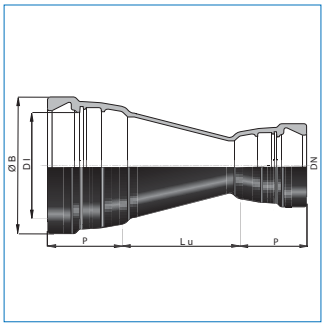
Weight: fitting alone - References: fitting

DEDICATED APPLICATIONS

Fittings / ALPINAL taper

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:

- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

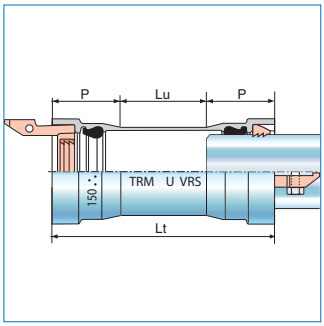
DN	dn	Lu	P	DI	B	p	di	Weight	Reference
mm								kg	
100	80	90	139	120.5	177	116	100.5	12.3	ANB10VE0E
125	80	-	139.9	146.5	208	116	100.5	14.8	ANB12VE0E
125	100	-	139.9	146.5	208	139	120.5	16.4	A NB12VE0F
150	80	190	145.8	172.5	230	116	100.5	18.6	ANB15VE0E
150	100	150	145.8	172.5	230	139	120.5	19.8	ANB15VE0F
150	125	-	145.8	172.5	230	139.9	146.5	22.5	ANB15VE0G
200	150	150	154	224.5	290	145.8	172.5	29	ANB20VE0J
250	100	350	160.6	276.5	347	139	120.5	37.2	ANB25VE0F
250	150	250	160.6	276.5	347	145.8	172.5	38	ANB25VE0J
250	200	150	160.6	276.5	347	154	224.5	41	ANB25VE0K
300	150	350	173.5	328.5	406	145.8	172.5	54.6	ANB30VE0J
300	200	250	173.5	328.5	406	154	224.5	55	ANB30VE0K
300	250	150	173.5	328.5	406	160.6	276.5	55	ANB30VE0L

Weight: fitting alone - References: fitting

DEDICATED APPLICATIONS

Fittings / ALPINAL anchored sleeve

Field of use:
- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:
- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DN	P	Lu	Lt	PFA	Angular deflection	Weight kg	Reference
80	127.5	160	415	100	5	7.7	ANA80MN00TT
100	135	160	430	75	5	9.7	ANB10MN00TT
125	147.5	165	460	63	5	12.5	ANB12MN00TT
150	157.5	165	480	63	5	15.2	ANB15MN00TT
200	165	170	500	40	4	22	ANB20MN00TT
250	172.5	175	520	40	4	30	ANB25MN00TT
300	180	180	540	40	4	38.5	ANB30MN00TT
400	210	590	190	30	3	59.5	ANB40MN00TT
500	220	620	200	30	3	107	ANB50MN00TT

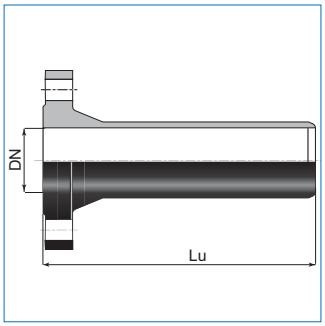
Weight: weight of the sleeve without joint or locking ring

Materials and coatings		
Description	**Materials**	**Coatings**
Body	Ductile iron 400/5	Blue epoxy
$^1/_2$ locking rings	Ductile iron	Red-brown anticorrosion paint
Joints	EPDM	

DEDICATED APPLICATIONS

Fittings / ALPINAL flanged spigot

Field of use:
- Water supply and connection for snow systems
- Networks operating under very high pressures



DN	Lu	Weight / kg						Reference					
mm		PN10	PN16	PN25	PN40	PN63	PN100	PN10	PN16	PN25	PN40	PN63	PN100
80	350	8.4	8.4	8.4	8.4	15	15	ANA80BU1	ANA80BU1	ANA80BU1	ANA80BU1	ANA80BU5	ANA80BUB
100	360	10.5	10.5	11	11	20.5	20.5	ANB10BU1	ANB10BU1	ANB10BU3	ANB10BU3	ANB10BU5	ANB10BUB
125	370	13.5	13.5	14	14	24.5	24.5	ANB12BU1	ANB12BU1	ANB12BU3	ANB12BU3	ANB12BU5	ANB12BUB

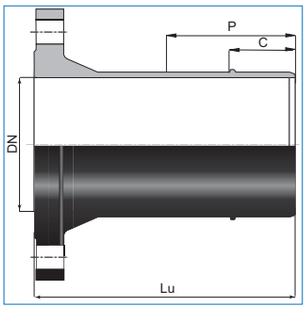
Main characteristics:
- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

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Fittings / ALPINAL flanged spigot

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



DN	Lu	Weight / kg						Reference					
mm		PN10	PN16	PN25	PN40	PN63	PN100	PN10	PN16	PN25	PN40	PN63	PN100
150	380	-	-	-	-	42	40.8	-	-	-	-	AKB15BU5	AKB15BUB
200	400	-	15.8	16.8	18.8	40.8	40.8	-	AKB20BU2	AKB20BU3	AKB20BU4	AKB20BU5	AKB20BUB
250	420	-	-	35.8	45.8	65.5	-	-	-	AKB25BU3	AKB25BU	AKB25BU5	-
300	440	-	42.7	-	63	85	-	-	AKB30BU2	-	AKB30BU4	AKB30BU5	-

Main characteristics:

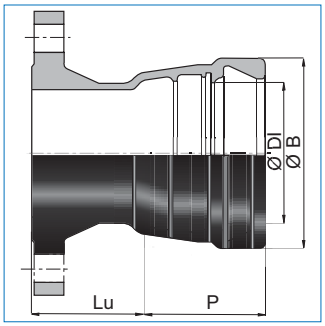
- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DEDICATED APPLICATIONS

Fittings / ALPINAL flanged socket

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



DN	Weight / kg						Reference					
mm	PN10	PN16	PN25	PN40	PN63	PN100	PN10	PN16	PN25	PN40	PN63	PN100
80	9	9	9	9	14.3	14.3	ANA80BE1	ANA80BE1	ANA80BE1	ANA80BE1	ANA80BE5	ANA80BEB
100	12.6	12.6	12.8	12.8	20.3	14.3	ANB10BE1	ANB10BE1	ANB10BE3	ANB10BE3	ANB10BE5	ANB10BEB
125	15.4	15.4	16	16	25	25	ANB12BE1	ANB12BE1	ANB12BE3	ANB12BE3	ANB12BE5	ANB12BEB
150	20.2	20.2	21.2	23.3	39.3	39.3	ANB15BE1	ANB15BE1	ANB15BE3	ANB15BE4	ANB15BE5	ANB15BEB
200	-	-	-	38	63	63	-	-	-	ANB20BE4	ANB20BE5	ANB20BEB
250	43.2	-	46	56	62	-	ANB25BE1	-	ANB25BE3	ANB25BE4	ANB25BE5	-
300	-	57	-	77	87	-	-	ANB30BE2	-	ANB30BE4	ANB30BE5	-

Main characteristics:

- Internal lining: cement mortar
- External coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

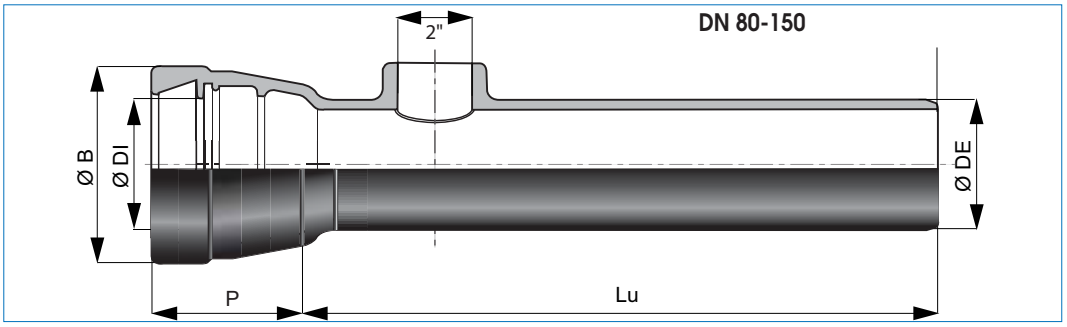
DN	Lu	P	B	DI
	mm			
80	130	116	149	100.5
100	130	139	177	120.5
125	135	139.9	208	146.5
150	135	145.8	230	172.5
200	140	154	290	224.5
250	145	160.6	347	276.5
300	150	173.5	406	328.5

DEDICATED APPLICATIONS

Fittings / ALPINAL straight fitting with socket/spigot with 2" gas hole

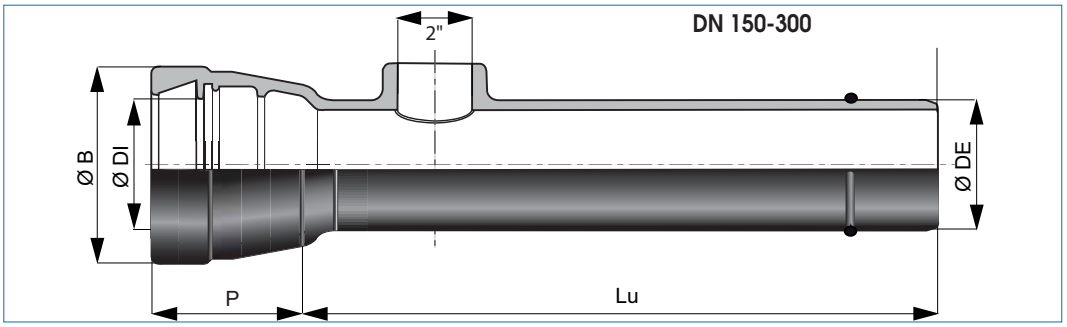
Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



Main characteristics:

- Internal lining: centrifuged blast furnace cement mortar
- External coating: zinc (200 g /m²) + bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531



DN mm	Lu mm	DE mm	DI mm	P mm	B mm	Weight Kg/m	Reference
80	600	98	100.5	116	149	15.1	ANA80EU
100	600	118	120.5	139	177	18	ANB10EU
125	600	144	146.5	139.9	208	22.5	ANB12EU
150	600	170	172.5	145.8	230	30	ANB15EU
150*	600	170	172.5	145.8	230	30	AKB15EU
200*	600	222	224.5	154	290	40	AKB20EU
250*	600	274	276.5	160.6	347	56	AKB25EU
300*	600	326	328.5	173.5	406	71	AKB30EU

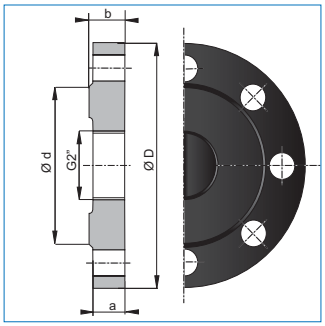
** with locking bead*

DEDICATED APPLICATIONS

ALPINAL blank flange with 2" gas hole

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



DN	Weight / kg						Reference					
mm	PN10	PN16	PN25	PN40	PN63	PN100	PN10	PN16	PN25	PN40	PN63	PN100
80	3.6	3.6	3.6	3.6	6.9	9.4	ABA80QN1	ABA80QN1	ABA80QN1	ABA80QN1	ABA80QN5	ABA80QNB
100	4.3	4.3	4.8	4.8	10.1	14.3	ABB10QN1	ABB10QN1	ABB10QN3	ABB10QN3	ABB10QN5	ABB10QNB
125	5.6	5.6	6.2	6.2	18.7	27	ABB12QN1	ABB12QN1	ABB12QN3	ABB12QN3	ABB12QN5	ABB12QNB
150	7.2	7.2	11.1	11.1	28.6	42	ABB15QN1	ABB15QN1	ABB15QN3	ABB15QN3	ABB15QN5	ABB15QNB
200	-	11	-	20	49	75	-	ABB20QN2	-	ABB20QN4	ABB20QN5	ABB20QNB
250	-	-	-	33.5	68	-	-	-	-	ABB25QN4	ABB25QN5	-
300	26	-	-	51.5	98	-	ABB30QN1	-	-	ABB30QN4	ABB30QN5	-

Main characteristics:

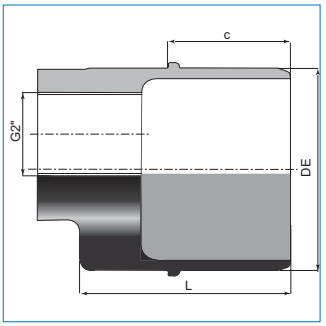
- Internal and external coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

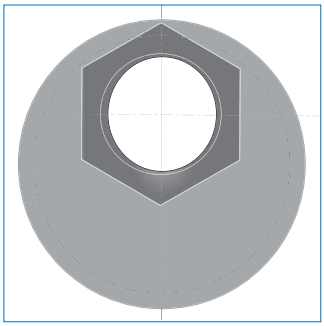
PFA	DN	D	d	a	b
			mm		
10-16	80	200	132	16	19
	100	220	156	16	19
	125	250	184	16	19
	150	280	211	16	19
	200	340	266	17	20
	250	400	319	19	22
	300	455	370	20.5	24.5
25	80	200	132	16	19
	100	235	156	16	19
	125	270	184	20.5	23.5
	150	300	211	23	26
	200	360	274	19	22
	250	425	330	21.5	24.5
	300	485	389	23.5	27.5
40	80	200	132	16	19
	100	235	156	16	19
	125	270	184	20.5	23.5
	150	300	211	23	26
	200	375	284	27	30
	250	450	345	31.5	34.5
	300	515	409	35.5	39.5
63	80	215	138	28	31
	100	250	156	30	33
	125				
	150	345	211	36	39
	200	415	284	43	46
	250	470	345	47	50
	300	530	409	53	57
100	80	230	138	35	38
	100	265	162	39	42
	125	315	188	41	44
	150	355	218	51	54
	200	430	285	63	66
	250				
	300				

DEDICATED APPLICATIONS

ALPINAL male plug with 2" gas hole

Field of use:
- Water supply and connection for snow systems
- Networks operating under very high pressures





Main characteristics:
- Internal and external coating: bituminous coating
- Wall thickness adapted to the pressure
- Joints made from EPDM quality elastomer
- EN 545
- ISO 2531

DN mm	L mm	DE mm	c mm	Weight Kg/m	Reference
80	-	-	-	2.5	ANA80BH
100	150	118	90	3.8	AKB10BH
125	150	144	87	5.7	AKB12BH
150	180	170	95	8.9	AKB15BH
200	180	222	100	13.2	AKB20BH
250	-	-	-	-	-
300	-	-	-	-	-

DN80: *must only be locked with ALPINAL UNIVERSAL VI locking with inserts (Novo-Sit)*

DN100 to 300*: must only be locked with ALPINAL UNIVERSAL Ve locking with inserts (Tisk-K)*

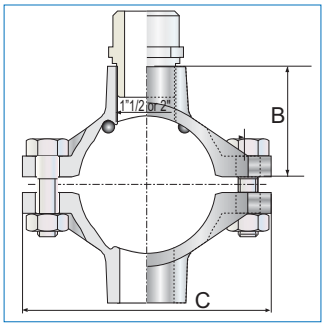
For more information, please contact us.

DEDICATED APPLICATIONS

ALPINAL tapping collar

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



DN mm	B mm	C mm	PFA bar	Weight kg	Reference	
					1"1/2	2"
80	90	415	100	5.4	ANA80AFBDD	ANA80AFLDD
100	100	430	100	6.0	ANB10AFBDD	ANB10AFLDD
125	113	460	100	6.6	ANB12AFBDD	ANB12AFLDD
150	126	480	100	7.2	ANB15AFBDD	ANB15AFLDD
200	152	500	100	8.8	ANB20AFBDD	ANB20AFLDD

NOTE: The tapping collar is delivered with its 1.5" or 2" nipple

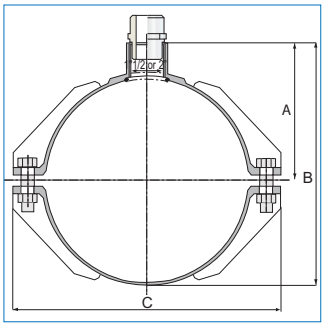
Materials and coatings		
Designation	**Materials**	**Coatings**
Body	Ductile iron 400/5	Bituminous coating
Bolts	Steel class 8/8	Zinc plated
Joint	EPDM	-

DEDICATED APPLICATIONS

ALPINAL tapping collar

Field of use:

- Water supply and connection for snow systems
- Networks operating under very high pressures



DN mm	A mm	B mm	C mm	Weight kg	Reference	
					1"1/2	2"
250	189	326	362	7.0	ANB25AFBDD	ANB25AFLDD
300	215	378	434	9.0	ANB30AFBDD	ANB30AFLDD
400	267	481	537	11.0	ANB40AFBDD	ANB40AFLDD

NOTE: The tapping collar is delivered with its 1.5" or 2" nipple

Materials and coatings	
Designation	**Materials**
Body	Steel
Nuts and bolts	Stainless steel
Joint	EPDM

DEDICATED APPLICATIONS

Fire protection networks

FM range

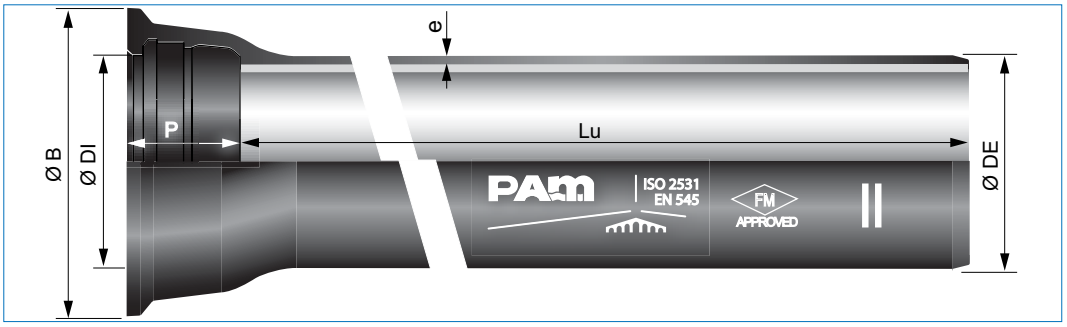
Pipes - Fittings - Joints - Accessories

DEDICATED APPLICATIONS

K9 pipe with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites

Main characteristics:
- External coating: metallic zinc (200 g/m²) + bituminous coating
- Internal lining: centrifuged cement mortar
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
100	6	K9	6	118	121.4	94.5	188	18.167	120528
125	6	K9	6	144	147.4	97.5	215	22.833	120529
150	6	K9	6	170	173.4	100.5	242	27.333	120530
200	6	K9	6.3	222	225.2	106.5	295	37.000	120531
250	6	K9	6.8	274	276.8	105.5	352	48.333	120532
300	6	K9	7.2	326	328.8	107.5	409.2	60.667	120533

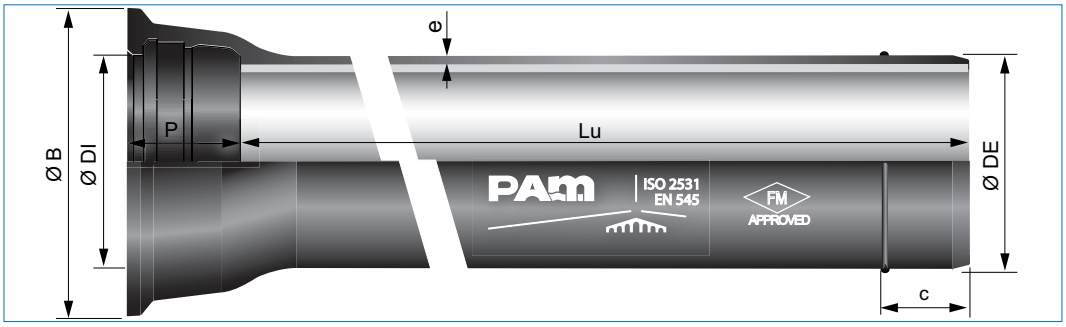
Junction:
- STANDARD joint

DEDICATED APPLICATIONS

Ve K9 pipe with Standard Ve joint "FM APPROVAL"

Field of use:
For industrial sites

Main characteristics:
- External coating: metallic zinc (200 g/m²) + bituminous coating
- Internal lining: centrifuged cement mortar
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



DN	Lu m	Class	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Bead position c mm	Weight Kg/m	Reference
100	6	K9	6	118	121.4	94.5	188	90	18.167	210247
125	6	K9	6	144	147.4	97.5	215	95	22.833	-
150	6	K9	6	170	173.4	100.5	242	95	27.333	210248
200	6	K9	6.3	222	225.2	106.5	295	100	37.000	210250
250	6	K9	6.8	274	276.8	105.5	352	110	48.333	208635
300	6	K9	7.2	326	328.8	107.5	409.2	115	60.667	-

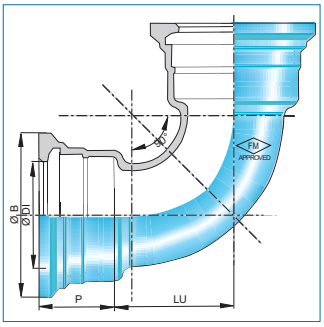
For more information, please contact us.

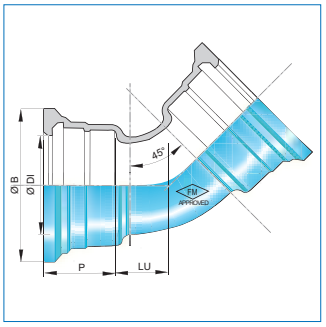
Junction:
- STANDARD Ve joint

DEDICATED APPLICATIONS

Fittings / STANDARD bend with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites





Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
	mm						
90°	200	200	100	225.5	294	29.2	SSB20CA00NNF
90°	250	252	105	277.3	351	49.6	SSB25CA00NNF
45°	200	100	100	225.5	294	23.7	SSB20CB00NNF
45°	250	136	105	277.3	351	40.5	SSB25CB00NNF

Weight: fitting alone - Reference: fitting

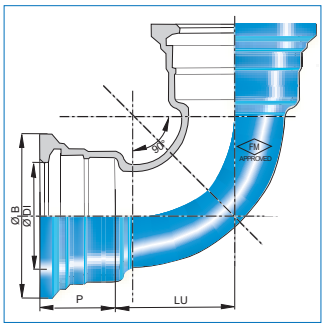
DEDICATED APPLICATIONS

Fittings / STANDARD bend with STANDARD joint "FM APPROVAL"

90° bend

Field of use:
For industrial sites

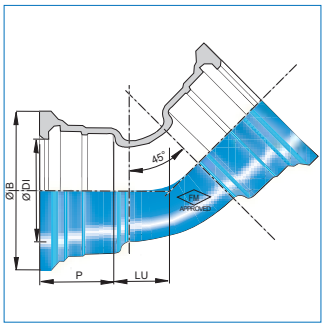
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
	mm						
90°	100	105	88	121.4	187.5	10	SSB10CA00TTF
90°	125	133.5	91	147.4	214.5	10	SSB12CA00TTF
90°	150	152.5	94	173.4	241	18.1	SSB15CA00TTF
90°	200	200	100	225.5	294	29.2	SSB20CA00TTF
90°	250	252	105	277.3	351	49.6	SSB25CA00TTF
90°	300	304	110	329.3	408.3	72.7	SSB30CA00TTF

Weight: fitting alone - Reference: fitting

45° bend



Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
	mm						
45°	100	65	88	121.4	187.5	8.9	SSB10CB00TTF
45°	150	92.5	94	173.4	241	15.6	SSB15CB00TTF
45°	200	100	100	225.5	294	23.7	SSB20CB00TTF
45°	250	136	105	277.3	351	40.5	SSB25CB00TTF
45°	300	167.5	110	329.3	408.3	59	SSB30CB00TTF

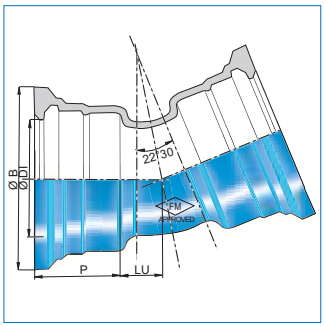
Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / STANDARD bend with STANDARD joint "FM APPROVAL"

22°30 bend

Field of use:
For industrial sites

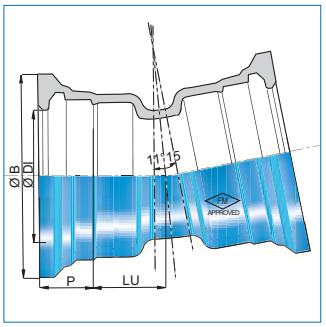


Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
	mm						
22°30	100	35	88	121.4	187.5	7.8	SSB10CD00TTF
22°30	150	42	94	173.4	241	12.2	SSB15CD00TTF
22°30	200	51	100	225.5	294	18.9	SSB20CD00TTF
22°30	250	70	105	277.3	351	32.2	SSB25CD00TTF
22°30	300	70	110	329.3	408.3	42.2	SSB30CD00TTF

Weight: fitting alone - Reference: fitting

11°15 bend

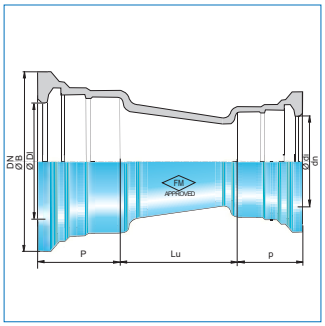


Angle Degree	DN	Lu	P	DI	B	Weight kg	Reference
	mm						
11.15°	100	40	88	121.4	187.5	7.9	SSB10CE00TTF
11.15°	150	46	94	173.4	241	12.6	SSB15CE00TTF
11.15°	200	52	100	225.5	294	19.2	SSB20CE00TTF
11.15°	250	55	105	277.3	351	30.5	SSB25CE00TTF
11.15°	300	50	110	329.3	408.3	39.7	SSB30CE00TTF

Weight: fitting alone - Reference: fitting

Fittings / STANDARD taper with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites



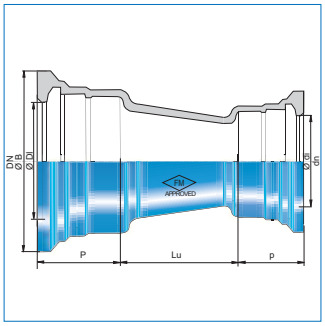
Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

DN	dn	Lu	P	DI	B	p	di	Weight	Reference
mm								kg	
200	150	125	100	225.5	294	94	173.4	16.7	SSB20VE0JNNF
300	150	321.5	110	329.3	408.3	94	173.4	36	SSB30VE0JNNF
300	200	222	110	329.3	408.3	100	225.5	36	SSB30VE0KNNF

Weight: fitting alone - Reference: fitting

Fittings / STANDARD taper with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

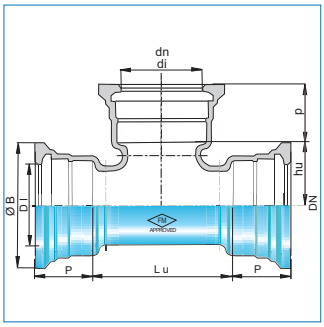
DN	dn	Lu	P	DI	B	p	di	Weight	Reference
mm								kg	
150	100	130	94	173.4	241	88	121.4	11.1	SSB15VE0FTTF
200	100	230	100	225.5	294	88	121.4	17.3	SSB20VE0FTTF
250	150	225	105	277.3	351	94	173.4	26	SSB25VE0JTTF
250	200	125	105	277.3	351	100	225.5	25.3	SSB25VE0KTTF
300	150	321.5	110	329.3	408.3	94	173.4	36	SSB30VE0JTTF
300	200	222	110	329.3	408.3	100	225.5	36	SSB30VE0KTTF
300	250	123	110	329.3	408.3	105	277.3	36	SSB30VE0LTTF

Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / STANDARD all socket tee with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites



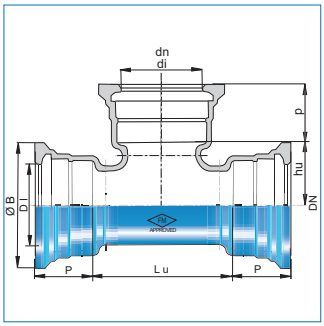
Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

DN	dn	Lu	P	DI	B	hu	p	di	Weight	Reference
				mm					kg	
200	200	360	100	225.5	294	180	100	225.5	40.7	SSB20TE0KNNF
300	150	347	110	329.3	408.3	194.5	94	173.4	64	SSB30TE0JNNF
300	250	467	110	329.3	408.3	207	105	277.3	83.4	SSB30TE0LNNF

Weight: fitting alone - Reference: fitting

Fittings / STANDARD all socket tee with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

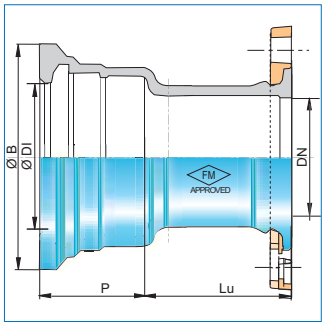
DN	dn	Lu	P	DI	B	hu	p	di	Weight	Reference
				mm					kg	
100	100	210	88	121.4	187.5	105	88	121.4	14.9	SSB10TE0FTTF
150	100	190	94	173.4	241	140	88	121.4	19.8	SSB15TE0FTTF
150	150	305	94	173.4	241	152.5	94	173.4	27	SSB15TE0JTTF
200	100	195	100	225.5	294	170	88	121.4	27.5	SSB20TE0FTTF
200	150	250	100	225.5	294	177.5	94	173.4	32.3	SSB20TE0JTTF
200	200	360	100	225.5	294	180	100	225.5	40.7	SSB20TE0KTTF
250	100	234	105	277.3	351	183	88	121.4	41.3	SSB25TE0FTTF
250	150	251	105	277.3	351	164.5	94	173.4	44.6	SSB25TE0JTTF
250	200	344	105	277.3	351	168	100	225.5	53	SSB25TE0KTTF
250	250	404	105	277.3	351	202	105	277.3	63.6	SSB25TE0LTTF
300	100	237	110	329.3	408.3	213	88	121.4	56	SSB30TE0FTTF
300	150	347	110	329.3	408.3	194.5	94	173.4	64	SSB30TE0JTTF
300	200	347	110	329.3	408.3	198	100	225.5	68.4	SSB30TE0KTTF
300	250	467	110	329.3	408.3	207	105	277.3	83.4	SSB30TE0LTTF
300	300	467	110	329.3	408.3	233.5	110	329.3	89.9	SSB30TE0MTTF

Weight: fitting alone - Reference: fitting

Fittings / STANDARD flanged socket with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites

Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



DN 100-200



DN 250-300

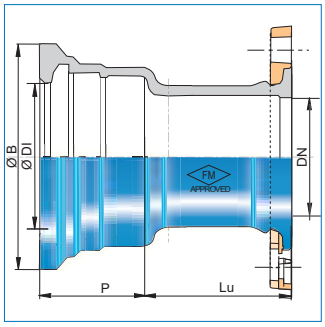
DN	Lu	P	ØDI	ØB	Weight (kg)	Reference
	mm				PN10	PN10
200	120	100	225.5	294	20.4	SSB20BE10NNF
250	135	105	277.3	351	31.3	SSB25BE10NNF
300	130	110	329.3	408.3	42	SSB30BE10NNF

Weight: fitting alone - Reference: fitting

Fittings / STANDARD flanged socket with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites

Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



DN 100-200



DN 250-300

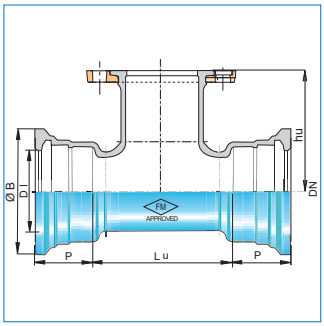
DN	Lu	P	ØDI	ØB	Weight (kg)		Reference	
	mm				PN10	PN16	PN10	PN16
100	110	88	121.4	187.5	-	8.7	-	SSB10BE20TTF
125	110	91	147.4	214.5	-	11	-	SSB12BE20TTF
150	115	94	173.4	241	13.8	-	SSB15BE10TTF	-
200	120	100	225.5	294	-	20.3	-	SSB20BE20TTF
250	135	105	277.3	351	31.3	30.9	SSB25BE10TTF	SSB25BE20TTF
300	130	110	329.3	408.3	-	41.3	-	SSB30BE20TTF

Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / STANDARD double socket tee with flanged branch with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites



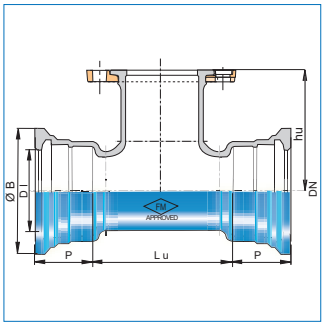
Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

DN	dn	Lu	hu	P	DI	B	Weight / kg	Reference
mm							PN10	PN10
300	200	347	320	110	329.3	408.3	75.7	SSB30UD1KNNF

Weight: fitting alone - Reference: fitting

Fittings / STANDARD double socket tee with flanged branch with STANDARD joint "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

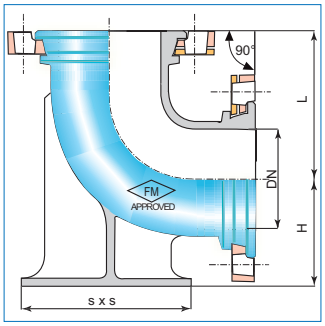
DN	dn	Lu	hu	P	DI	B	Weight / kg			Reference		
mm							PN10	PN16	PN25	PN10	PN16	PN25
150	150	305	220	94	173.4	241	29.5	29.5	-	SSB15UD1JTTF	SSB15UD1JTTF	-
200	80	170	240	100	225.5	294	27	27	27	SSB20UD1ETTF	SSB20UD1ETTF	SSB20UD1ETTF
200	100	195	245	100	225.5	294	29.1	29.1	29.6	SSB20UD1FTTF	SSB20UD1FTTF	SSB20UD3FTTF
200	125	220	240	100	225.5	294	31.6	31.6	-	SSB20UD1GTTF	-	-
200	150	250	245	100	225.5	294	34.9	34.9	29.6	SSB20UDIJTTF	SSB20UD1JTTF	SSB20UD3JTTF
200	200	360	260	100	225.5	294	-	44.6	-	-	SSB20UD2KTTF	-
250	100	234	270	105	277.3	351	43.4	43.4	-	SSB25UD1FTTF	SSB25UD1FTTF	-
250	150	251	280	105	277.3	351	49.5	49.5	-	SSB25UD1JTTF	SSB25UD1JTTF	-
250	200	344	290	105	277.3	351	-	60.2	-	-	SSB25UD2KTTF	-
250	250	404	300	105	277.3	351	-	69.1	-	-	SSB25UD2LTTF	-
300	100	237	300	110	329.3	408.3	58.1	58.1	-	SSB30UD1FTTF	SSB30UD1FTTF	-
300	150	347	310	110	329.3	408.3	71.2	71.2	-	SSB30UD1JTTF	SSB30UD1JTTF	-
300	200	347	320	110	329.3	408.3	75.7	75.7	-	SSB30UD1KTTF	SSB30UD2KTTF	-
300	250	467	305	110	329.3	408.3	89.4	75.7	-	SSB30UD1LTTF	SSB30UD2LTTF	-
300	300	467	340	110	329.3	408.3	-	97.2	-	-	SSB30UD2MTTF	-

Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / Duckfoot 90° bend with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



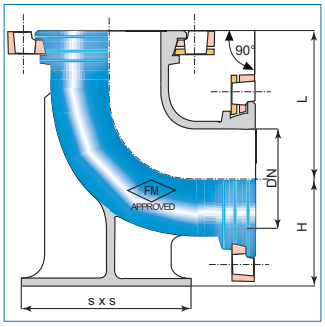
Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

Angle Degree	DN	Lu	H	Weight / kg			Reference		
	mm			PN10	PN16	PN25	PN10	PN16	PN25
90°	100	180	125	17.2	17.2	18.2	BAB10CF10NNF	BAB10CF10NNF	BAB10CF30NNF
90°	150	220	160	31.5	31.5	-	BAB15CF10NNF	BAB15CF10NNF	-

Weight: fitting alone - Reference: fitting

Fittings / Duckfoot 90° bend with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

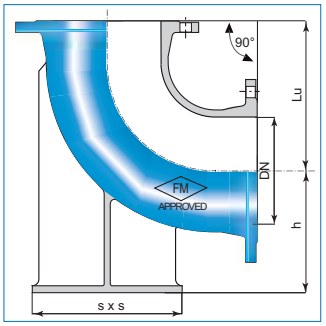
Angle Degree	DN	Lu	H	Weight / kg		Reference	
	mm			PN10	PN16	PN10	PN16
90°	100	180	125	17.2	17.2	BAB10CF10TTF	BAB10CF10TTF
90°	200	260	190	-	48	-	BAB20CF20TTF
90°	250	350	225	-	85	-	BAB25CF20TTF

Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / Duckfoot 90° bend with fixed flanges "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

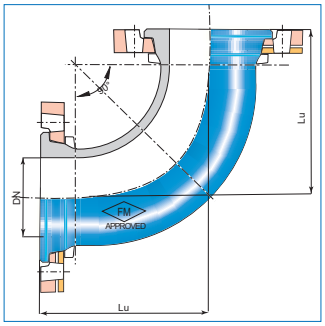
Angle Degree	DN	Lu	H	Weight / kg	Reference
	mm			PN16	PN16
90°	200	260	190	43.5	BBB20CF20TTF

Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / 90° bend with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



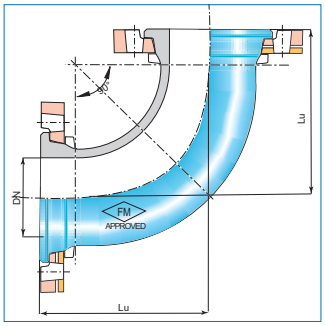
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

Angle Degree	DN	Lu	Weight / kg		Reference	
	mm		PN10	PN16	PN10	PN16
90°	150	220	23	23	BAB15CA10TTF	BAB15CA10TTF

Weight: fitting alone - Reference: fitting

Fittings / 90° bend with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

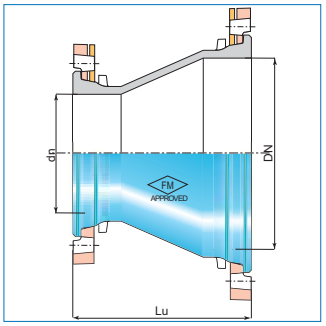
Angle Degree	DN	Lu	Weight / kg	Reference
	mm		PN16	PN16
90°	200	260	37.5	BAB20CA20NNF
90°	250	350	58	BAB25CA20NNF

Weight: fitting alone - Reference: fitting

DEDICATED APPLICATIONS

Fittings / Taper with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

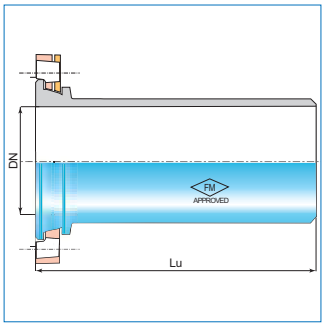
DN	dn	Lu	PSI (*)	Weight / kg		Reference	
	mm		bar	PN10	PN16	PN10	PN16
150	100	306	363 (25)	15.7	15.7	BAB15VE1FNNF	BAB15VE1FNNF
200	100	385	363 (25)	-	22.7	-	BAB20VE2FNNF
250	150	319	290 (20)	-	34.5	-	BAB25VE2JNNF
250	200	300	290 (20)	-	32.7	-	BAB25VE2KNNF
300	150	424	290 (20)	-	45.5	-	BAB30VE2JNNF
300	200	323	290 (20)	-	48	-	BAB30VE2KNNF
300	250	300	290 (20)	-	48	-	BAB30VE2LNNF

Weight: fitting alone - Reference: fitting
(*) PSI = "Working Pressure" in PSI (bar) depending on FM methodology

DEDICATED APPLICATIONS

Fittings / Flanged spigot with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

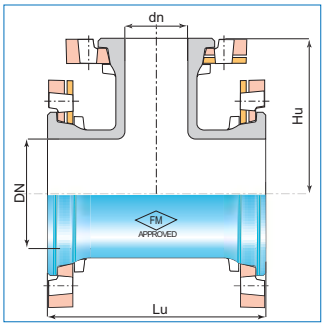
DN	Lu	Weight / kg			Reference		
mm		PN10	PN16	PN25	PN10	PN16	PN25
					(*) PSI 363 (25)		
100	350	-	8.56	6.5	-	NEB10BU10NNF	NEB10BU30NNF
125	350	-	10.8	-	-	NEB12BU20NNF	-
150	400	13.96	-	-	NEB15BU10NNF	-	-
200	400	-	20.5	22	-	NEB20BU20NNF	NEB30BU30NNF
250	400	-	33.5	-	-	NEB25BU20NNF	-
300	450	-	46.1	-	-	NEB30BU20NNF	-

Weight: fitting alone - Reference: fitting
(*) PSI = "Working Pressure" in PSI (bar) depending on FM methodology

DEDICATED APPLICATIONS

Fittings / All flanged tee with rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites



Main characteristics:

- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531

DN	dn	Lu	hu	PSI (*)	Weight / kg		Reference	
mm				bar	PN10	PN16	PN10	PN16
100	100	360	180	363 (25)	-	19	-	BAB10UE2FNNF
125	125	400	200	363 (25)	-	25.5	-	BAB12UE2GNNF
150	100	440	210	363 (25)	-	31	-	BAB15UE2FNNF
150	150	440	220	363 (25)	-	35	-	BAB15UE2JNNF
200	100	520	240	363 (25)	-	44.5	-	BAB20UE2FNNF
200	125	520	240	363 (25)	-	46	-	BAB20UE2GNNF
200	150	520	250	363 (25)	-	48	-	BAB20UE2JNNF
200	200	520	260	363 (25)	-	51	-	BAB20UE2KNNF
250	100	430	270	290 (20)	-	59.8	-	BAB25UE2FNNF
250	150	447	280	290 (20)	-	62	-	BAB25UE2JNNF
250	200	540	290	290 (20)	73.2	72.3	BAB25UE1KNNF	BAB25UE2KNNF
250	250	600	300	290 (20)	84	83	BAB25UE1LNNF	BAB25UE2LNNF
300	150	560	310	290 (20)	89	87	BAB30UE1JNNF	BAB30UE2JNNF
300	200	560	320	290 (20)	93	92	BAB30UE1KNNF	BAB30UE2KNNF
300	250	680	305	290 (20)	-	106	-	BAB30UE2LNNF
300	300	680	340	290 (20)	-	115	-	BAB30UE2MNNF

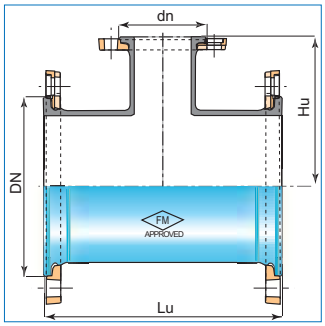
Weight: fitting alone - Reference: fitting
(*) PSI = "Working Pressure" in PSI (bar) depending on FM methodology

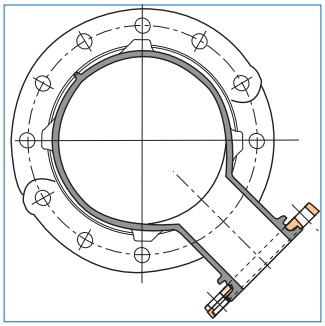
DEDICATED APPLICATIONS

Fittings / Washout tee with 3 rotatable flanges "FM APPROVAL"

Field of use:
For industrial sites

Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531





DN	dn	Lu	hu	Weight / kg	Reference
mm				PN16	PN16
					(*) PSI 290
300	100	450	300	67	BAB30UV2FNNF

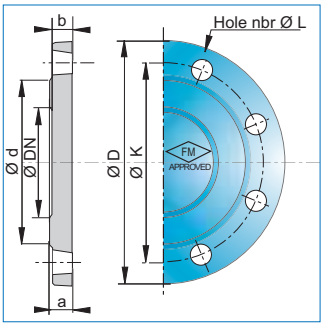
Weight: fitting alone - Reference: fitting
(*) PSI = "Working Pressure" in PSI (bar) depending on FM methodology

DEDICATED APPLICATIONS

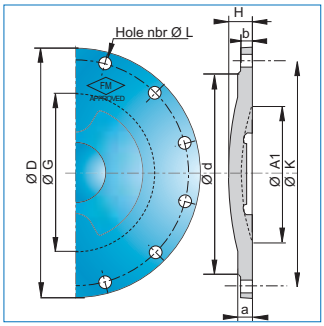
Fittings / Blank flange "FM APPROVAL"

Field of use:
For industrial sites

Main characteristics:
- Internal and external coating: blue cataphoresis
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



DN 100-250



DN 300

DN	Weight / kg		Reference	
mm	PN10	PN16	PN10	PN16
			(*) PSI 363 (25)	
100	4.3	4.3	BBB10QN10NNF	BBB10QN20NNF
125	-	5.6	-	BBB12QN20NNF
150	-	7.2	-	BBB15QN20NNF
200	11	13.8	BBB20QN10NNF	BBB20QN20NNF
250	-	16.9	-	BBB25QN20NNF
300	26.5	26.5	BBB30QN10NNF	BBB30QN20NNF

Weight: fitting alone - Reference: fitting
(*) PSI = "Working Pressure" in PSI (bar) depending on FM methodology

PFA 10

DN	Ø D	a	b	Ø d	Ø G	H	Hole nbr	Ø L	Ø K	A1
DN 100 to 150 see PFA 16 below										
200	340	20	17	266	-	-	8	23	295	-
250	400	22	19	319	-	-	12	23	350	-
300	455	24.5	20.5	370	290	40.5	12	23	400	246

PFA 16

DN	Ø D	a	b	Ø d	Ø G	H	Hole nbr	Ø L	Ø K	A1
100	220	19	16	156	-	-	8	19	180	-
125	250	19	16	184	-	-	8	19	210	-
150	285	19	16	211	-	-	8	23	240	-
200	340	20	17	266	-	-	12	23	295	-
250	400	22	19	319	-	-	12	28	355	-
300	455	24.5	20.5	370	290	40.5	12	28	410	246

PFA 25

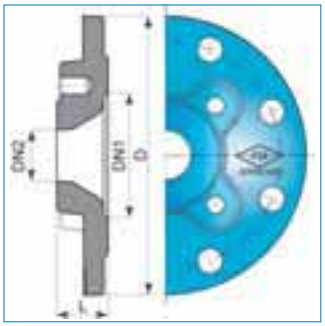
DN	Ø D	a	b	Ø d	Ø G	H	Hole nbr	Ø L	Ø K	A1
100	235	19	16	156	-	-	8	23	190	-
125	270	23.5	20.5	184	115	28.5	8	28	220	105
150	300	26	23	211	140	32	8	28	250	130
200	360	22	19	274	190	39	12	28	310	180
250	425	24.5	21.5	330	240	46.5	12	31	370	230
300	485	27.5	23.5	389	290	53.5	16	31	430	250

DEDICATED APPLICATIONS

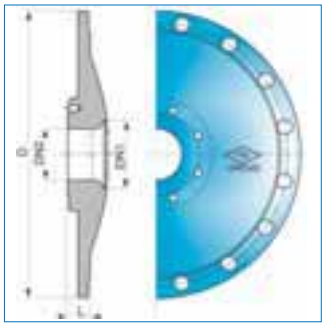
Fittings / Reducing plate "FM APPROVAL"

Field of use:
For industrial sites

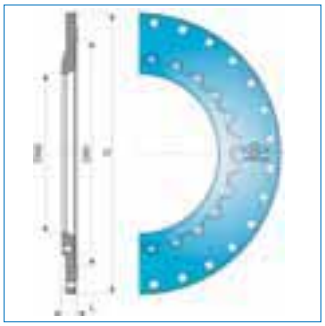
Main characteristics:
- Internal and external coating: blue epoxy in compliance with EN 14901
- FM (Factory Mutual System) approval
- EN 545
- ISO 2531



Shape 1



Shape 2


Shape 3

PN 16

DN1	DN2	D	Shape	L	Weight	Reference PSI 363 (*)
mm				mm	kg	
250	100	400	3	42	17.9	BBB25RN2FTTGF

(*) PSI = "Working Pressure" in PSI (bar) depending on FM methodology



DEDICATED APPLICATIONS

Recycled water

URBITAL range

Pipes - Fittings - Joints - Accessories

Ranges for recycled water



PAM products suitable for recycled water are:

- *Pipes – URBITAL range from DN 100 to 1000 dedicated specifically to recycled water*

The following ranges are also suitable for recycled water, especially for the fittings and accessories:

- *NATURAL from DN 60 to 600*
- *CLASSIC from DN 700 to 2000*
- *FLANGED from DN 40 to 2000*
- *BLUTOP in DN 90, 110 and 125*
- *KLIKSO from DN 63 to 225*

When the recycled water is heavily loaded, products from the INTEGRAL range must be used. (Please contact us)

Field of use

Transport and distribution of recycled water

Main characteristics

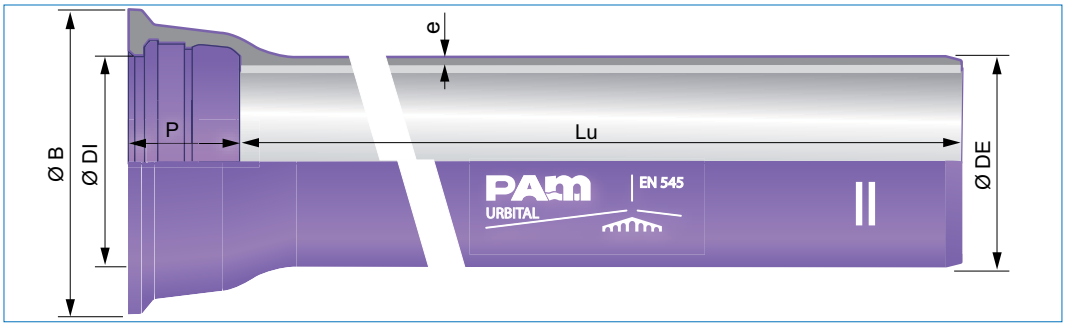
- External coating: metallic zinc (200 g /m²) + purple epoxy paint
- Internal lining: centrifuged cement mortar
- EN 545

DEDICATED APPLICATIONS

URBITAL pipe with STANDARD joint

Field of use:
Transport and distribution of recycled water

Main characteristics:
- External coating: metallic zinc (200 g/m²) + purple epoxy paint
- Internal lining: centrifuged cement mortar
- EN 545



DN	Lu m	Class*	e mm	ØDE mm	ØDI mm	P mm	ØB mm	Weight Kg/m	Reference
60	6	K9	6	77	80.3	89.5	144	11.700	SSA60N60AM
80	6	K9	6	98	101.4	92.5	167	12.500	SSA80N60AM
100	6	K9	6	118	121.4	94.5	188	18.600	SSB10N60AM
150	6	K9	6	144	173.4	100.5	242	27.400	SSB15N60AM
200	6	K9	6.3	222	225.2	106.5	295	37.600	SSB20N60AM
250	6	K9	6.8	274	276.8	105.5	352	49.333	SSB25N60AM
300	6	K9	7.2	326	328.8	107.5	409.2	62.400	SSB30N60AM
350	6	K9	7.7	378	380.9	110.5	464.2	79.200	SSB35N60AM
400	6	K9	8.1	429	431.9	112.5	516.2	94.000	SSB40N60AM
500	6	K9	9	532	535.0	117.5	629.2	128.200	SSB50N60AM
600	6	K9	9.9	635	638.1	132.5	738.5	169.667	SSB60N60AM
700	6.955	K9	10.8	738	741.7	192	863	217.900	SSB70N69AM
800	6.950	K9	11.7	842	845.8	197	974	267.000	SSB80N69AM
900	6.950	K9	12.6	945	948.9	200	1082	319.800	SSB90N69AM
1000	6.955	K8	12	1048	1052	203	1191	342.900	SSC10E69AM

** For C40 and C30 pipes, please consult us*


DN/OD 110

Connecting and repair pieces

Summary

Fields of use

PAM connecting and repair pieces (PMI range) are designed:
- To connect valves to pipes or tubes,
  - In network maintenance, to simplify the assembly of new products replacing old valves.
  - When installing valves on new networks in unstable grounds (proximity of other networks in urban areas) and fitting of valves in chambers and water treatment plants.
- To connect two pipes or two tubes together,
- To repair damaged pipes or tubes and thereby reduce water losses.
- To simplify assembly and disassembly of valves.
  - When installing flange-flange devices, to simplify their future removal for maintenance outside the trench or the valve chamber.

The networks are frequently composed of pipes made from different materials: grey cast iron, ductile iron, steel, asbestos cement, PVC, PE.
The PAM PMI range meets most connection and repair requirements, either with multi-material products or dedicated products.

Light, small and extremely easy to install, the PAM PMI pieces can be classified into several generic families:

RANGE	MATERIAL				
FLANGE ADAPTORS	**DUCTILE IRON**	**STEEL**	**PVC**	**ASBESTOS CEMENT**	**PE**
QUICK GS					
• simple	DN 60-300				
• anchored	DN 60-300				
• simple PN10	DN 350-1000				
• simple PN16	DN 350-1000				
• simple standard PN10	DN 1000-2000				
• simple standard PN16	DN 1000-2000				
• simple standard PN25	DN 50-2000				
ULTRAQUICK NG	DN 50-350				
QUICK PVC AND BLUTOP					
• simple	BLUTOP DE 90-125		DE 40-225		
• anchored	BLUTOP DE 90-125		DE 25 et 32		
			DE 40-225		
QUICK PE FUS					DN 50-200
COUPLINGS	**DUCTILE IRON**	**STEEL**	**PVC**	**ASBESTOS CEMENT**	**PE**
LINK GS					
• simple	DN 40-600				
• simple PFA 16 bars	DN 350-1000				
• simple standard PN25	DN 50-2000				
• FIXLINK anchored	DN 60-300				
ULTRALINK NG	DN 50-350				
FIXLINK PVC					
• anchored			DE 40-225		DE 40-225
					Reinforcement ring

Main features:

● Flange adaptor:

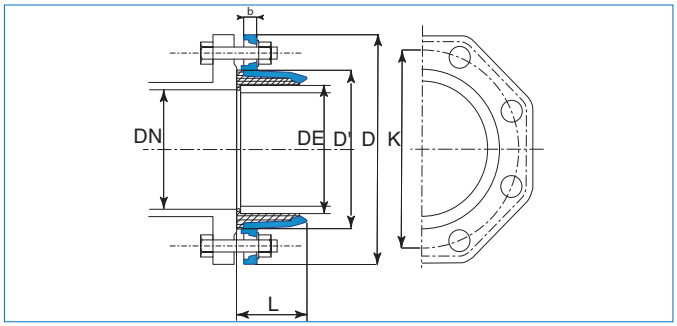
These are junction products installed between a flanged device and a pipe or tube spigot.
They are designed for connection onto pipes or tubes made from different materials.
They can also be dedicated to one material and in this case are proposed in anchored or non-anchored versions.
Anchored (self-restrained) products avoid the need for concrete thrust blocks.

● Couplings :

This is a connection product installed between two pipes spigots.
It is designed for connection onto pipes made from different materials or dedicated to one material.

QUICK GS non-anchored flange adaptor PFA 16 bar

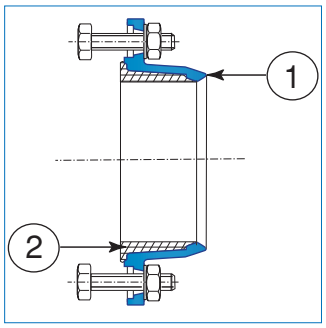




DN mm	Pipe external diameter DE / mm	L: Overall length / mm	D mm	D' mm	b mm	K mm		Weight kg	Reference
60-65	77	51	185	110	16	145		1.80	MAA60CACH
80	98	56	200	134.5	16	160		2.25	MAA80CACH
100	118	63	220	156	16	180		2.65	MAB10CACH
125	144	70	250	183	16	210		3.65	MAB12CACH
150	170	76	285	210	16	240		4.60	MAB15CACH
200*	222	90	340	265	17	295		7.15	MAB20CACH
250*	274	108	400	322	19	**PN10** 350	**PN16** 355	10.90	MAB25CACH
300*	326	117	455	373	20.5	**PN10** 400	**PN16** 410	13.80	MAB30CACH

** ISO PN10 and ISO PN16 multi-hole flange*

Nomenclature of materials and coatings

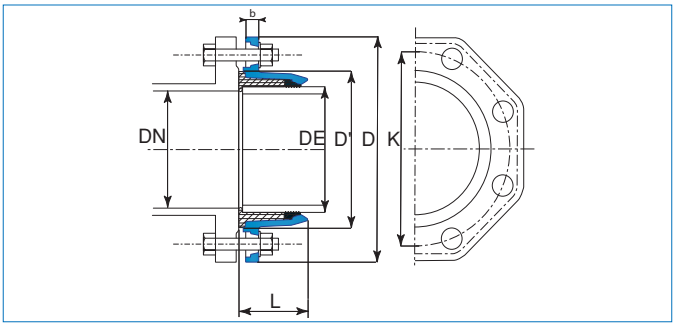


1 - Gland: Ductile iron coated with blue epoxy in compliance with EN 14901

2 - Joint ring: EPDM

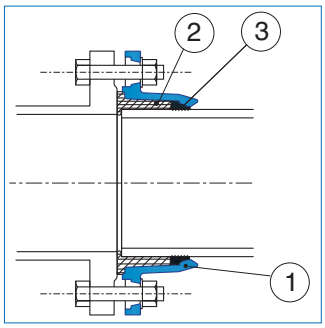
QUICK GS anchored flange adaptor PFA 16 bar





DN mm	Pipe external diameter DE / mm	L: Overall length / mm	D mm	D' mm	b mm	K mm	Weight kg	Reference
60-65	77	51	185	110	16	145	1.85	MAA60CBCH
80	98	56	200	134.5	16	160	2.30	MAA80CBCH
100	118	63	220	156	16	180	2.70	MAB10CBCH
125	144	70	250	183	16	210	3.70	MAB12CBCH
150	170	76	285	210	16	240	4.70	MAB15CBCH
200*	222	90	340	265	17	295	7.25	MAB20CBCH

** ISO PN 10 and ISO PN 16 multi-hole flange*



Nomenclature of materials and coatings

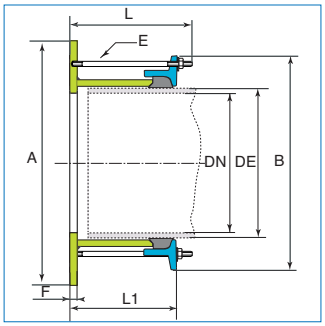
1 - Gland: Ductile iron coated with blue epoxy in compliance with EN 14901

2 - Joint ring: EPDM

3 - Inserts: Chromium-nickel type stainless steel

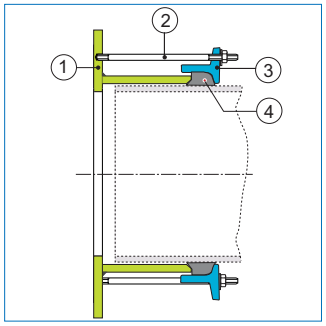
QUICK GS flange adaptor, large diameters PFA 10 bar





DN	DE Nominal	DE Tolerance	A	F	B	L	L1	E	Weight	Reference
350	378	+2.5 -5.5	505	18	469	148	108	8-x-M12x 140	24.2	MAB35WCBR
400	429	+2.5 -5.5	565	18	520	148	108	8-x-M12x 140	27.9	MAB40WCBR
450	480	+2.9 -4	615	23	572	153	113	10-x-M12x 140	35.7	MAB45WCBR
500	532	+3.5 -4.5	670	23	624	153	113	10-x-M12x 140	40.3	MAB50WCBR
600	635	+3 -5	780	23	727	153	113	10-x-M12x 140	49.2	MAB60WCBR
700	738	+3.5 -4.5	895	23	830	153	113	12-x-M12x 140	60.2	MAB70WCBR
800	842	+1 -7	1015	23	932	153	113	12-x-M12x 140	73.1	MAB80WCBR
900	945	+2 -6	1115	25	1054	169	134	14-x-M16x 160	105	MAB90WCBR
1000	1048	+1 -7	1230	25	1156	169	134	14-x-M16x 160	121	MAC10WCBR

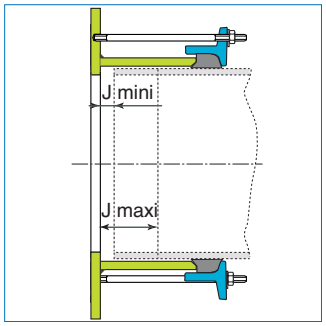
Dimensions in mm *Weight in Kg* *E= Nbr of tie bars and threads*

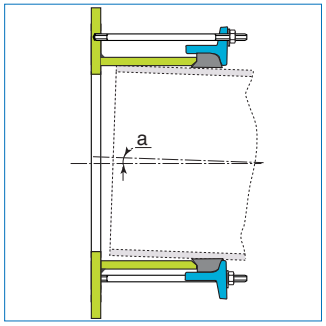


Construction characteristics

Materials and coatings

Item	Designation	Materials	Coatings
1	Flange	Steel E28 type	Black Rilsan 250 microns
2	Bolts	Steel 8.8 class	Sheraplex
3	Gland	Steel E28 type	Black Rilsan 250 microns
4	Sealing joint	EPDM	-





Installation

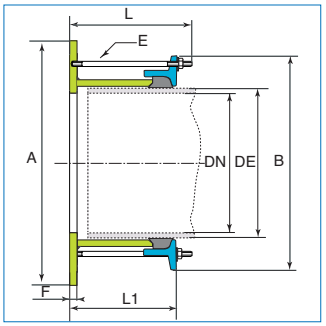
- Connection with all flanged parts fitted with standardized flanges according to ISO 7005-2, ISO 2531, EN 1092-2
- This product is fitted with metal reinforced joint gaskets.
- Screw tightening torque M12: 55 to 65 Nm and M16: 95 to 115 Nm

DN	J min	J max(*)	a = angular deflection
350	12	25	±1.5
400	12	25	±1.5
450	12	25	±1.5
500	12	25	±1.25
600	12	25	±1.25
700	12	25	±1
800	12	25	±0.75
900	16	40	±0.75
1000	16	40	±0.75

J max(*) *includes the max. angular deflection.*
Dimensions in mm. Angular deflection a in degrees.

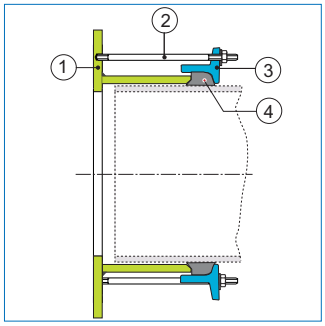
QUICK GS flange adaptor, large diameters PFA 16 bar





DN	DE Nominal	DE Tolerance	A	F	B	L	L1	E	Weight	Reference
350	378	+2.5 -5.5	520	18	469	148	108	8-x-M12x 140	25.4	MAB35WCAR
400	429	+2.5 -5.5	580	18	520	148	108	8-x-M12x 140	29.5	MAB40WCAR
450	480	+2.9 -4	640	23	572	153	113	10-x-M12x 140	39.6	MAB45WCAR
500	532	+3.5 -4.5	715	23	624	153	113	10-x-M12x 140	48	MAB50WCAR
600	635	+3 -5	840	23	727	153	113	10-x-M12x 140	61.7	MAB60WCAR
700	738	+3.5 -4.5	910	23	830	153	113	12-x-M12x 140	62.6	MAB70WCAR
800	842	+1 -7	1025	23	932	153	113	12-x-M12x 140	74.5	MAB80WCAR
900	945	+2 -6	1125	25	1054	169	134	14-x-M16x 160	107	MAB90WCAR
1000	1048	+1 -7	1255	25	1156	169	134	14-x-M16x 160	128	MAC10WCAR

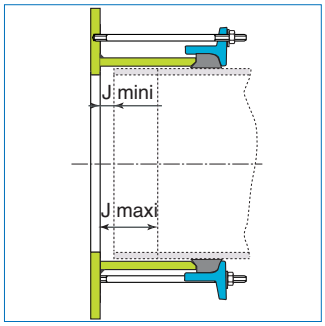
Dimensions in mm *Weight in Kg* *E= Nbr of tie bars and threads*

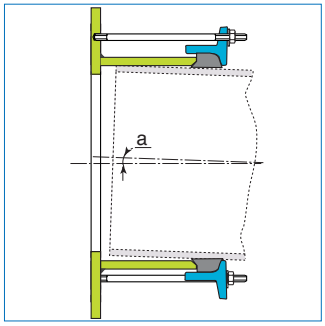


Construction characteristics

Materials and coatings

Item	Designation	Materials	Coatings
1	Flange	Steel E28 type	Black Rilsan 250 microns
2	Bolts	Steel 8.8 class	Sheraplex
3	Gland	Steel E28 type	Black Rilsan 250 microns
4	Sealing joint	EPDM	-





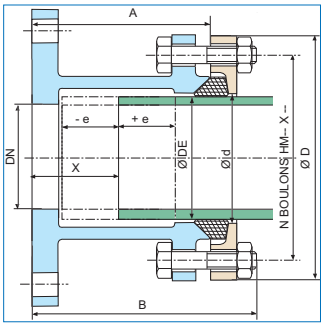
Installation

- Connection with all flanged parts fitted with standardized flanges according to ISO 7005-2, ISO 2531, EN 1092-2
- This product is fitted with metal reinforced joint gaskets.
- Screw tightening torque M12: 55 to 65 Nm and M16: 95 to 115 Nm

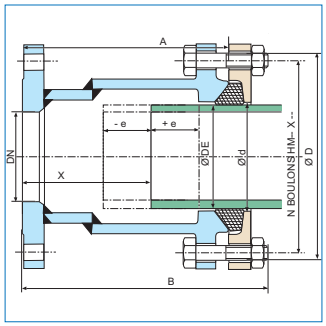
DN	J min	J max(*)	a = angular deflection
350	12	25	±1.5
400	12	25	±1.5
450	12	25	±1.5
500	12	25	±1.25
600	12	25	±1.25
700	12	25	±1
800	12	25	±0.75
900	16	40	±0.75
1000	16	40	±0.75

J max(*) *includes the max. angular deflection.*
Dimensions in mm. Angular deflection a in degrees.

QUICK GS flange adaptor, large diameters PFA 10 bar



DN 1000-1600

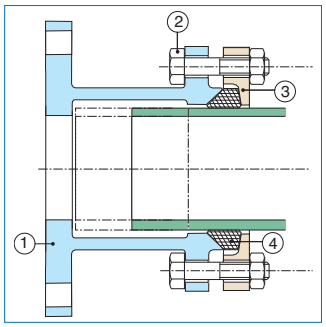


DN 1800-2000

Dimensions and weight

DN	DE	A	B	D	X	d	N Qty	Bolts	Weight	Reference
1000	1048 +2/-7	300	355	1195	95	1056	14	M20x90	236	160774
1100	1151 +2/-7	300	365	1300	95	1160	16	M20x100	274	163792
1200	1255 +3/-7.5	300	365	1410	95	1265	16	M24x100	345	163797
1400	1462 +3/-7.5	300	365	1640	190	1472	18	M24x100	440	171705
1500	1565 +2.5/-8	300	365	1740	105	1575	18	M24x100	484	163817
1600	1668 +2.5/-8	300	365	1830	105	1680	20	M24x100	572	163824
1800	1875 +2/-8.5	300	375	2075	170	1885	20	M27x120	750	160793
2000	2082 +1/-9.5	350	425	2290	185	2092	24	M27x120	1125	160796

Dimensions in mm *Weight in kg*



Construction characteristics

Materials and coatings

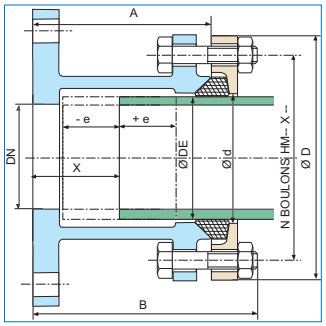
Item	Designation	Materials	Coatings
1	Fixed body	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901
2	Bolts, rings	Steel EN 10025 S235JRG2 or S335J2G3 Class 6/8	Zinc
3	Gland	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901
4	Joint	EPDM elastomer	-

Installation

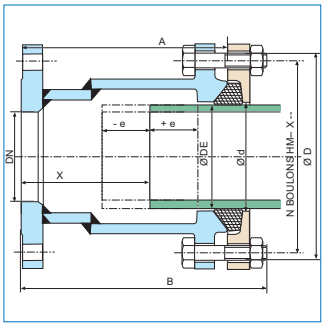
- Pipe installation tolerance, joint side:
  According to external diameter tolerance, see dimension table (tolerance for a non ovalised pipe)
  Check that the pipe to be installed in the quick is not ovalised by more than 3 mm and that the measurement of the external diameter with ovalisation does not exceed the tolerance given in the table.

  Otherwise, re-rounding is required (see recommended method on page 281)
- Adjustment range possible from installation dimension **X = ±e** (50 mm DN 300-2000)
- Angular deflection a in degrees +/-2 degrees (caution: after assembly)
- Connection with all flanged parts fitted with standardized flanges according to ISO 7005-2, ISO 2531, EN 1092-2
- This product is fitted with metal reinforced joint gaskets.

QUICK GS flange adaptor, large diameters PFA 16 bar



DN 1000-1600

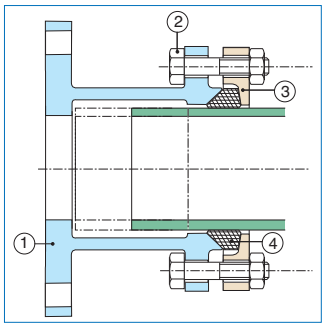


DN 1800-2000

Dimensions and weight

DN	DE	A	B	D	X	d	N Qty	Bolts	Weight	Reference
1000	1048 +2/-7	300	355	1195	105	1056	14	M20x90	280	160775
1100	1151 +2/-7	300	365	1300	105	1160	16	M20x100	330	176401
1200	1255 +3/-7.5	300	365	1425	130	1265	16	M24x100	420	163798
1400	1462 +3/-7.5	320	395	1650	175	1472	22	M24x120	502	163809
1500	1565 +2.5/-8	350	425	1770	175	1575	18	M27x120	784	171708
1600	1668 +2.5/-8	350	425	1845	170	1680	20	M27x120	662	173405
1800	1875 +2/-8.5	350	425	2075	185	1885	22	M27x120	865	160794
2000	2082 +1/-9.5	400	475	2290	190	2092	24	M27x120	1250	160797

Dimensions in mm *Weight in kg*



Construction characteristics

Materials and coatings

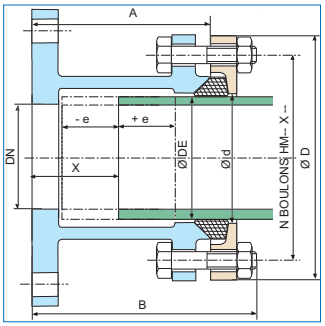
Item	Designation	Materials	Coatings
1	Fixed body	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901
2	Bolts, rings	Steel EN 10025 S235JRG2 or S335J2G3 Class 6/8	Zinc
3	Gland	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901
4	Joint	EPDM elastomer	-

Installation

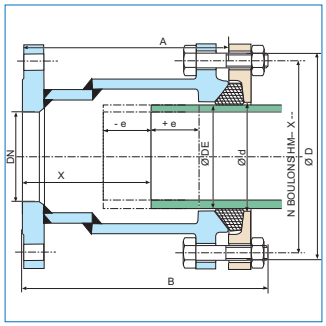
- Pipe installation tolerance, joint side:
  According to external diameter tolerance, see dimension table (tolerance for a non ovalised pipe)
  Check that the pipe to be installed in the quick is not ovalised by more than 3 mm and that the measurement of the external diameter with ovalisation does not exceed the tolerance given in the table.
  Otherwise, re-rounding is required (see recommended method on page 281)
- Adjustment range possible from installation dimension **X** = ±e (50 mm DN 300-2000)
- Angular deflection in degrees +/-2 degrees (caution: after assembly)
- Connection with all flanged parts fitted with standardised flanges according to ISO 7005-2, ISO 2531, EN 1092-2
- This product is fitted with metal reinforced joint gaskets.

CONNECTING AND REPAIR PIECES / FLANGE ADAPTORS

QUICK GS flange adaptor PFA 25 bar



DN 1000-1600



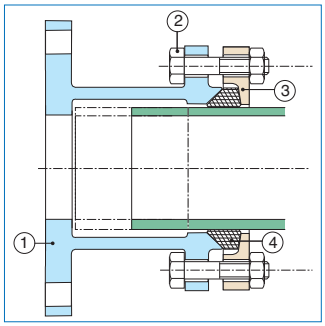
DN 1800-2000

Dimensions and weight

DN	DE	A	B	D	X	d	N Qty	Bolts	Weight	Reference
50	66 +1/-2	140	180	165	70	70	4	M16x60	8	177016
65	77 +1/-2	140	180	185	70	86	4	M16x60	11	177017
80	98 +1/-2	140	180	200	70	102	4	M16x70	13	177018
100	118 +1/-2.5	140	180	220	70	123	4	M16x70	16	176982
125	144 +1/-2.5	150	190	250	70	149	4	M16x70	20	177019
150	170 +1/-2.5	150	190	285	70	175	4	M16x70	25	176983
200	222 +1/-2.5	150	200	340	75	227	6	M16x80	34	176984
250	274 +2/-5	180	235	385	90	280	6	M16x80	52	177020
300	326 +2/-5	200	255	460	100	332	8	M20x90	64	177031
350	378 +2/-5	200	255	510	100	384	8	M20x90	86	163975
400	429 +2/-5	200	255	575	100	435	8	M20x90	100	163993
450	480 +2/-5	200	255	625	105	486	10	M20x90	112	177456
500	532 +2/-5	200	275	675	105	538	10	M20x110	132	164022
600	635 +3/-6	200	275	790	105	643	10	M24x110	181	164040
700	738 +3/-6	200	275	890	105	746	12	M24x110	220	164055
800	842 +2/-7	200	275	1010	105	850	12	M24x110	276	164067
900	945 +2/-7	230	300	1110	120	953	14	M24x110	330	164077
1000	1048 +2/-7	300	365	1215	110	1056	14	M24x110	400	163786
1100	1151 +2/-7	300	365	1310	110	1160	16	M24x110	595	160788
1200	1255 +3/-7.5	300	380	1445	115	1265	16	M27x120	698	177032
1400	1462 +3/-7.5	400	480	1680	130	1472	18	M27x120	937	160790
1500	1565 +2.5/-8	400	480	1750	135	1576	18	M27x120	1098	160791
1600	1668 +2.5/-8	400	480	1890	135	1680	20	M27x120	1173	160792
1800	1875 +2/-8.5	420	500	2115	145	1885	22	M30x130	1490	160795
2000	2082 +1/-9.5	420	500	2300	150	2092	24	M30x130	2166	160798

Dimensions in mm *Weight in kg*

QUICK GS flange adaptor PFA 25 bar



Construction characteristics

Materials and coatings

Item	Designation	Materials	Coatings
1	Fixed body	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901
2	Bolts, rings	Steel EN 10025 S235JRG2 or S335J2G3 Class 6/8	Zinc
3	Gland	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901
4	Joint	EPDM elastomer	-

Installation

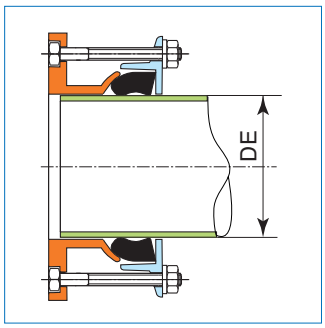
- Pipe installation tolerance, joint side:
  According to external diameter tolerance, see dimension table (tolerance for a non ovalised pipe)
  Check that the pipe to be installed in the quick is not ovalised by more than 3 mm and that the measurement of the external diameter with ovalisation does not exceed the tolerance given in the table
  Otherwise, re-rounding is required (see recommended method on page 281)
- Adjustment range possible from installation dimension **X = ±e** (40 mm DN 50-250; 50 mm DN 300-2000)
- Angular deflection in degrees +/-2 degrees (caution: after assembly)
- Connection with all flanged parts fitted with standardized flanges according to ISO 7005-2, ISO 2531, EN 1092-2
- This product is fitted with metal reinforced joint gaskets.

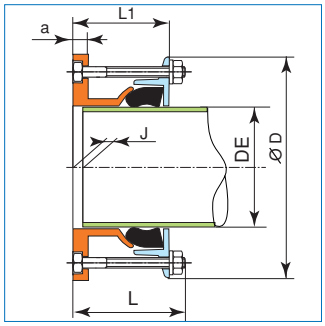
ULTRAQUICK very large tolerance flange adaptor PFA 16 bar



Construction characteristics

- The very large tolerance flange adaptors cover the entire range of pipe external diameters (OD) from 49 to 348 mm, with no discontinuity,
- Each model has an overlap on the OD: the maximum allowable OD of the product is greater than the minimum OD of the next product.
  ex : Max. OD **A** = 71 Min OD **B** = 62 Overlap = 9
  Max. OD **H** = 241 Min OD **I** = 235 Overlap = 6
- Angular deflection possible = 6 degrees (see drawing on next page)

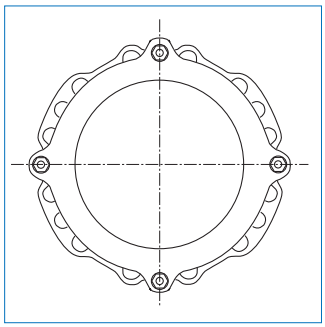


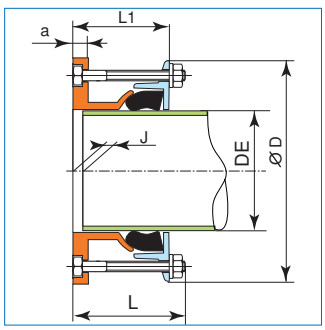


Choice of type

Type	DN flange	DN range		Reference
		Mini	Maxi	Flange PN 10 and PN 16
A	50.60	49	71	MAA50HACHA
B	50/60/65/80	62	84	MAA50HACHB
C	65/80	80	102	MAA65HACHC
D	100	97	127	MAB10HACHD
E	125 et 150	123	153	MAB12HACHE
F	150	151	181	MAB15HACHF
FP	200	170	200	MAB20HACHP
G	200	196	226	MAB20HACHG
H	200	211	241	MAB20HACHH
I	250	235	265	MAB25HACHY
J	250	260	290	MAB25HACHJ
JR	300	285	315	MAB30HACHR
K	300	306	336	MAB30HACHK
L	300	318	348	MAB30HACHL

Dimensions in mm



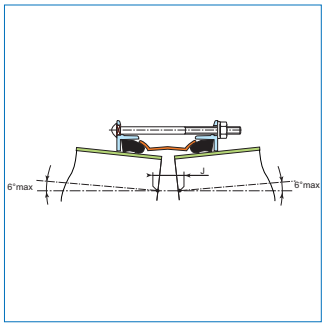


Dimensions and weight

Type	L	L1 Min - Max	a	D	J Min - Max (*)	Weight
A	142	82-106	17	178	4 – 32	3.3
B	142	82-106	17	196	4 – 32	4.1
C	142	83-107	18	209	5 – 31	4.3
D	142	84-115	17	242	7 – 30	6.0
E	142	87-118	17	280	8 – 29	7.9
F	142	87-119	17	297	9 – 27	8.5
FP	142	88-120	18	337	10 – 26	10.7
G	142	95-127	18	348	12 – 35	10.7
H	172	105-138	18	363	13 – 34	11.0
I	172	97-130	20	402	14 – 33	15.2
J	172	113-147	20	409	15 – 36	14.4
JR	173	101-135	22	459	16 – 35	20.2
K	173	106-141	22	459	18 – 40	19.4
L	173	117-152	22	469	18 - 48	18.9

Dimensions in mm *Weight in Kg* *(*)**J** see next page **Installation***

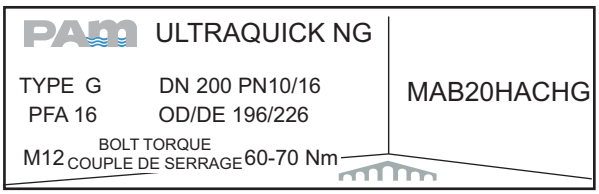
ULTRAQUICK very large tolerance flange adaptor PFA 16 bar



Materials and coatings

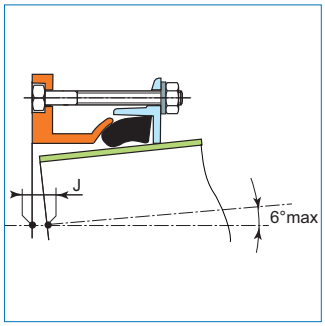
Item	Designation	Materials	Coatings
1	Body	Ductile iron	Blue epoxy in compliance with EN 14901
2	Gland	Ductile iron	Blue epoxy in compliance with EN 14901
3	Joint	EPDM	-
4	Tie bars	Steel class 6.8	Dacromet
5	Nuts	Steel class 6	Dacromet
6	Rings	Mild steel	Dacromet

Marking



Installation

- **The very large tolerance flange adaptors** cover the entire range of pipe external diameters (OD) from 49 to 348 mm, with no discontinuity. Each model has an overlap on the OD, i.e. the maximum allowable OD of the product is greater than the minimum OD of the next product:
  ex : Max. OD **A** = 71 Min. OD **B** = 62 Overlap = 9
  Max. OD **H** = 241 Min. OD **I** = 235 Overlap = 6, etc.



- Connection with all standardized flanged parts according to: ISO 7005-2 – ISO 2535 – EN 1092-2
- Angular deflection possible = 6 degrees.
- J measured along the axis.
- Max. angular deflection 6° with J max. for a 90° cut of the pipe
- Tightening of "diametrically opposed" tie rods to a torque between 60 and 70 Nm.
- No connection with a Wafer butterfly valve (highly insufficient metal/metal contact area)

ULTRAQUICK very large tolerance flange adaptor PFA 16 bar



Since the annular contact area "valve flange/UltraQuick flange" is very low, it is recommended to use an EPDM gasket with ears to ensure correct centering.

Gasket with centering ears

Type	Weight kg	Reference	
		PN10	PN16
A-B	0.020	MJA60UAXA	MJA60UAXA
C	0.030	MJA80UAXA	MJA80UAXA
D	0.040	MJB10UAXA	MJB10UAXA
E	0.060	MJB12UAXA	MJB12UAXA
F	0.090	MJB15UAXA	MJB15UAXA
FP-G-H	0.120	MJB20UAXA	MJB20UAXA
I-J	0.120	MJB25UAXA	162274
JR-K-L	0.090	MJB30UAXA	162275

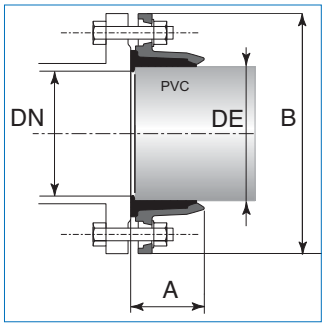
Using range depending on type of pipe

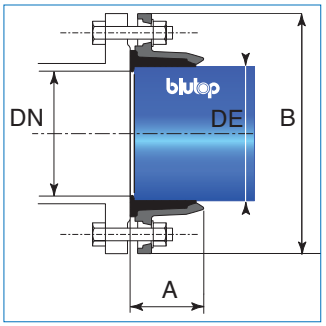
Type	ULTRA QUICK		Old grey iron						Ductile iron		Steel	PVC	Asbestos cement	
			Pipes (lead joint)		EXPRESS pipes		RAPID pipes							
	OD Mini	OD Maxi	DN	OD	DN	OD	DN	OD	DN	OD	OD	OD	DN/Class	OD
A	49	71	40	**56**	40	**57**	-	-	40	**56**	**51 - 54 - 57**	**50**	40 Cl25	**60**
			50	**66**	50	**67**			50	**66**	**60.3 - 63.5 - 70**	**63**	50 Cl10	**66**
B	62	84	50	**66**	50	**67**	60	**81.4**	50	**66**	**63.5 - 70 - 76.1**	**63**	50 Cl10. Cl25	**66. 74**
			60	**77**	60	**77**			60	**77**	**82.5**	**75**	60 Cl10-15. Cl25	**76. 80**
C	80	102	80	**98**	80	**98**	-	-	80	**98**	**88.9 - 101.6**	**90**	60 Cl30	**84**
													80 CL10-15. Cl25	**96. 100**
D	97	127	100	**118**	100	**118**	80	**102.2**	100	**118**	**101.6 - 108**	**110**	80 Cl25. Cl30	**100. 104**
							100	**123**			**114.3 - 127**	**125**	100 Cl10-15. Cl20-25	**118. 124**
E	123	153	125	**144**	125	**144**	125	**149**	125	**144**	**133 - 139.7**	**125**	100 Cl30	**130**
											141.3 - 127	**140**	125 Cl10. Cl20-25	**145. 149**
F	151	181	150	**170**	150	**170**	150	**175**	150	**170**	**159 - 168.3**	**160**	125 Cl30	**161**
											177.8		150 Cl10. Cl15. Cl20	**170. 174. 178**
FP	170	200	175	**196**	175	**196**	-	-	-	-	**177.8 - 193.7**	**200**	150 Cl15. Cl20	**174. 178**
													150 Cl25. Cl30	**184. 192**
G	196	226	200	**222**	200	**222**	175	**201**	200	**222**	**219.1**	**200**	175 Cl15. Cl20-25. Cl30	**199. 207. 225**
												225	200 Cl10	**220**
H	211	241	200	**222**	200	**222**	200	**227**	200	**222**	**219.1**	**225**	175 Cl30	**225**
													200Cl10. Cl15. Cl20-25	**220. 228. 238**
I	235	265	-	-	-	-	-	-	-	-	**244.5**	**250**	200 Cl20-25. Cl30	**238. 246**
J	260	290	250	**274**	250	**274**	250	**279**	250	**274**	**273**	-	250 Cl15	**280**
JR	285	315	-	-	-	-	-	-	-	-	-	**315**	250 Cl20-25. Cl30	**292. 306**
K	306	336	300	**326**	300	**326**	300	**331**	300	**326**	**323.9**	**315**	300 Cl10. Cl15	**324. 334**
L	318	348	300	**326**	300	**326**	300	**331**	300	**326**	**323.9**	-	300 Cl10. Cl15	**324. 334**

Dimensions in mm

QUICK PVC and BLUTOP non-anchored flange adaptor PFA 16 bar





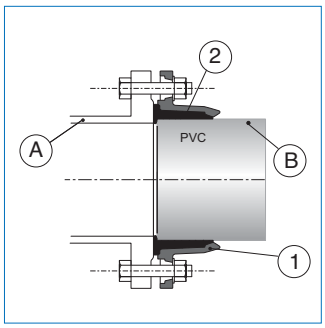


DN	DE	A	B	Weight	Reference
40	40	50	150	1.2	MAL40DACH
40-50	50	53	165	1.5	MAL50DACH
50	63	54	165	1.8	MAL60DACH
60-65	63	54	185	2.0	MAL65DACH
60-65	75	58	185	2.3	MAL75DACH
80	90	62	200	2.6	MAL90DACH
100	110	68	220	3.1	160754
125	125	73	250	4.1	160755
125	140	76	250	4.1	160756
150	160	82	285	5.2	160757
200	200	91	340	7.5	160758
200	225	93	340	7.1	160759

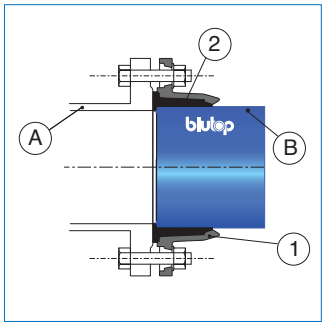
Dimensions in mm *Weight in Kg*

Note: BLUTOP range for DN90, 110 and 125

Nomenclature of materials and coatings



Item	Designation	Materials	Coatings
1	Gland	Ductile iron	Blue epoxy in compliance with EN 14901
2	Tightness gasket	EPDM	-
A	Valve	Ductile iron	-
B	Pipe	PVC or Ductile iron (BLUTOP)	-

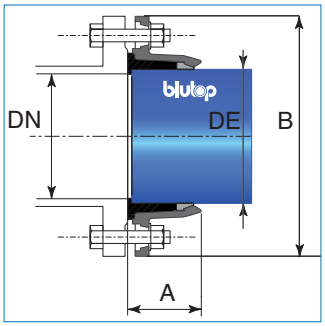


Marking



QUICK BLUTOP anchored flange adaptor PFA 16 bar

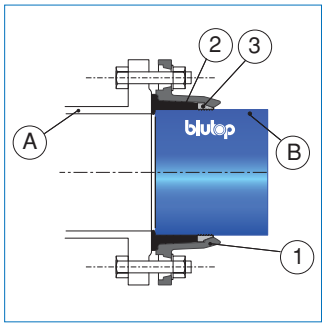




DN	DE	A	B	Weight	Reference
80	90	62	200	2.8	216901
100	110	68	220	3.4	216902
125	125	73	250	4.3	216906

Dimensions in mm *Weight in Kg*

Nomenclature of materials and coatings



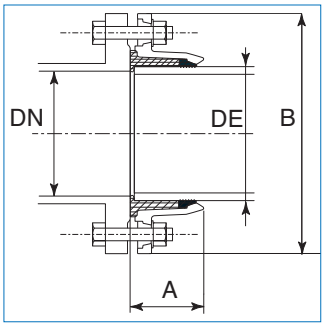
Item	Designation	Materials	Coatings
1	Gland	Ductile iron	Blue epoxy in compliance with EN 14901
2	Tightness gasket	EPDM	-
3	Anchoring ring	Nickel 100C6 or 16MnCr5	-
A	Valve	Ductile iron	-
B	Pipe	Ductile iron (BLUTOP)	-

Marking



QUICK PVC anchored flange adaptor PFA 16 bar

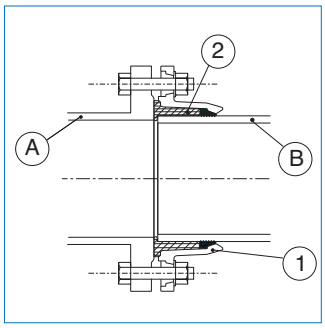




DN	DE	Field of use	A	B	Weight	Reference
40	40	PVC	50	150	1.3	MAL40DBCH
40-50	50		53	165	1.6	MAL50DBCH
50	63		54	165	1.9	MAL60DBCH
60-65	63		54	185	2.1	MAL65DBCH
60-65	75		58	185	2.4	MAL75DBCH
80	90		62	200	2.8	MAL90DBCH
100	110		68	220	3.4	MAM11DBCH
125	125		73	250	4.3	MAM12DBCH
125	140		76	250	4.3	MAM14DBCH
150	160		82	285	5.7	MAM16DBCH
200	200		91	340	8.2	MAM20DBCH
200	225		93	340	7.7	MAM22DBCH

Dimensions in mm *Weight in Kg*

Nomenclature of materials and coatings



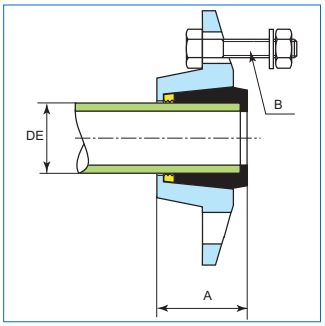
Item	Designation	Materials	Coatings
1	Gland	Ductile iron	Blue epoxy in compliance with EN 14901
2	Tightness gasket	EPDM	-
3	Anchoring ring	Brass Cu Zn 40 type	-
A	Valve	Ductile iron	-
B	Pipe	PVC	-

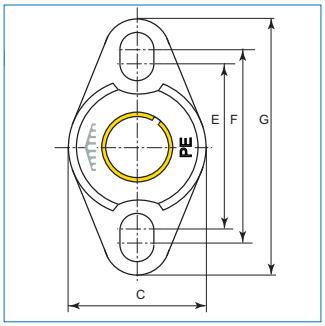
Marking



QUICK PVC - PE anchored OD 25 and 35







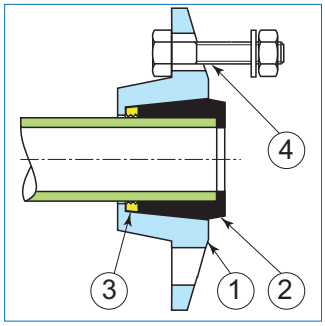
Dimensions and weight

DE	E min	DN flange	E max	DN flange	G
25	65	15	75	20	104
32	75	20	85	25	114

DE	d	A	B	C	Weight	Reference
25	19	37	2 bolts H M 12.50	55	0.4	MAL25DACH
32	25	41		62	0.5	MAL32DACH

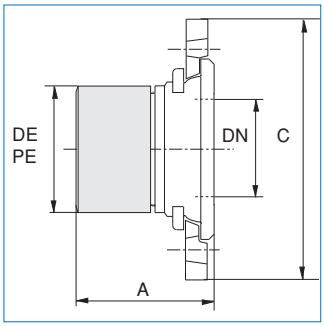
Dimensions in mm *Weight in Kg*

Nomenclature of materials and coatings



Item	Designation	Materials	Coatings
1	Flange	Ductile iron	Blue epoxy in compliance with EN 14901
2	EPDM	EPDM	-
3	Anchoring ring	Brass	-
4	Bolt with washer	Steel	Galvanized

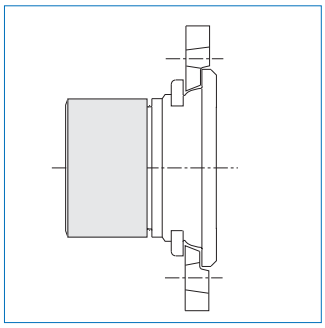
Flange adaptor for PE tubes



Type	DN	DE PE	A	C	Weight	Reference
50 x 63	50	63	157	165	3.4	MAL63FAAH
80 x 90	80	90	141	200	4.9	MAL90FAAH
100 x 110	100	110	141	220	6	MAM11FAAH
100 x 125	100	125	147	220	6.2	MAM12FAAH
150 x 160	150	160	170	285	11.8	MAM16FAAH
150 x 180	150	180	176	285	13.1	MAM18FAAH
200 x 225	200	225	192	340	20.8	MAM22FAAH

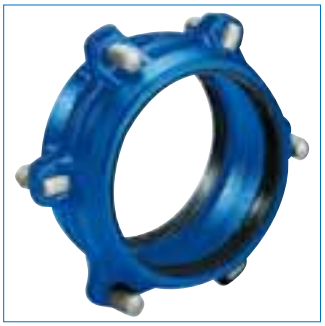
Dimensions in mm *Weight in Kg*

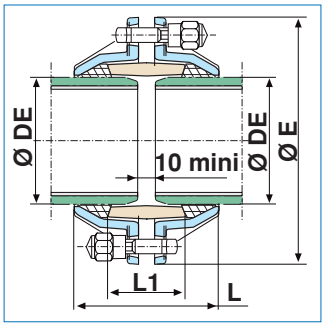
Nomenclature of materials and coatings



Item	Designation	Materials	Coatings
1	BU	Ductile iron	Blue epoxy in compliance with EN 14901
2		Duplicate moulding PE	-
3	Rotatable flange	Ductile iron	Blue epoxy in compliance with EN 14901

LINK GS coupling PFA 16 to 40

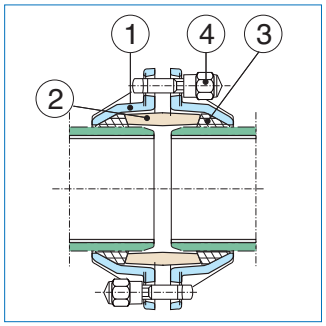




DN	PFA bar	DE		Approx. L	L1	E	Weight	Reference
		Min	Max					
40	40	55	58	126	60	168	3.26	160280
50		65	68	127	60	178	3.6	MCA50KAEH
60		76	79	127	60	191	4	MCA60KAEH
80		97	100	127	60	213	4.8	MCA80KAEH
100		117	120	133	65	233	6.18	MCB10KAEH
125	25	143	146	140	70	259	7.6	MCB12KADH
150		168	172	145	75	287	9.6	MCB15KADH
200		220	223	153	80	342	14	MCB20KADH
250		272	275	164	90	403	18.1	MCB25KADH
300		323	327	170	95	457	22.2	MCB30KADH
350	16	375	379	183	100	511	28.3	MCB35KAAH
400		426	430	185	100	564	33.4	MCB40KAAH
450		477	481	192	105	617	37.9	MCB45KAAH
500		529	533	193	105	671	45.6	MCB50KAAH
600		631	636	200	110	777	58.6	MCB60KAAH

Dimensions in mm *Weight in kg*

Materials and coatings



Item	Designation		Materials	Coatings
1	Ring and glands		Ductile iron	Blue epoxy in compliance with EN 14901
2	Ring		Ductile iron	Blue epoxy in compliance with EN 14901
3	Bolts	DN 40-400	Ductile iron	Dacromet 320 Grade B
	Bolts	DN 500-600	Steel class 6/8	Zinc
4	Gasket		EPDM elastomer	-

Installation

● **Angular deflection**

DN 40-150 **± 2.5°** DN 200-300 **± 2°** DN 350-600 **± 3°**

● **Tightening torque**

DN 40-200 **8 m/daN** DN 250-600 **12 m/daN**

LINK GS coupling PFA 16 to 40

Spare parts

Joint ring

DN	40	50	60	80	100	125	150	200
Reference	JGA40BA	JGA50BA	JGA60BA	JGA80BA	JGB10BA	JGB12BA	JGB15BA	JGB20BA

DN	250	300	350	400	450	500	600
Reference	JGB25BA	JGB30BA	JGB35BA	JGB40BA	JGB45BA	JGB50BA	JGB60BA

Nuts and bolts

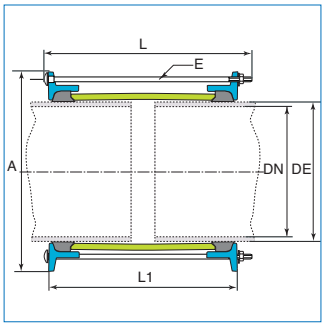
Screwed nuts with key of 24								
DN	40	50	60	80	100	125	150	200
Qty	2	2	2	2	4	4	4	64
Reference	**JXM18HD61** 1 bolt Ductile iron of 18x61x25							

Screwed nuts with key of 27				
DN	250	300	350	400
Qty	2	2	2	2
Reference	**JXM20HD70** 1 bolt Ductile iron of 20x71x33.5			

Screwed nuts with key of 30			
DN	450	500	600
Qty	2	2	2
Reference	**JXM20HD110** 1 bolt Stainless Dacromet HM 20 of 110x55		**JXM20HD120** 1 bolt Stainless Dacromet HM 20 of 120x60

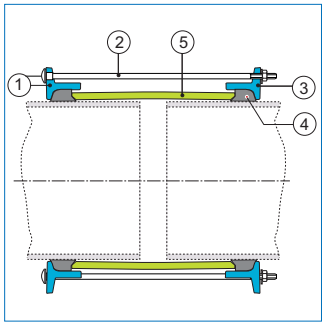
LINK GS coupling large diameters PFA 16





DN	DE Nominal	DE Tolerance	A	L	L1	E	Weight	Reference
350	378	+2.5 -5.5	469	243	184	8 x M12	21.2	MCB35WAAR
400	429	+2.5 -5.5	520	243	184	8 x M12	23.7	MCB40WAAR
450	480	+2.9 -4	571.5	243	184	10 x M12	26.2	MCB45WAAR
500	532	+3.5 -4.5	624	243	184	10 x M12	29.2	MCB50WAAR
600	635	+3 -5	726.5	243	184	10 x M12	34.2	MCB60WAAR
700	738	+3.5 -4.5	830	243	184	12 x M12	39.6	MCB70WAAR
800	842	+1 -7	931.5	243	184	12 x M12	45	MCB80WAAR
900	945	+2 -6	1054	276	222	14 x M16	88.3	MCB90WAAR
1000	1048	+1 -7	1156	276	222	14 x M16	96.8	MCC10WAAR

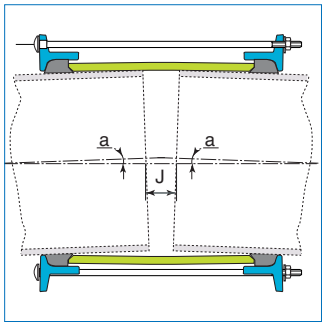
Dimensions in mm *Weight in kg* ***E**: Nbr of tie bars and threads*



Construction characteristics

Materials and coatings

Item	Designation	Materials	Coatings
1 and 3	Flange	Steel E28 type	Black Rilsan 250 microns
2	Bolts	Steel class 8.8	Sheraplex
4	Sealing ring	EPDM	-
5	Body	Steel E28 type	Black Rilsan 250 microns



Installation

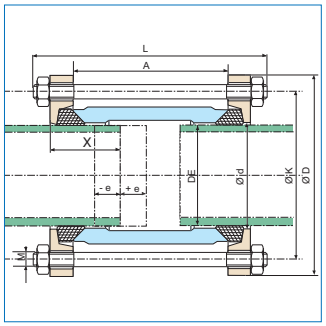
Screw tightening torque:
M12: 55 to 65 Nm and M16: 95 to 115 Nm

DN	J min	J max(*)	a = angular deflection
350	25	50	±1.5
400	25	50	±1.5
450	25	50	±1.5
500	25	50	±1.25
600	25	50	±1.25
700	25	50	±1
800	25	50	±0.75
900	38	76	±0.75
1000	38	76	±0.75

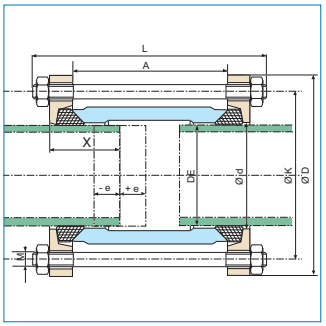
***J maxi(*)** includes the max. angular deflection (a) on the 2 pipes.*
Dimensions in mm. Angular deflection a in degrees.

CONNECTING AND REPAIR PIECES / COUPLINGS

LINK GS coupling PFA 25



DN 50-500



DN 600-2000

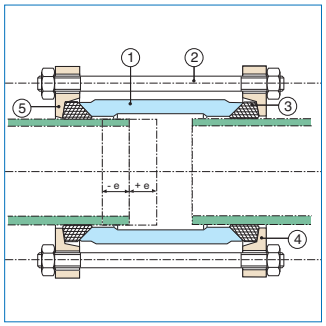
Dimensions and weight

DN	DE	A	D	X	d	e	Nbr	M	L	Weight	Reference
50	66 +1/-2	96	-	40	70	-	-	-	170	4.5	177078
60	77 +1/-2	96	-	40	86	-	-	-	170	6	177077
80	98 +1/-2	96	-	40	102	-	-	-	170	8	177076
100	118 +1/-2.5	96	-	40	123	-	-	-	170	10	177075
125	144 +1/-2.5	96	-	40	149	-	-	-	170	13	177074
150	170 +1/-2.5	96	-	40	175	-	-	-	170	15	177073
200	222 +1/-2.5	96	-	40	227	-	-	-	170	21	177072
250	274 +2/-5	116	-	50	280	-	-	-	200	25	177071
300	326 +2/-5	116	435	50	332	15	6	16	230	34	177070
350	378 +2/-5	134	485	50	384	20	8	16	230	42	163980
400	429 +2/-5	134	535	50	435	20	8	16	230	50	164000
450	480 +2/-5	134	590	50	486	20	8	16	230	55	177457
500	532 +2/-5	154	640	55	538	25	10	16	250	62	164027
600	635 +3/-6	174	765	60	643	25	12	20	290	104	164044
700	738 +3/-6	174	870	60	746	25	12	20	290	120	164058
800	842 +2/-7	204	975	70	850	35	16	20	320	144	160781
900	945 +2/-7	204	1075	70	953	35	16	20	320	160	164079
1000	1048 +2/-7	220	1180	70	1056	35	16	20	340	186	163790
1100	1151 +2/-7	220	-	70	1160	45	16	-	-	200	-
1200	1255 +3/-7.5	300	1410	100	1265	45	20	27	450	332	163804
1400	1462 +3/-7.5	300	1620	100	1472	50	24	27	460	390	163814
1500	1565 +2.5/-8	315	1715	100	1576	50	24	27	460	440	163823
1600	1668 +2.5/-8	315	1825	100	1680	50	28	27	460	450	163828
1800	1875 +2/-8.5	380	2050	120	1885	75	28	30	530	665	177079
2000	2082 +1/-9.5	380	2255	120	2092	75	28	30	530	740	177080

Dimensions in mm *Weight in kg*

LINK GS coupling PFA 25

Construction characteristics



Materials and coatings

Item	Designation	Materials	Coatings
1	Body	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901 RAL 5005
2	Tie bars, washers	Steel EN 10025 S235JRG2 or S335J2G3 Class 6/8	Zinc
3	Sealing ring	EPDM elastomer	-
4 and 5	Gland	Steel EN 10025 S235JRG2	Blue epoxy in compliance with EN 14901 RAL 5005

Installation

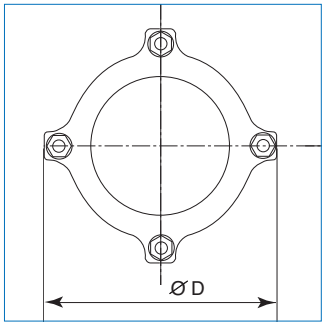
- Pipe installation tolerance: **according to dimension table** (tolerances for a non ovalised pipe)
  Check that the pipe to be installed in the Link is not ovalised by more than 3 mm and that the measurement of the external diameter with ovalisation does not exceed the tolerance given in the table
  Otherwise, re-rounding is required (see recommended method on page 281)
- Adjustment range possible from installation dimension **X = ±e (see dimension table)**
- Angular deflection a in degrees +/- degrees per outlet (total of +/- 4)

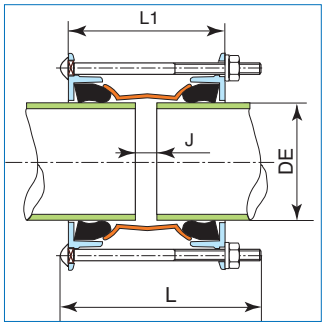
ULTRALINK very large tolerance coupling PFA 16 bar



Construction characteristics

- The very large tolerance sleeves cover the entire range of pipe external diameters (OD) from 49 to 348 mm, with no discontinuity.
  Each model has an overlap on the OD: the maximum allowable OD of the product is greater than the minimum OD of the next product:
  ex : Max. OD **A** = 71 Min. OD **B** = 62 Overlap = 9
  Max. OD **H** = 241 Min. OD **I** = 235 Overlap = 6. etc…
- Angular deflection possible = 2 x 6 degrees between the 2 pipes (see drawing on next page).

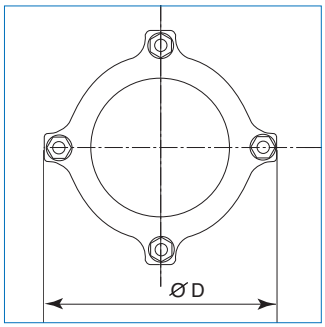


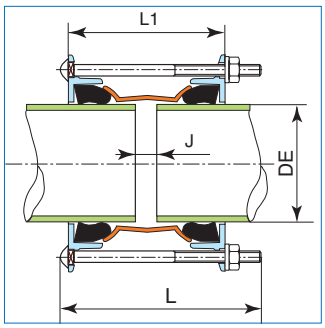


Choice of type

Type	DE range		Reference
	Mini. diameter	Maxi. diameter	
A	49	71	MCX65RAAHA
B	62	84	MCX75RAAHB
C	80	102	MCX90RAAHC
D	97	127	MCY11RAAHD
E	123	153	MCY14RAAHE
F	151	181	MCY16RAAHF
FP	170	200	MCY19RAAHP
G	196	226	MCY21RAAHG
H	211	241	MCY22RAAHH
I	235	265	MCY25RAAHY
J	260	290	MCY27RAAHJ
JR	285	315	MCY30RAAHR
K	306	336	MCY32RAAHK
L	318	348	MCY33RAAHL

Dimensions in mm



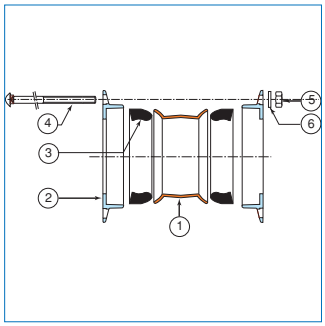


Dimensions and weight

Type	L	L1 Min - Max	D	J Min - Max (*)	Weight
A	182	104-152	176	4 – 20	3.6
B	182	104-152	190	4 – 20	4.1
C	182	107-155	208	5 – 20	4.9
D	232	127-188	240	7 – 25	7.7
E	232	135-197	267	8 – 25	8.9
F	232	144-207	295	9 – 29	10.4
FP	262	150-214	315	10 – 32	11.5
G	262	159-224	342	12 – 35	13.9
H	262	163-228	357	13 – 38	14.8
I	262	171-237	381	14 – 45	16.2
J	292	179-246	407	15 – 48	18.1
JR	292	187-255	434	16 – 55	21.3
K	292	194-263	455	18 – 58	22.9
L	292	198-267	467	18 - 62	23.7

Dimensions in mm *Weight in Kg* *(*)J see next page* ***Installation***

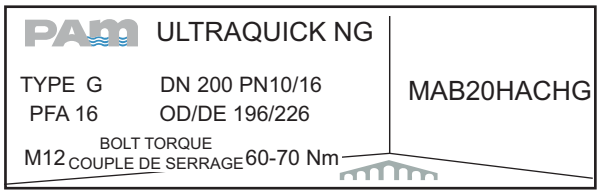
ULTRALINK very large tolerance coupling PFA 16 bar



Materials and coatings

Item	Designation	Materials	Coatings
1	Body	Ductile iron	Blue epoxy in compliance with EN 14901
2	Gland	Ductile iron	Blue epoxy in compliance with EN 14901
3	Sealing ring	EPDM	-
4	Tie bars	Steel class 6.8	Dacromet
5	Nut	Steel class 6	Dacromet
6	Washer	Mild Steel	Dacromet

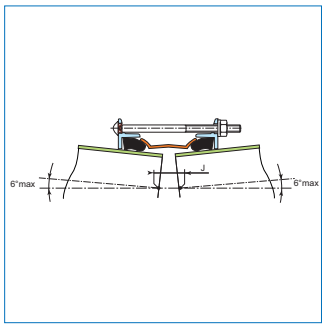
Marking



Installation

- **The very large tolerance couplings** cover the entire range of pipe external diameters (OD) from 49 to 348 mm, with no discontinuity.
  Each model has an overlap on the OD: the maximum allowable OD of the product is greater than the minimum OD of the next product:
  ex : Max. OD **A** = 71 Min. OD **B** = 62 Overlap = 9
  Max. OD **H** = 241 Min. OD **I** = 235 Overlap = 6. etc…

- Possibility of assembling two pipes made from different materials or with different diameters
- Angular deflection possible = 2 x 6 degrees = 12 degrees between the 2 pipes.
- J measured along the axis.
- Max. angular deflection 6° with J max. for a 90° cut of the pipe



- Tightening of "diametrically opposed" tie rods to a torque between 60 and 70 Nm.

CONNECTING AND REPAIR PIECES / COUPLINGS

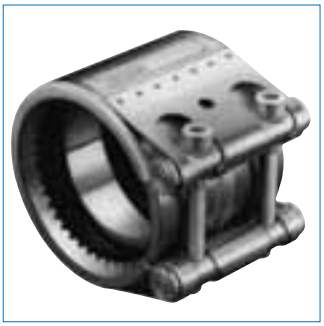
ULTRALINK very large tolerance coupling PFA 16 bar

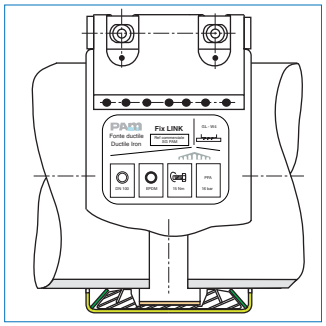
Using range depending on type of pipe

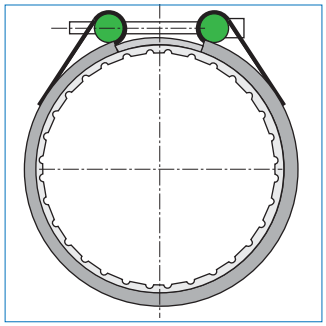
Type	ULTRA LINK		Old grey iron						Ductile iron		Steel	PVC	Asbestos cement	
			Pipes (lead joint)		EXPRESS pipes		RAPID pipes							
	OD Mini	OD Maxi	DN	OD	DN	OD	DN	OD	DN	OD	OD	OD	DN/Class	OD
A	49	71	40	**56**	40	**57**	-	-	40	**56**	**51 - 54 - 57**	**50**	40 Cl25	**60**
			50	**66**	50	**67**			50	**66**	**60.3 - 63.5 - 70**	**63**	50 Cl10	**66**
B	62	84	50	**66**	50	**67**	60	**81.4**	50	**66**	**63.5 - 70 - 76.1**	**63**	50 Cl10. Cl25	**66. 74**
			60	**77**	60	**77**			60	**77**	**82.5**	**75**	60 Cl10-15. Cl25	**76. 80**
C	80	102	80	**98**	80	**98**	-	-	80	**98**	**88.9 - 101.6**	**90**	60 Cl30	**84**
													80 CL10-15. Cl25	**96. 100**
D	97	127	100	**118**	100	**118**	80	**102.2**	100	**118**	**101.6 - 108**	**110**	80 Cl25. Cl30	**100. 104**
							100	**123**			**114.3 - 127**	**125**	100 Cl10-15. Cl20-25	**118. 124**
E	123	153	125	**144**	125	**144**	125	**149**	125	**144**	**133 - 139.7**	**125**	100 Cl30	**130**
											141.3 - 127	**140**	125 Cl10. Cl20-25	**145. 149**
F	151	181	150	**170**	150	**170**	150	**175**	150	**170**	**159 - 168.3**	**160**	125 Cl30	**161**
											177.8		150 Cl10. Cl15. Cl20	**170. 174. 178**
FP	170	200	175	**196**	175	**196**	-	-	-	-	**177.8 - 193.7**	**200**	150 Cl15. Cl20	**174. 178**
													150 Cl25. Cl30	**184. 192**
G	196	226	200	**222**	200	**222**	175	**201**	200	**222**	**219.1**	**200**	175 Cl15. Cl20-25. Cl30	**199. 207. 225**
												225	200 Cl10	**220**
H	211	241	200	**222**	200	**222**	200	**227**	200	**222**	**219.1**	**225**	175 Cl30	**225**
													200Cl10. Cl15. Cl20-25	**220. 228. 238**
I	235	265	-	-	-	-	-	-	-	-	**244.5**	**250**	200 Cl20-25. Cl30	**238. 246**
J	260	290	250	**274**	250	**274**	250	**279**	250	**274**	**273**	-	250 Cl15	**280**
JR	285	315	-	-	-	-	-	-	-	-	-	**315**	250 Cl20-25. Cl30	**292. 306**
K	306	336	300	**326**	300	**326**	300	**331**	300	**326**	**323.9**	**315**	300 Cl10. Cl15	**324. 334**
L	318	348	300	**326**	300	**326**	300	**331**	300	**326**	**323.9**	-	300 Cl10. Cl15	**324. 334**

Dimensions in mm

FIX LINK anchored coupling for ductile iron pipes in compliance with EN 545

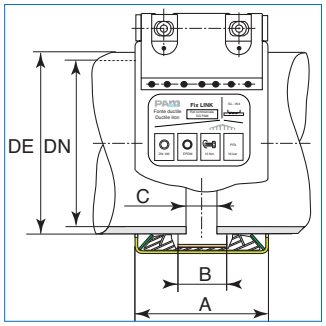


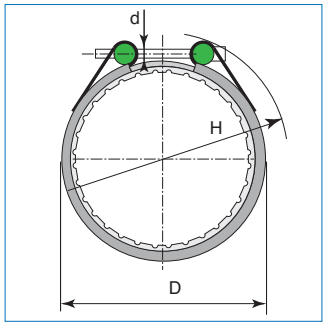




Choice of type

DN	PFA bar	Reference
60	16	MCA60NBAZ
80	16	MCA80NBAZ
100	16	MCB10NBAZ
125	16	MCB12NBAZ
150	16	MCB15NBAZ
200	16	MCB20NBAZ
250	16	MCB25NBAZ
300	10	MCB30NBAZ



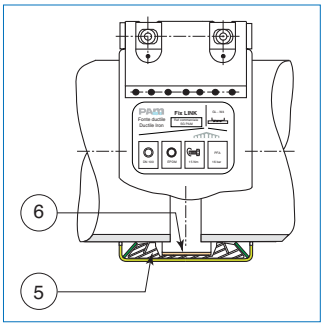


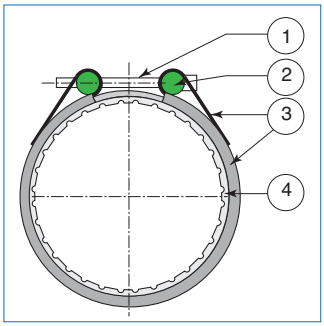
Dimensions and weight

DN	OD mini. OD maxi.	A	B	C (Maxi)	D	H	d Vis CHc	Tightening torque Nm	Weight
60	75.8-78	98	40	25	100	120	M 10	30	1.5
80	95.3-99	98	40	25	120	140	M 10	30	1.7
100	115.2-120	98	40	25	140	160	M 10	40	1.8
125	141.2-146	113	50	35	170	200	M 12	50	3.3
150	167.1-171.5	115	50	35	195	225	M 12	60	3.7
200	219-224.2	142	67	35	255	285	M 16	150	6
250	270.3-275.7	142	67	35	305	335	M 16	150	6.1
300	322.4-329.6	142	67	35	360	390	M 16	150	6.9

Allowable angular deflection: +/-2 %
The tightening torque for nuts and bolts is indicated on the product label

FIX LINK anchored coupling for ductile iron pipes in compliance with EN 545

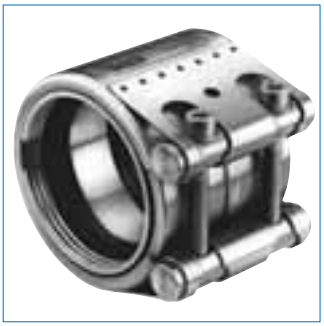


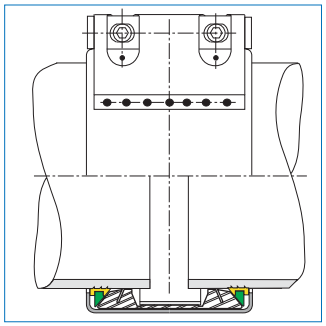


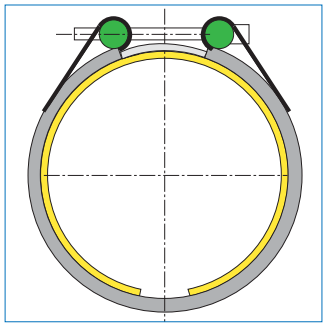
Materials and coatings

Item	Designation	Materials	Coatings
1	Screw	Stainless steel Z3CND18-12 type	-
2	Nut	Stainless steel Z3CND18-12 type	-
3	External tape	Stainless steel Z6CN18-09 type	-
4	Anchoring ring	Stainless steel Z11CN17-08 type	-
5	Tightening gasket	EPDM elastomer	-
6	Reinforcement ring	Stainless steel Z6CNDT17-12 type	-

FIX LINK anchored coupling for PVC or PE pipes

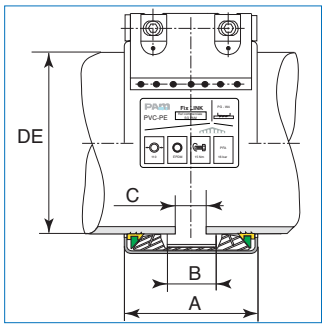


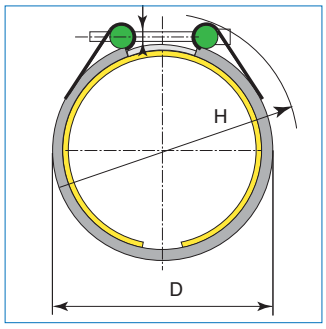




Choice of type

DN	PFA bar	Reference
40	16	MCL40PBAZ
50	16	MCL50PBAZ
63	16	MCL63PBAZ
75	16	MCL75PBAZ
90	16	MCL90PBAZ
110	16	MCM11PBAZ
125	16	MCM12PBAZ
140	16	MCM14PBAZ
160	16	MCM16PBAZ
180	16	MCM18PBAZ
200	16	MCM20PBAZ
225	16	MCM22PBAZ



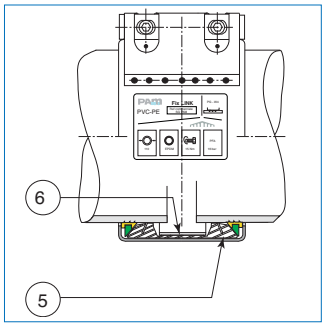


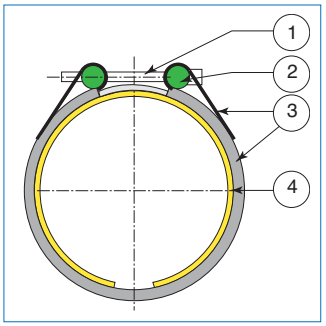
Dimensions and weights

DN	OD mini. OD maxi.	A	B	C (Maxi)	D	H	d Vis CHc	Tightening torque Nm	Weight
40	39.5-40.5	62	14	8	60	80	M8	15	15
50	49.5-50.5	62	14	8	70	90	M8	15	15
63	62.5-63.5	77	29	17	85	105	M8	20	20
75	74.5-75.5	98	40	25	95	115	M10	30	30
90	89 - 91	98	40	25	110	130	M10	30	30
110	109-111	98	40	25	130	150	M10	40	40
125	124-126	115	50	35	165	185	M12	40	40
140	139-141	115	50	35	180	200	M12	50	50
160	159-161.5	115	50	35	200	220	M12	60	60
180	178.5-182.5	142	67	35	210	240	M12	60	60
200	198.5-202	142	67	35	230	260	M12	60	60
225	223-227	142	67	35	255	285	M12	80	80

Allowable angular deflection: +/-2 %
The tightening torque for nuts and bolts is indicated on the product label

FIX LINK anchored coupling for PVC or PE pipes

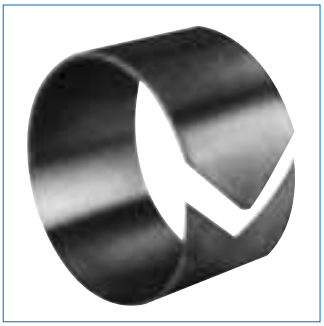




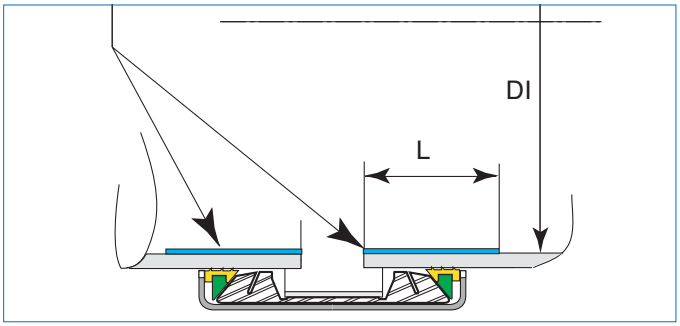
Materials and coatings

Item	Designation	Materials	Coatings
1	Screw	Stainless steel Z3CND18-12 type	-
2	Nut	Stainless steel Z3CND18-12 type	-
3	External tape	Stainless steel Z6CN18-09 type	-
4	Anchoring ring	Brass	-
5	Tightening gasket	EPDM elastomer	-
6	Reinforcement ring	Stainless steel Z6CNDT17-12 type	-

Reinforcement ring for FIX LINK coupling for PE pipe



Material:
Stainless steel type Z6CND 17-12



Fit a ring at each end of the PE pipe, as shown by the arrows

DE of PE tube	PE 80 PN 10 SDR 13.6			PE 80 PN 16 SDR 9			Weight
	Reference	DI	L	Reference	DI	L	
40	MBL40QEBZ	34	55	MBL40QFAZ	31	55	0.1
50	MBL50QEBZ	42.6	55	MBL50QFAZ	38.8	55	0.1
63	MBL63QEBZ	53.6	55	MBL63QFAZ	48.8	55	0.2
75	MBL75QEBZ	64	65	MBL75QFAZ	58.2	65	0.2
90	MBL90QEBZ	76.8	65	MBL90QFAZ	69.5	65	0.2
110	MBM11QEBZ	93.8	65	MBM11QFAZ	85.4	65	0.3
125	MBM12QEBZ	106.6	75	MBM12QFAZ	97	75	0.3
140	MBM14QEBZ	119.4	75	MBM14QFAZ	108.6	75	0.4
160	MBM16QEBZ	136.4	75	MBM16QFAZ	124.2	75	0.4
180	MBM18QEBZ	153.4	100	MBM18QFAZ	139.8	100	0.6
200	MBM20QEBZ	170.6	100	MBM20QFAZ	155.2	100	0.7
225	MBM22QEBZ	191.8	100	MBM22QFAZ	174.6	100	0.8

ID=PE tube internal diameter Dimensions in mm Weight in kg

DE of PE tube	PE 100 PN 10 SDR 17			PE 100 PN 16 SDR 11			Weight
	Reference	DI	L	Reference	DI	L	
40	MBL40QGBZ	35.2	55	MBL40QHAZ	32.6	55	0.1
50	MBL50QGBZ	44	55	MBL50QHAZ	40.8	55	0.1
63	MBL63QGBZ	55.4	55	MBL63QHAZ	51.4	55	0.2
75	MBL75QGBZ	66	65	MBL75QHAZ	61.4	65	0.2
90	MBL90QGBZ	79.5	65	MBL90QHAZ	73.6	65	0.2
110	MBM11QGBZ	96.8	65	MBM11QHAZ	90	65	0.3
125	MBM12QGBZ	110.2	75	MBM12QHAZ	102.2	75	0.3
140	MBM14QGBZ	123.4	75	MBM14QHAZ	114.6	75	0.4
160	MBM16QGBZ	141	75	MBM16QHAZ	130.8	75	0.4
180	MBM18QGBZ	158.6	100	MBM18QHAZ	147.2	100	0.6
200	MBM20QGBZ	176.2	100	MBM20QHAZ	163.6	100	0.7
225	MBM22QGBZ	198.2	100	MBM22QHAZ	184.6	100	0.8

ID=PE tube internal diameter Dimensions in mm Weight in kg

Repair collars

Stainless steel REPLINK for cast iron, steel, PVC pipes

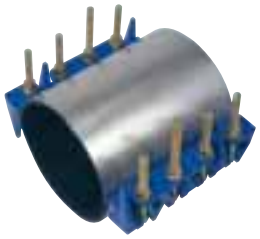
Repair collar with one clamp, length 80 mm

Repair collar with one clamp, lengths 200 mm and 300 mm



Repair collar with two clamps

Repair collar with three clamps



PFA 16 bar for cast iron, steel, PVC pipe

Repair collar with two or three parts



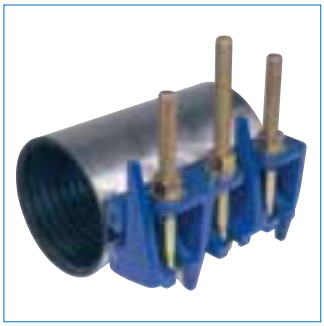
Repair collar with one clamp, length 80 mm



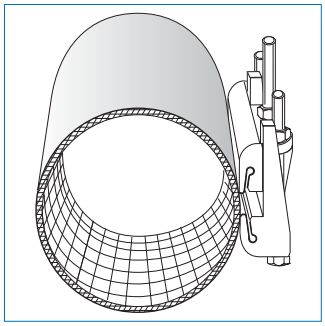
DE range	PFA bar	Reference	Weight
21-25	35	MRX21AAXHM	0.3
26-30	35	MRX26AAXHM	0.3
29-33	35	MRX29AAXHM	0.3
33-37	30	MRX33AAXHM	0.3
38-42	30	MRX38AAXHM	0.3
42-45	25	MRX42AAXHM	0.4
44-48	25	MRM44AAXXMN	0.3
48-51	25	MRX48AAXHM	0.4
50-54	22	MRM50AAXMN	0.3
55-60	22	MRM55AAXHM	0.3
60-64	20	MRX60AAXHM	0.4
65-69	20	MRM65AAXXMN	0.5
69-73	20	MRM69AAXXMN	0.5
71-76	18	MRX71AAXHM	0.5
76-82	18	MRM76AAXXMN	0.5
82-87	15	MRM82AAXXMN	0.5
87-93	15	MRX87AAXHM	0.6
94-100	15	MRM94AAXXMN	0.5
99-104	15	MRM99AAXXMN	0.5
105-111	13	MRN05AAXXMN	0.5
112-118	13	MRY11AAXHM	0.6
120-126	13	MRN20AAXXMN	0.6
126-131	10	MRN26AAXXMN	0.7
131-136	10	MRN31AAXXMN	0.7
139-145	10	MRN39AAXXMN	0.7
156-162	8	MRN56AAXXMN	0.7
167-173	8	MRN67AAXXMN	0.7
173-179	8	MRN73AAXXMN	0.8
217-223	8	MRP17AAXXMN	0.8
223-229	6	MRP23AAXXMN	0.9

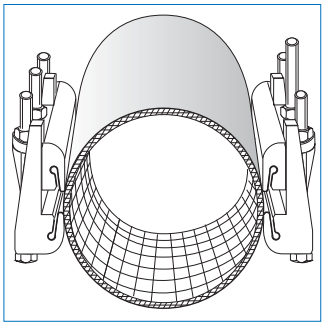
Weight in kg

Repair collar with one clamp, lengths 200 mm and 300 mm



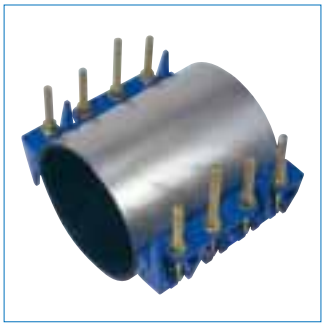
Length 200 mm 3 bolts					Length 300 mm 4 bolts				
Pipe DE range		PFA bar	Reference	Weight	Pipe DE range		PFA	Reference	Weight
Mini	Maxi				Mini	Maxi			
48	56	32	MRX50AAXHE	3.6	-	-	-	-	-
56	64	31	MRX60AAXHE	3.7	-	-	-	-	-
60	68	30	MRX65AAXHE	3.8	-	-	-	-	-
68	78	29	MRX70AAXHE	3.8	-	-	-	-	-
78	88	28	MRX80AAXHE	3.9	78	88	28	MRX80AAXHG	5.9
88	98	26	MRX90AAXHE	4.0	88	98	26	MRX90AAXHG	6.1
98	108	25	MRY10AAXHE	4.1	98	108	25	MRY10AAXHG	6.2
108	118	23	MRY11AAXHE	4.1	108	118	23	MRY11AAXHG	6.3
114	126	22.5	MRY12AAXHE	4.2	114	126	22.5	MRY12AAXHG	6.4
126	138	21.5	MRY13AAXHE	4.3	126	138	21.5	MRY13AAXHG	6.5
138	150	20	MRY14AAXHE	4.4	138	150	20	MRY14AAXHG	6.7
140	153	20	MRY15AAXHE	4.4	140	153	20	MRY15AAXHG	6.7
150	162	19	MRY16AAXHE	4.4	150	162	19	MRY16AAXHG	6.8
162	174	17	MRY17AAXHE	4.5	162	174	17	-	6.9
168	182	16.5	MRYA7AAXHE	4.6	168	182	16.5	MRYA7AAXHG	7.0
174	186	16	MRY18AAXHE	4.7	174	186	16	MRY18AAXHG	7.0
186	198	15	MRY19AAXHE	4.8	186	198	15	MRY19AAXHG	7.3
198	210	13.5	MRY20AAXHE	4.9	198	210	13.5	MRY20AAXHG	7.4
210	223	13	MRY22AAXHE	5.0	210	223	13	MRY22AAXHG	7.5
222	234	12	MRY23AAXHE	5.0	222	234	12	MRY23AAXHG	7.7
234	246	11	MRY24AAXHE	5.1	234	246	11	MRY24AAXHG	7.8
243	255	10.5	MRY25AAXHE	5.2	243	255	10.5	-	7.9
260	272	9.5	MRY27AAXHE	5.3	260	272	9.5	MRY27AAXHG	8.0
273	285	9	MRY28AAXHE	5.4	273	285	9	MRY28AAXHG	8.3
285	297	8.5	MRY29AAXHE	5.5	285	297	8.5	-	8.4
298	310	8	MRY30AAXHE	5.6	298	310	8	MRY30AAXHG	8.6





Designation	Materials	Coatings
Body	Stainless steel Z7 CN 18.09 type	-
Gasket	EPDM	-
Clamp	Ductile iron	Blue epoxy in compliance with EN 14901
Bolts	Steel class 6.S	Zinc

Repair collar with two clamps

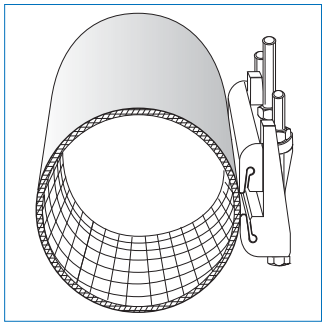


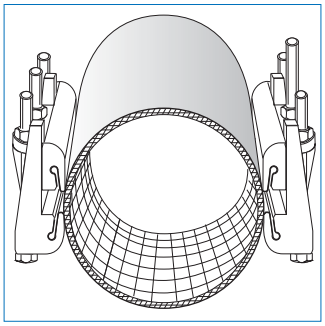
Construction characteristics

Dimensions and weight - Sleeve with 2 clamps

Length 200 mm 3 bolts					Length 300 mm 4 bolts		Length 500 mm 7 bolts	
Pipe DE range		PFA bar	Reference	Weight	Reference	Weight	Reference	Weight
Mini	Maxi							
88	110	26	MRY10BAXHE	7.2	-	-	-	-
114	137	22.5	MRY12BAXHE	7.4	MRY12BAXHG	11.5	-	-
138	160	20	MRY15BAXHE	7.6	MRY15BAXHG	11.7	-	-
160	182	17	MRY17BAXHE	7.7	MRY17BAXHG	11.8	-	-
182	202	15.5	MRY20BAXHE	8.0	MRY20BAXHG	12.2	MRY20BAXHH	20.8
202	224	13.5	MRY22BAXHE	8.1	MRY22BAXHG	12.3	-	21.0
217	240	12.5	MRY24BAXHE	8.2	MRY24BAXHG	12.4	170829	21.2
240	262	10.5	-	-	MRY25BAXHG	12.8	MRY25BAXHH	21.7
262	284	9.5	-	-	MRY28BAXHG	12.9	MRY28BAXHH	22.3
273	296	9	-	-	MRY29BAXHG	13.4	MRY29BAXHH	22.6
296	319	8	-	-	MRY30BAXHG	13.3	MRY30BAXHH	23.0
324	346	6.5	-	-	MRY33BAXHG	13.6	MRY33BAXHH	23.8
346	368	6	-	-	MRY35BAXHG	13.8	MRY35BAXHH	23.8
365	387	5.5	-	-	MRY37BAXHG	14.0	MRY37BAXHH	24.3
387	410	4.5	-	-	MRY40BAXHG	14.3	MRY40BAXHH	25.6
410	432	4	-	-	MRY42BAXHG	14.6	MRY42BAXHH	26.1
428	450	3.5	-	-	MRY44BAXHG	14.8	MRY44BAXHH	25.8
450	474	3	-	-	MRY46BAXHG	15.6	-	27.0
470	492	2.5	-	-	MRY48BAXHG	15.7	MRY48BAXHH	27.3
492	516	2.5	-	-	MRY50BAXHG	15.8	MRY50BAXHH	27.8

Nomenclature of materials and coating





Designation	Material	Coating
Body	Stainless steel Z7 CN 18.09 type	-
Gasket	EPDM	-
Clamp	Ductile iron	Blue epoxy in compliance with EN 14901
Bolts	Steel class 6.S	Zinc

Repair collar with three clamps

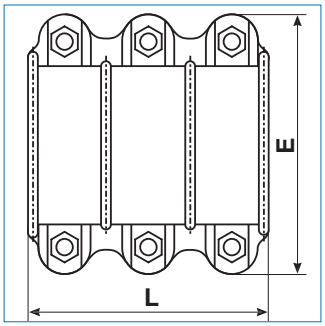


DE range	PFA bar	Length = 200 mm		Length = 300 mm		Length = 500 mm	
		Reference	Weight	Reference	Weight	Reference	Weight
300-330	7	MRY30CAXHEN	12.2	MRY30CAXHGN	18.2	MRY30CAXHHN	31.3
330-360	6	MRY33CAXHEN	12.2	MRY33CAXHGN	18.4	MRY33CAXHHN	31.8
360-390	5.5	MRY36CAXHEN	12.8	MRY36CAXHGN	18.7	MRY36CAXHHN	32.2
390-420	4	MRY39CAXHEN	12.8	MRY39CAXHGN	19.2	MRY39CAXHHN	33
420-450	3.5	MRY42CAXHEN	13.6	MRY42CAXHGN	19.5	MRY42CAXHHN	34.1
450-480	3	MRY45CAXHEN	13.7	MRY45CAXHGN	19.7	MRY45CAXHHN	34.2
480-510	2.5	MRY48CAXHEN	13.8	MRY48CAXHGN	19.9	MRY48CAXHHN	34.3
510-540	2	MRY51CAXHEN	13.8	164031	20	MRY51CAXHHN	35.8
540-570	2	MRY54CAXHEN	13.9	MRY54CAXHGN	20.8	MRY54CAXHHN	36.7
570-600	2	MRY57CAXHEN	14.3	MRY57CAXHGN	21.4	MRY57CAXHHN	36.9
600-630	2	MRY60CAXHEN	14.4	MRY60CAXHGN	21.6	MRY60CAXHHN	38.2
630-660	2	MRY63CAXHEN	14.4	MRY63CAXHGN	21.7	MRY63CAXHHN	38.4
660-690	2	MRY66CAXHEN	14.7	MRY66CAXHGN	22.4	MRY66CAXHHN	40.3
690-720	2	MRY69CAXHEN	15.4	MRY69CAXHGN	22.6	MRY69CAXHHN	40.5
720-75	1	MRY72CAXHEN	15.5	MRY72CAXHGN	23.2	-	-

Repair collar with two or three parts



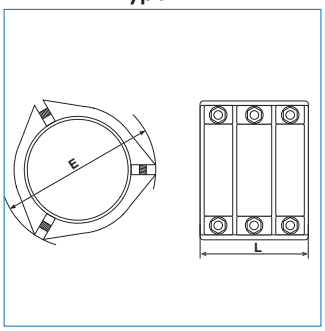
Type W2



Type W2



Type W3



Type W3

DE		L	E	Weight	Type	Reference
Mini	Maxi					
54	61	200	178	6	W2-A	MRA40SACA
60	68	200	184	5.9	W2-B	MRA50SACB
76	87	240	192	8.3	W2-C	MRA60SACC
89	98	200	218	8.6	W2-D	MRA80SACD
95	108	200	218	8.4	W2-F	MRA80SACF
108	118	240	245	11.6	W2-G	MRB10SACG
116	128	240	245	11.2	W2-I	MRB10SACY
133	144	245	258	13.8	W2-A	MRB12SACJ
142	153	245	258	13.7	W2-B	MRB12SACL
159	172	300	300	21.3	W2-C	MRB15SACM
168	184	300	300	22.3	W2-D	MRB15SACP
193	203	400	360	39.9	W2-F	MRB17SACQ
214	225	400	360	37.5	W2-G	MRB20SACR
218	250	260	365	25.5	W3-H	MRB20SACH
267	298	350	420	46	W3-I	MRB25SACY
315	358	400	460	59.5	W3-J	MRB30SACJ

Dimensions in mm *Weight in kg*

Dismantling joints

Self-restrained large stroke dismantling joint for flanged valve

Standard version DN 40 to 600, type JP
Standard version DN 700 to 2000, type PO
Reinforced version



Self-restrained dismantling joint 8-14 mm stroke for flanged valve

Standard version

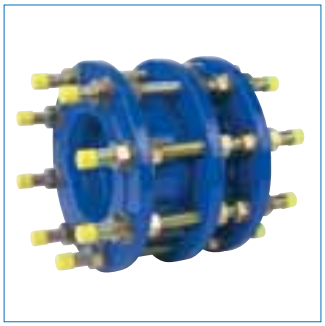


Self-restrained large stroke dismantling joint for non-flanged valve TYPE PF

Standard version



Type JP self-restrained large stroke dismantling joint for flanged valves DN 40 to 600



Description

Type JP self-restrained dismantling joints allow installation by insertion or removal of a flanged valve between two fixed elements of a pipeline.
Their design (sliding components) permits a very long stroke to release the valves (see columns +e and –e in dimension table).
For all these types of self-restrained dismantling joint, the valve and the pipe are locked together by the tie bars and the gland.

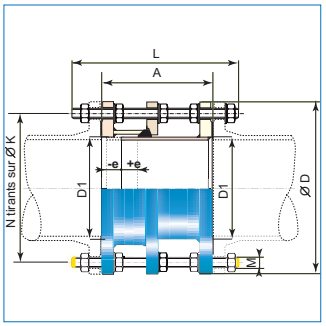
Range

Type JP self-restrained dismantling joints exist in range DN 40 to 600 for pressures **PFA 10 - PFA 16 - PFA 25 bar.**

Product references

DN	PFA 10 bar	PFA 16 bar	PFA 25 bar
40	206620	206620	206348
50	206633	206633	206349
60	206634	206634	206350
65	184034	184034	206446
80	183212	183212	204089
100	183213	183213	206513
125	184481	184481	206514
150	183214	183214	206516
200	183783	183627	184600
250	206550	183628	205292
300	184220	183640	184611
350	206677	183682	185346
400	206678	183634	206517
450	206679	206546	206518
500	206680	183702	198572
600	184918	183626	183856

Type JP self-restrained large stroke dismantling joint for flanged valves DN 40 to 600



Construction characteristics

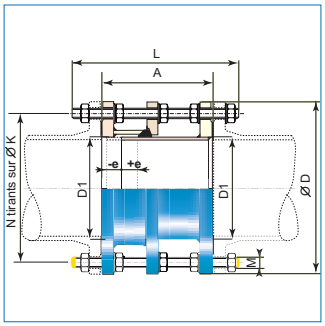
● Dimensions and weight - Type JP PFA 10 bar

Adjustment range: ± e

					Tie bars					
DN	**A**	**Ø D**	**Ø D1**	**Ø K**	**N**	**M**	**L**	**Weight**	**+ e**	**- e**
40	200	150	49	110	4	M16	330	11	30	30
50	200	165	61	125	4	M16	330	13	30	30
60	200	175	76	135	4	M16	330	14	30	30
65	200	185	77	145	4	M16	330	15	30	30
80	200	200	90	160	8	M16	330	21	30	30
100	200	220	116	180	8	M16	330	22	30	30
125	200	250	142	210	8	M16	330	28	30	30
150	200	285	171	240	8	M20	330	37	30	30
200	280	340	222	295	8	M20	430	53	40	40
250	280	395	276	350	12	M20	430	72	40	40
300	280	445	328	400	12	M20	430	81	40	40
350	280	505	360	460	16	M20	430	109	40	40
400	280	565	411	515	16	M24	450	150	40	40
450	330	615	462	565	20	M24	530	180	50	50
500	330	670	514	620	20	M24	530	206	50	50
600	330	780	617	725	20	M27	550	264	50	50

Dimensions in mm *Weight in kg*

Type JP self-restrained large stroke dismantling joint for flanged valves DN 40 to 600



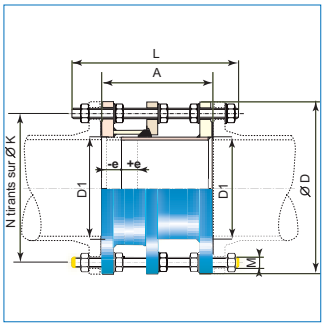
Dimensions and weight - Type JP PFA 16 bar

Adjustment range: ± e

					Tie bars				
DN	**A**	**Ø D**	**Ø D1**	**Ø K**	**N**	**M**	**L**	**Weight**	**+ e**	**- e**
40	200	150	49	110	4	M16	330	11	30	30
50	200	165	61	125	4	M16	330	13	30	30
60	200	175	76	135	4	M16	330	14	30	30
65	200	185	77	145	4	M16	330	15	30	30
80	200	200	90	160	8	M16	330	21	30	30
100	200	220	116	180	8	M16	330	22	30	30
125	200	250	142	210	8	M16	330	28	30	30
150	200	285	171	240	8	M20	330	37	30	30
200	280	340	222	295	12	M20	430	60	40	40
250	280	405	276	355	12	M24	450	84	40	40
300	280	460	328	410	12	M24	450	99	40	40
350	280	520	360	470	16	M24	450	143	40	40
400	280	580	411	525	16	M27	450	170	40	40
450	330	640	462	585	20	M27	550	187	50	50
500	330	715	514	650	20	M30	550	276	50	50
600	330	840	617	770	20	M33	550	395	50	50

Dimensions in mm *Weight in kg*

Type JP self-restrained large stroke dismantling joint for flanged valves DN 40 to 600



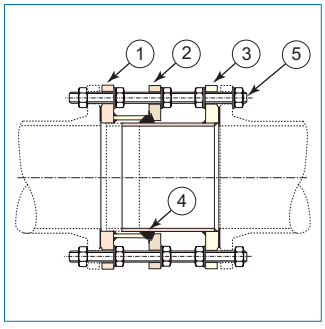
Dimensions and weight - Type JP PFA 25 bar

Adjustment range: ± e

					Tie bars					
DN	**A**	**Ø D**	**Ø D1**	**Ø K**	**N**	**M**	**L**	**Weight**	**+ e**	**- e**
40	200	150	49	110	4	M16	330	11	30	30
50	200	165	61	125	4	M16	330	14	30	30
60	200	175	74	135	8	M16	330	16	30	30
65	200	184	77	145	8	M16	330	18	30	30
80	200	200	90	160	8	M16	330	22	30	30
100	220	235	116	190	8	M20	360	29	30	30
125	240	270	142	220	8	M24	400	42	30	30
150	240	300	171	250	8	M24	400	51	30	30
200	280	360	222	310	12	M24	450	73	40	40
250	280	425	276	370	12	M27	450	101	40	40
300	280	485	328	430	16	M27	450	132	40	40
350	320	555	372	490	16	M30	503	200	40	40
400	320	620	411	550	16	M33	530	243	40	40
450	350	670	462	600	20	M33	580	295	40	40
500	350	730	514	660	20	M33	580	344	40	40
600	380	845	617	770	20	M36	620	462	50	50

Dimensions in mm *Weight in kg*

Nomenclature of materials and coatings



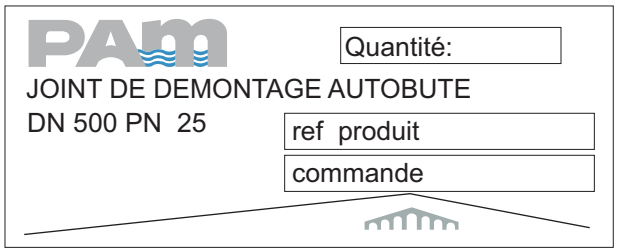
Item	Designation	Material
1	Fixed body	Steel ST37-2
2	Gland	Steel ST37-2
3	Sliding body	Steel ST37-2
4	Sealing ring	EPDM elastomer
5	Tie bars	Zinc plated steel 12 microns S235JRG2 Class 6/8

Item	Type	Thickness
1-2-3	Blue epoxy in compliance with EN 14901	250 μm mini
5	Zinc plated steel	12 μm

Type JP self-restrained large stroke dismantling joint for flanged valves DN 40 to 600

Marking

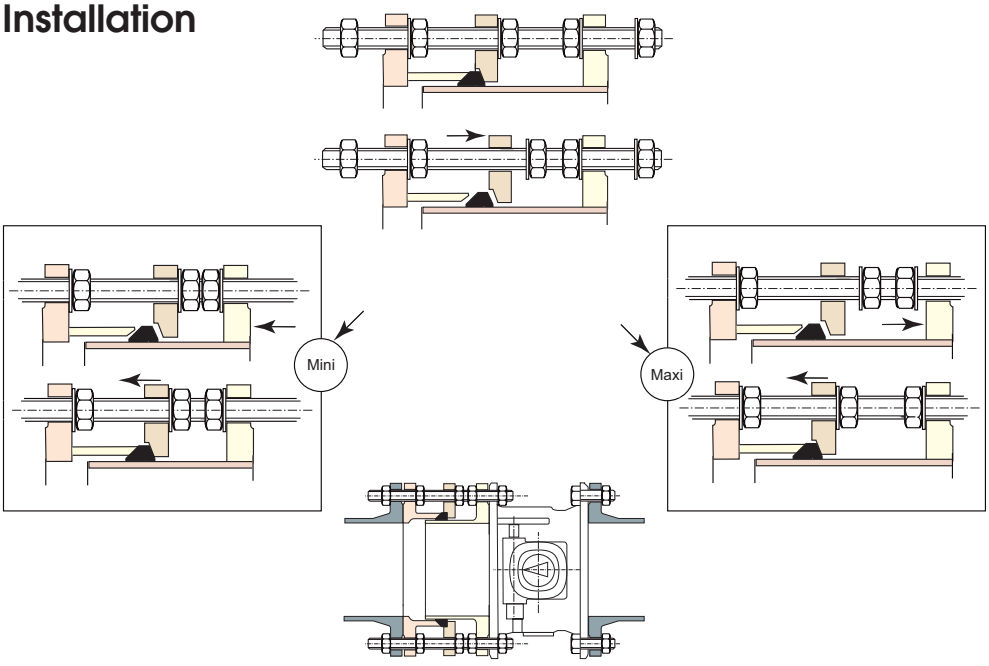
● **Package label**



● **Product label**



Installation



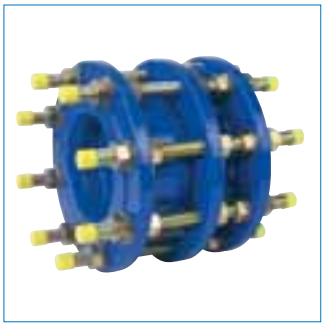
Compliance with standards

For JP joints

The components are made in compliance with the requirements of standard **NFE 29220** especially as regards the dimensions of flanges according to **NFEN 1092**.

The adjustment range is greater than that recommended in standard **NFE 29220**.

Self-restrained large stroke dismantling joint for flanged valves DN 700 to 2000



Description

Type PO self-restrained dismantling joints for **flanged valves** allow installation by insertion or removal of a valve between two fixed elements of a pipeline.
Their sliding design generally permits 50 mm movement to release the valves (see columns +e and –e in dimension table).
For all these types of self restrained dismantling joint, the valve and the pipe are locked together by the tie bars and the gland.

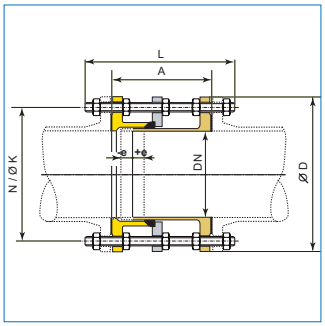
Range

Type PO self-restrained dismantling joints exist in range DN 700 to 2000 for pressures **PFA 10 - PFA 16 and PFA 25 bar.**

Product references

DN	PFA 10 bar	PFA 16 bar	PFA 25 bar
700	MDB70DABH	MDB70DAAH	MDB70DADH
800	MDB80DABH	MDB80DAAH	MDB80DADH
900	MDB90DABH	MDB90DAAH	MDB90DADH
1000	MDC10DABH	160968	MDC10DADH
1100	MDC11DABH	160954	MDC11DADH
1200	MDC12DABH	160939	MDC12DADH
1400	MDC14DABH	MDC14DAAH	163600
1500	MDC15DABH	MDC15DAAH	MDC15DADH
1600	MDC16DABH	MDC16DAAH	MDC16DADH
1800	MDC18DABH	MDC18DAAH	MDC18DADH
2000	MDC20DABH	MDC20DAAH	MDC20DADH

Self-restrained large stroke dismantling joint for flanged valves DN 700 to 2000



Construction characteristics

Dimensions and weight - Type PO PFA 10 bar

Adjustment range: ± e

				Tie bars					
DN	**A**	**Ø D**	**Ø K**	**N**	**M**	**L**	**Weight**	**+ e**	**- e**
700	260	895	840	24	M27	450	256	25	25
800	290	1015	950	24	M30	480	352	25	25
900	290	1115	1050	28	M30	480	405	20	25
1000	290	1230	1160	28	M33	485	484	15	25
1100	300	1340	1270	32	M33	485	585	25	25
1200	320	1455	1380	32	M36	545	744	25	25
1400	360	1675	1590	36	M39	590	1036	25	25
1500	380	1785	1700	36	M39	615	1165	25	25
1600	390	1915	1820	40	M45	645	1524	25	25
1800	410	2115	2020	44	M45	675	1994	25	25
2000	410	2325	2230	48	M45	675	2400	25	25

Dimensions in mm *Weight in kg*

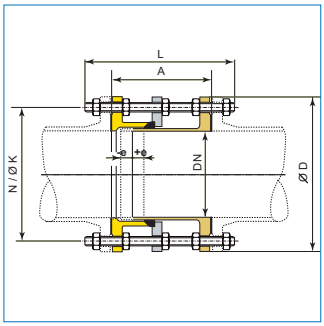
Dimensions and weight - Type PO PFA 16 bar

Adjustment range: ± e

				Tie bars					
DN	**A**	**Ø D**	**Ø K**	**N**	**M**	**L**	**Weight**	**+ e**	**- e**
700	300	910	840	24	M33	500	366	20	25
800	320	1025	950	24	M36	530	482	15	25
900	320	1125	1050	28	M36	540	546	15	25
1000	340	1255	1170	28	M39	570	715	15	25
1100	340	1355	1270	32	M39	560	810	25	25
1200	360	1485	1390	32	M45	630	1112	25	25
1400	380	1685	1590	36	M45	660	1352	25	25
1500	400	1820	1710	36	M52	695	1580	25	25
1600	420	1930	1820	40	M52	720	1400	25	25
1800	420	2130	2020	48	M52	730	2400	25	25
2000	450	2345	2230	48	M56	780	2800	25	25

Dimensions in mm *Weight in kg*

Self-restrained large stroke dismantling joint for flanged valves DN 700 to 2000



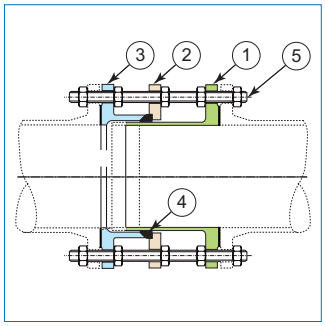
Dimensions and weight - Type PO PFA 25 bar

Adjustment range: ± e

				Tie bars					
DN	**A**	**Ø D**	**Ø K**	**N**	**M**	**L**	**Weight**	**+ e**	**- e**
700	340	960	875	24	M39	560	571	15	25
800	360	1085	990	24	M45	620	800	25	25
900	380	1185	1090	28	M45	635	920	15	25
1000	400	1320	1210	28	M52	680	1280	15	25
1200	450	1530	1420	32	M52	760	1871	25	25
1400	500	1755	1640	36	M56	830	2393	25	25
1500	500	1865	1750	36	M56	835	2805	25	25
1600	510	1975	1860	40	M56	860	3132	25	25
1800	550	2195	2070	44	M64	920	3850	25	25
2000	600	2425	2300	48	M64	975	4560	25	25

Dimensions in mm *Weight in kg*

Nomenclature of materials and coating

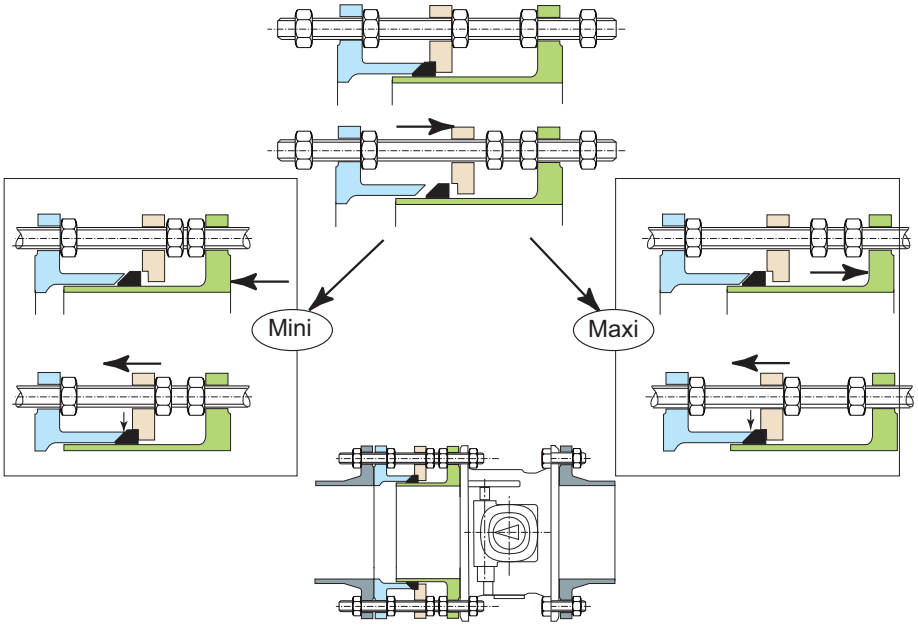


Item	Designation	Material
1	Fixed body	Steel EN 10025 S235JRG2
2	Gland	Steel EN 10025 S235JRG2
3	Sliding body	Steel EN 10025 S235JRG2
4	Sealing ring	EPDM elastomer
5	Tie bars	Steel EN 10025 S235JRG2 or S335J2G3 Class 6/8

Item	Type	Thickness
1-2-3	Blue epoxy in compliance with EN 14901	300 μm
5	Zinc plated steel	15 μm

Self-restrained large stroke dismantling joint for flanged valves DN 700 to 2000

Installation



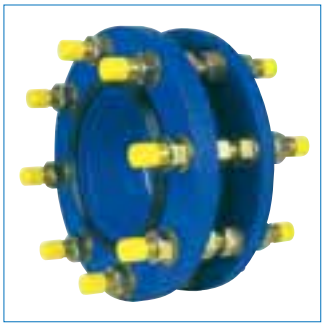
Compliance with standards

For PO joints
The components are made in compliance with the requirements of standard **NFE 29220** especially as regards the dimensions of flanges according to **NFE 29209 and 29209.**

The flange of the sliding body is heel type so that the flange bearing surface is standardized.

The adjustment range is greater than that recommended in standard **NFE 29220**.

Self-restrained dismantling joint 8-14 mm stroke for flanged valves



Description

Due to their limited adjustment range (8 to 14 mm depending on DN after removing the adjustment ring), **type PA** self-restrained dismantling joints for **flanged valves** are especially suitable when laying pipes one after the other or when there is very little space available.

For all these types of self restrained dismantling joint, the valve and the pipe are locked together by the tie bars and the gland.

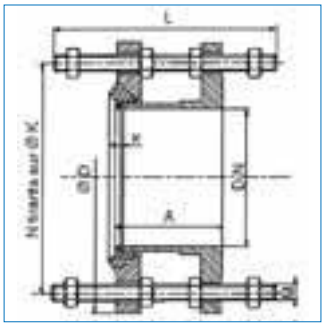
Range

Type PA self-restrained dismantling joints exist in range DN 40 to 600 for pressures **PFA 10 and PFA 16.**

Product references

DN	PFA 10 bar	PFA 16 bar
50	MDA50EACH	MDA50EACH
65	MDA65EACH	MDA65EACH
80	MDA80EACH	MDA80EACH
100	MDB10EACH	MDB10EACH
125	MDB12EACH	MDB12EACH
150	MDB15EACH	MDB15EACH
200	MDB20EABH	MDB20EAAH
250	MDB25EABH	MDB25EAAH
300	MDB30EABH	MDB30EAAH
350	MDB35EABH	MDB35EAAH
400	MDB40EABH	MDB40EAAH
450	MDB45EABH	MDB45EAAH
500	MDB50EABH	MDB50EAAH
600	MDB60EABH	MDB60EAAH

Self-restrained dismantling joint 8-14 mm stroke for flanged valves



Construction characteristics

● **Dimensions and weight - Type PA PFA 10-16**

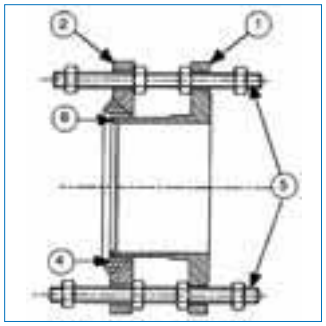
Max. installation dimension: A

Tolerance for smaller available space: X (remove the spacer ring)

PFA10 bar				Tie bars					PFA 16 bar				Tie bars				
DN	A	Ø D	Ø K	N	M	L	X	Weight	DN	A	Ø D	Ø K	N	M	L	X	Weight
50	100	165	125	4	M16	180	8	6	**50**	100	165	125	4	M16	180	8	6
65	100	185	145	4	M16	180	8	7.5	**65**	100	185	145	4	M16	180	8	7.5
80	100	200	160	8	M16	180	8	9	**80**	100	200	160	8	M16	180	8	9
100	100	220	180	8	M16	180	8	13	**100**	100	220	180	8	M16	180	8	13
125	100	250	210	8	M16	180	10	17	**125**	100	250	210	8	M16	180	10	17
150	100	285	240	8	M20	195	10	21	**150**	100	285	240	8	M20	195	10	21
200	100	340	295	8	M20	195	10	29	**200**	100	340	295	12	M20	195	10	29
250	110	395	350	12	M20	215	10	38	**250**	120	405	355	12	M24	225	10	44
300	110	445	400	12	M20	215	10	46	**300**	120	460	410	12	M24	225	10	55
350	120	505	460	16	M20	215	10	57	**350**	120	520	470	16	M24	250	10	77
400	120	565	515	16	M24	230	10	72	**400**	130	580	525	16	M27	250	10	98
450	120	615	565	20	M24	230	10	80	**450**	130	640	585	20	M27	250	10	122
500	120	670	620	20	M24	230	10	90	**500**	150	715	650	20	M30	285	10	156
600	120	780	725	20	M27	240	10	120	**600**	150	840	770	20	M33	300	12	222

Dimensions in mm *Weight in kg*

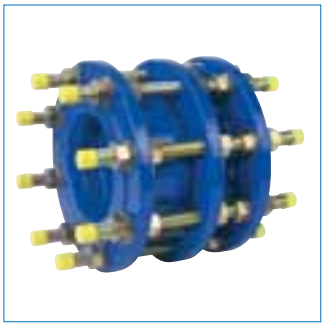
Nomenclature of materials and coatings



Item	Designation	Material
1	Fixed body	Steel E24 type
2	Gland	Steel E24 type
3	Sliding body	Steel E24 type
4	Sealing ring	EPDM
5	Tie bars	Zinc plated steel
6	Adjustment ring	Steel E24 type

Item	Type	Thickness
1-2-3-6	Blue epoxy in compliance with EN 14901	300 μm
5	Zinc plated steel	15 μm

Self-restrained large stroke dismantling joint for non-flanged valve type PF



Description

Type PF self-restrained dismantling joints for **non-flanged valves** allow installation by insertion or removal of a valve between two fixed elements of a pipeline.
Their sliding system permits 50 mm movement to release the valves.
For all these types of self-restrained dismantling joint, the valve and the pipe are locked together by the tie bars and the gland.

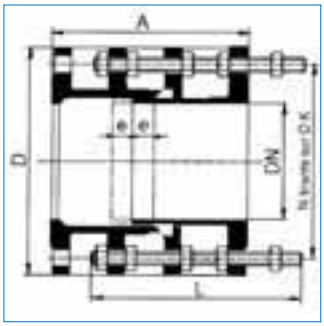
Range

Type PF self-restrained dismantling joints exist in range DN 40 to 1200 for pressures **PFA 10 and PFA 16.**

Product references

DN	PFA 10 bar	PFA 16 bar
50	160943	160943
65	163543	163543
80	160947	160947
100	-	163559
125	163559	166645
150	163605	163605
200	163634	160966
250	163658	163359
300	-	160969
350	166654	-
400	163707	-
450	-	-
500	160970	163731
600	160971	163742
700	163750	-
800	163762	160942
900	163770	-
1000	160950	160951
1200	163586	-

Self-restrained large stroke dismantling joint for non-flanged valve type PF



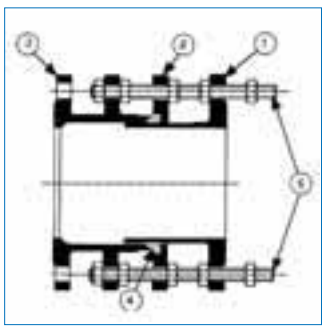
Construction characteristics

● **Dimension and weight - type PF DN 40 to 1200 PFA 10 and PFA 16**

Adjustment range: ± e e =25 mm

PFA10 bar				Tie bars				PFA 16 bar				Tie bars			
DN	A	Ø D	Ø K	N	M	L	Weight	DN	A	Ø D	Ø K	N	M	L	Weight
40	300	150	110	4	M16	250	11	**40**	300	150	110	4	M16	250	11
50	300	165	125	4	M16	250	13	**50**	300	165	125	4	M16	250	13
65	300	185	145	4	M16	250	16	**65**	300	185	145	4	M16	250	16
80	300	200	160	8	M16	250	21	**80**	300	200	160	8	M16	250	21
100	300	220	180	8	M16	250	27	**100**	300	220	180	8	M16	250	27
125	300	250	210	8	M16	250	34	**125**	300	250	210	8	M16	250	34
150	350	285	240	8	M20	290	51	**150**	350	285	240	8	M20	290	51
200	350	340	295	8	M20	290	62	**200**	350	340	295	12	M20	290	64
250	350	395	350	12	M20	290	88	**250**	375	405	355	12	M24	320	102
300	350	445	400	12	M20	290	100	**300**	375	460	410	12	M24	320	116
350	350	505	460	16	M20	290	124	**350**	425	520	470	16	M24	350	162
400	375	565	515	16	M24	320	160	**400**	425	580	525	16	M27	350	204
450	375	615	565	20	M24	320	176	**450**	425	640	585	20	M27	350	232
500	375	670	620	20	M24	340	202	**500**	450	715	650	20	M30	380	312
600	400	780	725	20	M27	340	268	**600**	475	840	770	20	M33	400	416
700	400	895	840	24	M27	340	330	**700**	475	910	840	24	M33	400	444
800	450	1015	950	24	M30	380	454	**800**	525	1025	950	24	M36	450	610
900	450	1115	1050	28	M30	380	522	**900**	525	1125	1050	28	M36	450	692
1000	475	1230	1160	28	M33	420	632	**1000**	550	1255	1170	28	M39	450	890
1200	525	1455	1380	32	M36	450	982	**1200**	600	1485	1390	32	M45	525	1392

Nomenclature of materials and coatings



Item	Designation	Material
1	Fixed body	Steel E24 type
2	Gland	Steel E24 type
3	Sliding body	Steel E24 type
4	Sealing ring	EPDM
5	Tie bars	Zinc plated steel

Item	Type	Thickness
1-2-3	Blue epoxy in compliance with EN 14901	300 μm
5	Zinc plated steel	15 μm

Reducing flanges



Description

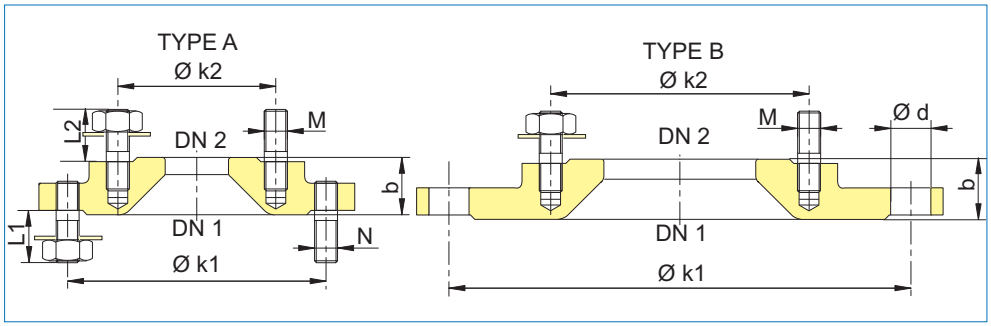
Reducing flanges allow installation of a gate valve and/or an air valve in chamber from the output flange of a tee.
There is no need to fit a large reducing taper. The flanges are delivered with the studs, washers and nuts.

Range

Reducing flanges are available in a range from

- DN 60 to 300 for pressures **PFA 10 - PFA 16 bar**
- DN 60 to 80 for pressures **PFA 25 bar**

Reducing flanges



Construction characteristics

● **Dimension and weight for types A and B**

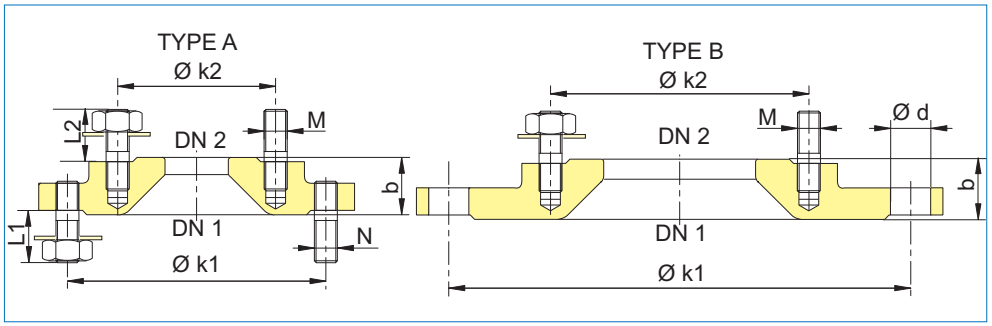
PFA 10-16 bar

					Bolts				Bolts				
DN1/DN2	Type	b	d	Ø k1	N	M	L1	Ø k2	N	M	L2	Weight	Reference
60-40	A	46	-	135	4	M16	50	110	4	M16	50	5.7	BBA60RM1ATT
60-50	A	47	-	135	4	M16	50	125	4	M16	50	5.6	BBA60RM1BTT
80-40	A	30	-	160	8	M16	50	110	4	M16	50	5.1	BBA80RM1ATT
80-50	A	40	-	160	8	M16	50	125	4	M16	50	5.6	BBA80RM1BTT
80-60	A	28	-	160	8	M16	50	135	4	M16	50	5.4	BBA80RM1CTT
100-40	A	30	-	180	8	M16	50	110	4	M16	50	6.6	BBB10RM1ATT
100-50	A	27	-	180	8	M16	50	125	4	M16	50	6.3	BBB10RM1BTT
100-60	A	30	-	180	8	M16	50	135	4	M16	50	6.5	BBB10RM1CTT
100-65	A	30	-	180	8	M16	50	145	4	M16	50	6.5	BBB10RM1DTT
100-80	A	40	-	180	8	M16	50	160	8	M16	50	6.9	BBB10RM1ETT
125-60	A	30	-	210	8	M16	50	135	4	M16	50	8.2	BBB12RM1CTT
125-80	A	30	-	210	8	M16	50	160	8	M16	50	8	BBB12RM1ETT
125-100	A	30	-	210	8	M16	50	180	8	M16	50	7.6	BBB12RM1FTT
150-60	B	30	23	240	8	-	-	135	4	M16	50	10.8	BBB15RM1CTT
150-80	B	30	23	240	8	-	-	160	8	M16	50	10.7	BBB15RM1ETT
150-100	A	30	-	240	8	M20	60	180	24	M16	50	11.2	BBB15RM1FTT

PFA 10 bar

					Bolts				Bolts				
DN1/DN2	Type	b	d	Ø k1	N	M	L1	Ø k2	N	M	L2	Weight	Reference
200-60	B	30	23	295	8	-	-	135	4	M16	50	14.8	BBB20RM1CTT
200-80	B	40	23	295	8	-	-	160	8	M16	50	14.7	BBB20RM1ETT
200-100	B	40	23	295	8	-	-	180	8	M16	50	15	BBB20RM1FTT
200-125	B	40	23	295	8	-	-	210	8	M16	50	13.7	BBB20RM1GTT
200-150	A	32	-	295	8	M20	60	240	8	M20	60	16.5	BBB20RM1JTT
250-80	B	31	23	350	12	-	-	160	8	M16	50	22.1	BBB25RM1ETT
250-100	B	31	23	350	12	-	-	180	8	M16	50	21.9	BBB25RM1FTT
250-150	B	31	23	350	12	-	-	240	8	M20	60	20	BBB25RM1JTT
250-200	A	32	-	350	12	M20	60	295	8	M20	60	21.3	BBB25RM1KTT
300-100	B	31	23	400	12	-	-	350	8	M16	50	27	BBB30RM1FTT
300-150	B	38	23	400	12	-	-	350	8	M20	60	33	BBB30RM1JTT
300-200	B	32	23	400	12	-	-	350	8	M20	60	25	BBB30RM1KTT
300-250	A	33	-	400	12	M20	60	350	12	M20	60	28	BBB30RM1LTT

Reducing flanges



Construction characteristics

Dimension and weight for types A and B

PFA 16 bar

					Bolts				Bolts				
DN1/DN2	Type	b	d	Ø k1	N	M	L1	Ø k2	N	M	L2	Weight	Reference
200-60	B	30	23	295	12	-	-	135	4	M16	50	14.7	BBB20RM2CTT
200-80	B	40	23	295	12	-	-	160	8	M16	50	14.5	BBB20RM2ETT
200-100	B	40	23	295	12	-	-	180	8	M16	50	14.9	BBB20RM2FTT
200-125	B	40	23	295	12	-	-	210	8	M16	50	13.6	BBB20RM2GTT
200-150	A	32	-	295	12	M20	60	240	8	M20	60	16.6	BBB20RM2JTT
250-80	B	31	28	355	12	-	-	160	8	M16	50	22.3	BBB25RM2ETT
250-100	B	31	28	355	12	-	-	180	8	M16	50	22	BBB25RM2FTT
250-150	B	31	28	355	12	-	-	240	8	M20	60	20.7	BBB25RM2JTT
250-200	A	32	-	355	12	M24	60	295	12	M20	60	21.6	BBB25RM2KTT
300-100	B	31	28	410	12	-	-	355	8	M16	50	30	BBB30RM2FTT
300-150	B	38	28	410	12	-	-	355	8	M20	60	36	BBB30RM2JTT
300-200	B	32	28	410	12	-	-	355	12	M20	60	28	BBB30RM2KTT
300-250	A	33	-	410	12	M24	70	355	12	M24	60	31	BBB30RM2LTT

PFA 25 bar

					Bolts				Bolts				
DN1/DN2	Type	b	d	Ø k1	N	M	L1	Ø k2	N	M	L2	Weight	Reference
60-40	A	46	-	135	8	M16	50	110	4	M16	50	5.7	BBA60RM3ATT
60-50	A	46	-	135	8	M16	50	125	4	M16	50	5.6	BBA60RM3BTT
80-40	A	30	-	160	8	M16	50	110	4	M16	50	5.1	BBA80RM3ATT
80-50	A	28	-	160	8	M16	50	125	4	M16	50	5.6	BBA80RM3BTT
80-60	A	28	-	160	8	M16	50	135	8	M16	50	5.4	BBA80RM3CTT

Nomenclature of materials

Designation	Material
Reducing flange	Blue epoxy in compliance with EN 14901
Bolts, nuts and washers	Zinc plated steel

Abbreviations

Joints

STD	STANDARD joint
STD Vi	STANDARD Vi joint
STD Ve	STANDARD Ve joint
STD V+i	STANDARD V+i joint
UNI	UNIVERSAL joint
UNI Vi	UNIVERSAL Vi joint
UNI Ve	UNIVERSAL Ve joint
PK	PAMLOCK joint
TYT	TYTON type joint
EXP	EXPRESS joint
EXP Vi	EXPRESS Vi joint
BR	Flange joint
EPDM	Elastomere material used for gaskets intended for water

Coatings

PECB	Blue epoxy powder coating
VEC	Black cataphoresis
ECB	Blue cataphoresis
VBI	Black bituminous varnish
TT PUX	External coating special polyurethane
TT PE	External coating special polyethylene
PUR	Internal coating polyurethane

Products

NAT	NATURAL pipe
K9	CLASSIC pipe
BE	Flange socket fitting
BU	Flange spigot fitting
TE 2EB	Double socket tee with flanged branch fitting
TE 3E	All socket fitting

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GENERAL CONDITIONS OF SALE

Article 1 - GENERAL PROVISIONS

These general conditions of sale determine the rights and obligations of Saint-Gobain PAM ("SG PAM") and of the Client.
All orders by the Client shall entail the Client's acceptance of these general conditions of sale. The Client's general conditions of purchase cannot prevail over these general conditions of sale unless SG PAM agrees thereto.

Article 2 - ORDERS - ACCEPTANCE

2.1 Each order for products issued by the Client must be identified as being an order and must contain accurate and sufficient information concerning, for example, labelling and delivery, in order to allow SG PAM to process the order under the best possible conditions. If the information is insufficient or inaccurate, SG PAM may, without prejudice to any other solution, delay the product dispatch date.

2.2 Orders shall only become firm and definitive following the issue of an order acknowledgement by SG PAM. No order changes or cancellations can be taken into account after the order acknowledgment has been issued.

Article 3 - PRICES

3.1 The prices invoiced shall be those prices that result from the price lists in force on the effective date of delivery or, if there is an offer, the prices contained in said offer, to the extent that the order reaches SG PAM during the period of validity of said offer.

3.2 When SG PAM issues an offer, the prices shall be firm for the duration of the offer or for a maximum of 3 months following the issue date of said offer. Thereafter, price increases may be applied.

3.3 Except as otherwise agreed, the prices are expressed in euros and net of all taxes. The prices shall be invoiced after application of value added tax at the rate in force.

Article 4 - DELIVERY

4.1 The delivery times are minimum times and provided for information only. A delivery time is only firm if expressly described as such in the order acknowledgment.

4.2 Failure to comply with the indications concerning the delivery time does not authorise the Client to cancel its order, to defer payment for the order compared to the agreed conditions or to perform any form of withholding or offsetting whatsoever.

4.3 No default penalties may be claimed by from SG PAM unless the principle, terms and conditions of such penalties have been expressly accepted in the order acknowledgement.

4.4 SG PAM is not liable for failure to comply with delivery times when:

- the Client did not comply with the payment conditions; or
- when the information to be provided by the Client did not arrive in time;

4.5 The title to the products shall be transferred to the Client on SG PAM's premises as soon as the products can be identified individually and collected by the carrier.

4.6 The risks shall be transferred under the conditions defined by the chosen Incoterm (Incoterms published by the Paris International Chamber of Commerce in force on the effective date of delivery, the "Incoterms") or when the products are identified individually and collected by the carrier.

4.7 The terms "carriage paid" or "flat-rate carriage" correspond to the Incoterm CPT.

Article 5 - INSPECTION

5.1 The products shall be inspected in the factory, in accordance with SG PAM's quality control procedures and the standards in force.

5.2 When it is agreed that a special inspection will be performed, by the Client or by an organisation that represents the Client, the inspectors who are responsible for performing the inspection shall be informed of the dates and times at which inspection operations must normally take place.

Article 6 - TRANSPORT

6.1 When the Client organises the transport operations itself, the Client shall be responsible for fulfilling the obligations to adapt the vehicles to the products and the obligation to schedule loading 48 hours in advance. If not, loading will not be possible.

6.2 The Client shall be responsible for the unloading operations, which shall be performed under its supervision. In this respect, the Client must ensure compliance with the on-site safety conditions and make available suitable means in order to ensure the unloading takes place under the best possible safety conditions. In particular, in the event of delivery by crane truck, the Client shall assist the driver by unhooking the pipes and packages at ground level. The Client must draw up a safety protocol with the carrier prior to the unloading operations.

6.3 In the event of losses, damage or missing goods (?) recorded at the time of delivery, the Client shall exercise its right of recourse against the carrier by mentioning reserves on the carrier's delivery note. The Client shall confirm said reserves and substantiate its claim to the carrier, by registered letter with return receipt, within 3 business days following the receipt of the products.

Article 7 - PAYMENT TERMS

7.1 Payments shall be made to the address shown on the invoice, within 30 days end of month as from the invoice date of issue, regardless of the date of receipt of the products by the Client.

7.2 Accepted bills of exchange must be returned within 10 days of issue. This timeframe shall also apply to the orders to pay issued by the Client.

7.3 All payments made after the payment deadline shown on the invoice shall, as of right ,trigger the invoicing of default penalties at a rate equal to three times the statutory rate of interest in force.

7.4 If an invoice is not paid when due, all invoices that have fallen due shall immediately become payable. Moreover, SG PAM reserves the right to suspend the orders in process, without prejudice to damages.

7.5 No Client claims can lead to a change, delay or suspension of payments that have fallen due or authorise the Client to perform

GENERAL CONDITIONS OF SALE

any offsetting or deduction whatsoever with the monies that are owed to SG PAM. All offsetting or deductions not agreed on beforehand shall constitute a payment incident that justifies the application of the measures referred to above.

7.6 In the event of a major change in the Client's legal or financial status, which has an impact on SG PAM's assessment of the Client's solvency or in the event of excessive amounts outstanding, SG PAM reserves the right, even after partially filling an order, either to demand guarantees or to cancel the remainder of the orders.

Article 8 - PRODUCT WARRANTY

8.1 Without prejudice to the measures to be implemented vis-à-vis the carrier, claims regarding the non-conformity of the products delivered with the products shown on the order acknowledgment of receipt must be made in writing within 3 days of the receipt of the products. Thereafter, no claims shall be accepted.

8.2 SG PAM warrants the Client against the latent defects that may affect the sold products. If the Client notes a manufacturing defect in the product, which, in the Client's opinion, is characteristic of a latent defect, the Client must make a claim to SG PAM without delay.

8.3 Triggering the conformity warranty and the latent defects warranty is contingent on the existence of said defects being confirmed in the presence of both parties and acknowledged as being effectively attributable to SG PAM. The Client shall provide all proof of the reality of the conformity or latent defects observed. The Client must give SG PAM every opportunity to observe said conformity or latent defects and to correct them. The Client shall refrain from intervening on the products.

8.4 Within 1 month – all things remaining as is, except in the event of force majeure – the conformity or latent defect shall be recorded in an official document, in the presence of SG PAM's representatives.

8.5 If the existence of a conformity or latent defect is recorded in the presence of both parties and acknowledged by SG PAM as being effectively attributable to it, SG PAM shall take responsibility for repairing the product or supplying a product to replace the product previously delivered and shall pay the corresponding transport costs.

8.6 The Client is required, under its exclusive liability, to comply with the instructions given by SG PAM as well as with best practices for the handling and appropriate use of the products, as well as all the technical guidelines.

8.7 The guarantee provided shall not apply in the following cases:

- apparent defect or a defect that a professional should have discovered;
- defects and/or deteriorations caused by natural wear and tear or an external accident;
- modification of the product that is not provided for or specified by SG PAM;
- defects and/or deteriorations caused by a lack of compatibility with products not supplied by SG PAM;
- failure by the Client to comply with the indications concerning the handling, the installation, the use and the maintenance of the products, as well as with best practices;
- force majeure or an assimilated event.

8.8 The warranty granted by SG PAM shall last for 12 months as from delivery. Work carried out under the warranty shall not extend the warranty period.

Article 9 - LIABILITY

Under no circumstances may SG PAM be held liable for the indirect material damages and for the direct and/or indirect consequential damages (such as operating loss or loss of Clientele, compensation for delay, etc.), that are alleged by the Client, which may result from a failure to comply with SG PAM's obligations, in particular in the event of non-conformity or of a defect that affects its products.

Article 10 - INDUSTRIAL PROPERTY

The plans, models, studies, results of tests, catalogues, manuals, and all the marketing and technical documents circulated by SG PAM, regardless of the media used, are the exclusive property of SG PAM. Consequently, the Client shall refrain from making any reproduction thereof whatsoever without SG PAM's prior agreement.

Article 11 - MANUFACTURING - RECOMMENDATIONS

11.1 The weights and dimensions of the products stated on SG PAM's documents are theoretical values. SG PAM reserves the right to make all amendments to the information contained in its documentation.

11.2 The documents concerning the handling, storage, installation, use and maintenance of the products are supplied free of charge by SG PAM, at the Client's request. The Client alone shall be liable for compliance with the health and safety conditions for these various operations and for the use of the products in accordance with best practices.

11.3 SG PAM reserves the right to amend the data contained in these documents at any time. It is the Client's responsibility to verify the validity thereof with SG PAM.

Article 12 - CONDITIONING

12.1 The product packaging is designed in order to meet haulage requirements.

12.2 The packaging and bracing wood not invoiced by SG PAM shall be recovered at the time of delivery.

Article 13 - FORCE MAJEURE

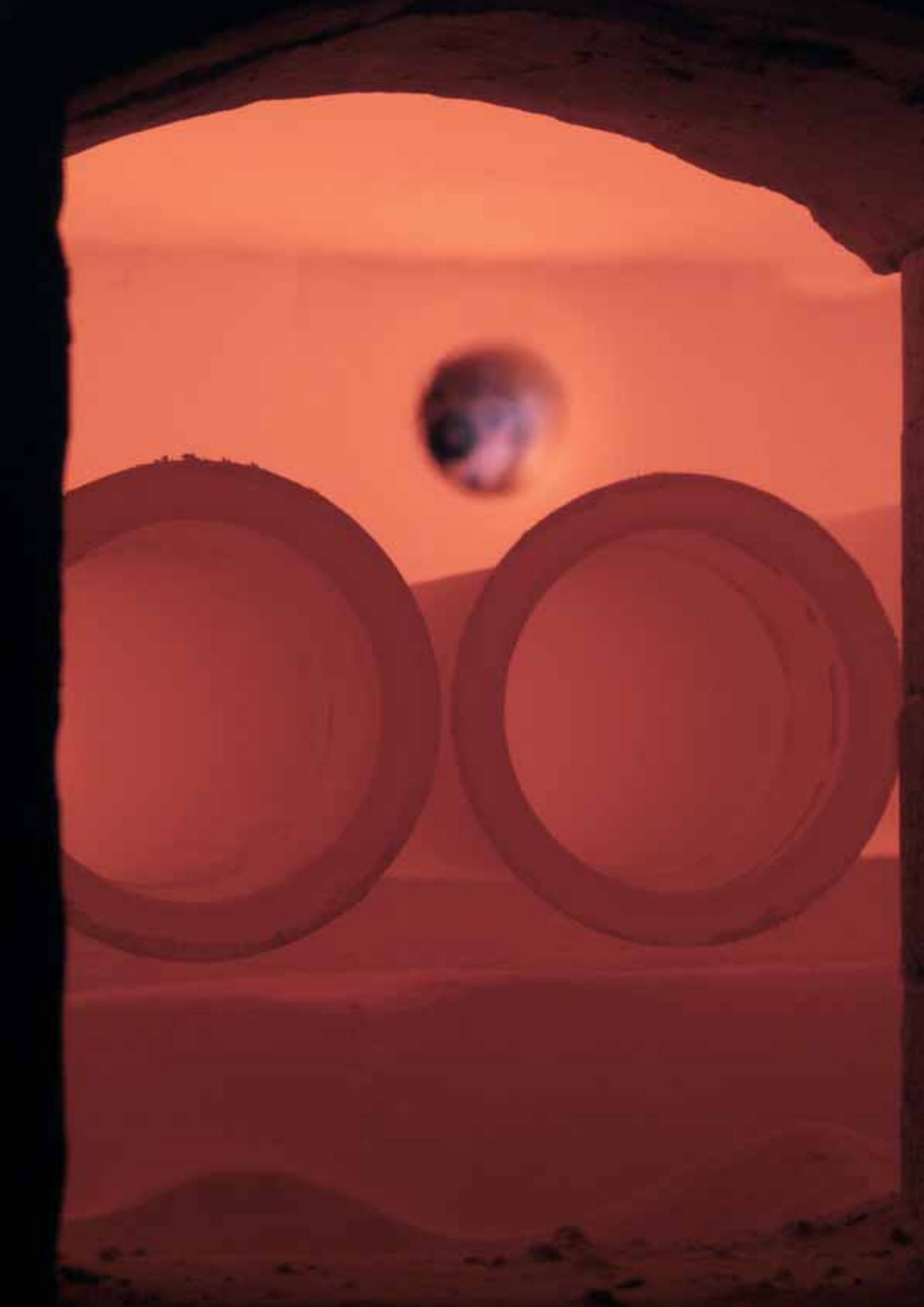
13.1 SG PAM shall not be liable in the event of force majeure. Force majeure shall be understood to mean all causes that are beyond SG PAM's control, which would make it impossible to fulfil its contractual obligations and would affect the manufacturing, dispatch and delivery of the products. The following, inter alia, are deemed to be cases of force majeure: disturbances to production and/or delivery that result from war (declared or undeclared), strikes, lockouts, accidents, fires, floods, natural disasters, epidemics, interruptions or delays in haulage, shortages of materials and/or raw materials, embargos or regulations of any kind whatsoever.

13.2 In the event of force majeure, SG PAM shall have a reasonable supplemental timeframe in which to perform its obligations

Article 14 - APPLICABLE LAW - JURISDICTION

In the event of a contestation concerning the formation, performance or construction of the sale contract, solely the Nancy courts shall have jurisdiction, even in the event of multiple respondents, third party notices or emergency interim proceedings. French law shall be the applicable law.

January 2010



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Saint-Gobain PAM Worldwide

ALGERIA
SAINT-GOBAIN PAM ALGERIE
Z.I. Sidi Abdelkader-Ben Boulaid
BP 538
09000 - BLIDA
Phone: + 213 (0) 25 36 00 60

ARGENTINA
SAINT-GOBAIN PAM ARGENTINA
Bouchard y Enz
1836 - LLAVALLOL - BUENOS AIRES
Phone: + 54 11 42 98 9600

AUSTRALIA
SAINT-GOBAIN PAM
4-6 Colbert Road, Campbellfield
Vic 3061
Phone: + 61 (0) 3 9358 6122

AUSTRIA
SAINT-GOBAIN
GUSSROHRVERTRIEB
OSTERREICH GmbH
Gussrohr Vertriebs Österreich
Archenweg, 52
A6020 - INNSBRUCK
Phone: + 43 5123 417 170

BELGIUM
SAINT-GOBAIN PIPE SYSTEMS
Raatshovenstraat, n°2
B-3400 - LANDEN
Phone: + 32 11 88 01 20

BRAZIL
SAINT-GOBAIN CANALIZACAO
LTDA
Praia de Botafogo 440 7° andar
22250-040 - RIO DE JANEIRO - RJ
Phone: + 55 21 2128 1677

CHILE
SAINT-GOBAIN PAM CHILE
Antillanca Norte 600
Parque Industrial Vespucio,
Comuna de Pudahuel
SANTIAGO DE CHILE
Phone: + 562 444 13 00

CHINA
SAINT-GOBAIN PAM CHINA
(SHANGAI)
1716 Ocean Tower
550 Yan'An East Road
SHANGAI 200001
Phone: + 86 21 63 61 21 42

SAINT-GOBAIN PAM CHINA
(XUZHOU)
Jinshanqiao Development Zone
PC 221004 - XUZHOU
Phone: + 86 516 8787 8107

SAINT-GOBAIN PAM CHINA
(MAANSHAN)
Hua Gong Road Cihu
PC 243052 - MAANSHAN Anhui
Province
Phone: + 86 555 350 8003

COLOMBIA
SAINT-GOBAIN PAM COLOMBIA
Terminal terrestre de carga de
Bogota
Etapa 1, Bodega 9, Modulo 3
Km 3,5 costado sur autopista
Medellin
COTA CUNDINAMARCA
Phone: + 57 (1) 841 5832

CZECH REPUBLIC
SAINT-GOBAIN PAM CZ s.r.o.
Polygon House
Doudlebska 5/1699
14000 PRAHA 4
Phone: + 420 246 088 611

FINLAND
SAINT-GOBAIN PIPE SYSTEMS OY
Nuijamiestentie 3A
FIN-00400 - HELSINKI
Phone: + 358 207 424 600

FRANCE AND DOM-TOM
SAINT-GOBAIN PAM
(Head Office)
91 Avenue de la Libération
54076 NANCY CEDEX
Phone: +33 3 83 95 20 00

SAINT-GOBAIN PAM (France
Commercial Department)
CRD – Chemin de Blénod – B.P. 109
54704 PONT A MOUSSON CEDEX
Phone: +33 3 83 80 73 00

SAINT-GOBAIN PAM (Europe and
International Commercial
Departments)
21 avenue Camille Cavallier
54705 - PONT A MOUSSON CEDEX
Phone: + 33 3 83 80 73 50

SAINT-GOBAIN PAM (Local Agency
of The Antilles)
Rue Alfred Lumière
ZI de Jarry
BP 2104
97122 - BAIE MAHAULT
Guadeloupe
Tél. : +33 590 26 71 46

SAINT-GOBAIN PAM (Local Agency
of Indian Ocean)
16, rue Claude Chappe
ZAC 2000
97420 - LE PORT
Reunion Island
Phone: + 33 262 55 15 34

GERMANY
SAINT-GOBAIN PAM
DEUTSCHLAND
Saarbrucker Strasse 51
66130 - SAARBRUCKEN
Phone: + 49 681 87 010

GREECE
SAINT-GOBAIN HELLAS ABEE PIPES
Kleisouras 5 PO BOX 52096
GR 14410 - METAMORFOSI
ATHENS
Phone: + 30 210 28 30 043

HONG-KONG
SAINT-GOBAIN PIPELINES
H15/F Hermes Commercial Centre
4-4A Hillwood Road
TSIM SHA TSUI - KOWLOON
Phone: + 852 27 35 78 26

INDIA
SAINT-GOBAIN PAM
Grindwell Norton Ltd 5th Level,
Leela Business Park
Andheri-Kurla Road
MUMBAI - 400059
Phone: + 91 22 402 12 121

ITALY
SAINT-GOBAIN PAM ITALIA SPA
Via Romagnoli n°6
I-20146 - MILAN
Phone: + 39 02 42 431

JORDAN
SAINT-GOBAIN PAM Regional Office
Abu Zaid Center - Office # 8
35 Saad Bin Abi Waqqas St,
PO BOX 831000
11183 AMMAN
Phone: + 962 6 551 4438

MEXICO
SAINT-GOBAIN PAM MEXICO
HORACIO 1855-502
Colonia Los Morales - Polanco
11510 - MEXICO D.F.
Phone: + 52 55 5279 1657

NETHERLANDS
SAINT-GOBAIN PIPE SYSTEMS
Markerkant 10-17
NL-1316 - ALMERE
Phone: + 31 36 53 333 44

NORWAY
SAINT-GOBAIN VAN OG AVLØP AS
c/o Maxit - Brobekkveien 84
N-0584 - OSLO
Phone: + 47 23 17 58 60

PERU
SAINT-GOBAIN PAM PERÚ
Avenida de los Faisanes N° 157
Chorillos
LIMA 09
Phone: + 511 252 40 34/35

POLAND
SAINT-GOBAIN CONSTRUCTION
PRODUCTS POLSKA sp z.o.o
Ul. Cybernetyki 21
PL-02-677 WARSZAWA
Phone: + 48 22 751 41 72

PORTUGAL
SAINT-GOBAIN PAM PORTUGAL
Est. Nac. 10 - Lugar de D. Pedro
Apartado 1708
P-2691-901 - SANTA IRIA DE AZOIA
Phone: + 351 218 925 000

ROMANIA
SAINT-GOBAIN CONSTRUCTION
PRODUCTS ROMANIA S.R.L
Business Unit PAM
Strada Tipografilor nr. 11-15,
Corp 84,
Etaj 3, Birourile 323-338, Sector 1
BUCURESTI
Phone: + 40 21 207 57 37

SLOVAKIA
SAINT-GOBAIN CONSTRUCTION
Stara Vajnorska 139
83104 - BRATISLAVA
Phone: + 421 265 45 69 61

SOUTH AFRICA
SAINT-GOBAIN PIPELINES
SOUTH AFRICA
275 Stephenson Road
Pretoria Industrial
GAUTENG
PO BOX 631
PRETORIA 0001
Phone: +24 12 380 46 79

SPAIN
SAINT-GOBAIN PAM ESPANA SA
Paseo de la Castellana n°77
Edificio Ederra - Planta 10
E-28046 - MADRID
Phone: + 34 91 397 20 00

UNITED ARAB EMIRATES
SAINT-GOBAIN PAM
PO BOX 47102
Building N° 1092 - Villa N° 7
Muroor Road
ABU DHABI
Phone: + 971 2 448 20 10

UNITED KINGDOM
SAINT-GOBAIN PAM UK
Lows Lane - Stanton-by-Dale
ILLKESTON - DERBYSHIRE
DE7 4QU
Phone: + 44 115 930 5000

VIETNAM
SAINT-GOBAIN PAM
17 Ngo Gia Thieu, Ward 7
District 3
HO CHI MINH CITY
Phone: +84 8 393 07273

www.pamline.com

Saint-Gobain PAM in France - Regional Directions and Warehouses

BORDEAUX
Regional Direction and Warehouse of Mérignac
16-17-19-24-33-40-64-79-86-87
Rue de Galus - BP 80277
33697 - MERIGNAC CEDEX
DR - Tél : +33 (0)5 56 13 21 30
Dépôt - Tél : +33 (0)5 56 13 21 30

BOURGES
Regional Direction and Warehouse of Bourges
03-18-23-28-36-37-41-45-58-89
Rue Thomas Edison
ZAC des Varennes
18000 - BOURGES CEDEX
DR - Tél : +33 (0)2 48 23 34 30
Dépôt - Tél : +33 (0)2 48 23 34 35

LILLE
Regional Direction and Warehouse of Wasquehal
02-27-59-60-62-76-80
Parc d'activités La pilaterie
21 rue du Centre - BP 164
59444 - WASQUEHAL CEDEX
DR - Tél : +33 (0)3 20 81 84 00
Dépôt - Tél : +33 (0)3 20 81 84 20

Warehouse of Bourg Achard
Parc d'activités "Les vergers de Quicangrogne"
Rue Fernand Lefée
27310 - BOURG-ACHARD CEDEX
Tél : +33 (0)2 32 42 88 20

LYON
Regional Direction and Warehouse of Meyzieu
01-15-21-38-39-42-43-63-69-71-73-74
12, boulevard Monge - BP 9
69881 - MEYZIEU CEDEX
DR - Tél : + 33(0) 4 78 04 54 50
Dépôt - Tél : + 33 (0)4 78 04 54 60

MARSEILLE
Regional Direction and Warehouse of Gréasque
04-05-06-07-13-20-26-30-34-48-83-84
33, Parc d'activités des Pradeaux
13850 - GREASQUE CEDEX
DR - Tél : +33 (0)4 42 12 65 00
Dépôt - Tél : +33 (0)4 42 12 65 00

NANCY
Regional Direction and Warehouse of Ludres
08-10-51-52-54-55-57
Dynapôle Ludres-Fléville
834, rue Gustave Eiffel - BP 20098
54714 - LUDRES CEDEX
DR - Tél : +33 (0)3 83 50 45 45
Dépôt - Tél : +33 (0)3 83 50 45 30

NANTES
Regional Direction and Warehouse of La Chapelle-sur-Erdre
14-22-29-35-44-49-50-53-56-61-72-85
Zac de la Bérangerais
Rue de Bavière
44240 - LA CHAPELLE-SUR-ERDRE
DR - Tél : +33 (0)2 51 81 42 00
Dépôt - Tél : +33 (0)2 51 81 42 30

PARIS
Regional Direction
75-77-78-91-92-93-94-95
39-41, rue Louis Blanc
(Immeuble Maison de la Mécanique)
92038 - PARIS LA DEFENSE CEDEX
Tél : +33 (0)1 47 17 14 30

Warehouse of Bonneuil-sur-Marne
4 route de l'ile Barbière
(anciennement route de Stains)
94380 - BONNEUIL-SUR-MARNE CEDEX
Tél : +33 (0)1 43 39 01 80

Warehouse of Villeron
Zone artisanale La Justice
Lieu-dit de la Sucrerie
95380 VILLERON
Tél : +33 (0)1 34 68 89 19

STRASBOURG
Regional Direction and Warehouse of Neudorf
25-67-68-70-88-90
ZI Forlen - 8 rue des Imprimeurs
67118 GEISPOLSHEIM
DR - Tél : +33 (0)3 88 34 13 38
Dépôt - Tél : +33 (0)3 88 34 13 38

TOULOUSE
Regional Direction and Warehouse of Balma
09-11-12-31-32-46-47-65-66-81-82
Zone artisanale Vidailhan
7 rue des frères Peugeot - BP 93118
31131 - BALMA CEDEX
DR - Tél : +33 (0)5 61 36 87 00
Dépôt - Tél : +33 (0)5 61 36 87 08

Head Office
91 avenue de la Libération
54076 NANCY
Tél : +33 (0)3 83 95 20 00

France Commercial Department
CRD – Chemin de Blénod – B.P. 109
54704 PONT A MOUSSON CEDEX
Tél : +33 (0)3 83 80 73 00

Europe and International (PAMEX) Commercial Departments
21, avenue Camille Cavallier
54705 PONT A MOUSSON CEDEX
Tél : +33 (0)3 83 80 73 50

www.pamline.fr

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