

Ductile iron pipe solutions
for highly aggressive soils

TT PE / TT PUX range

Water supply
and distribution

DN 80 to 2000

NEW

EN 545: 2010

ISO 2531: 2009

Compliant with
European standards

EN 14628, EN 14901,
EN 15189, EN 15655

STANDARD TT PE
DN 600 TO 700

UNIVERSAL TT PE
DN 80 TO 700

UNIVERSAL TT PUX
DN 800 TO 1200

UNIVERSAL FITTINGS
DN 800 TO 1200





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Mont Saint-Michel is known all over the world for its architecture and the natural beauty of the site. It has been listed as a UNESCO world heritage site since 1979.

For decades, PAM has been using the surrounding salt marshes as a test bed for its new coatings, including the TT range of coatings.

The polders surrounding the mount are a particularly corrosive environment. Resistivity of the soil in the salt marshes near Mont-Saint-Michel is almost 100 Ω.cm, making the location an excellent natural test facility in which to assess the performances of ductile iron pipe coatings.

introduction

Ductile iron pipes are appreciated for their outstanding durability. Whenever water supply players require high quality of service, particularly in terms of performance, leaktightness and reliability, they systematically turn to ductile iron products. This applies both in industrialized nations (Europe, USA, Japan, etc.) and in the emerging countries such as China, India and Middle Eastern countries, where ductile iron is used to build hydraulic infrastructures. Not only is this infrastructure of strategic importance to their economic and industrial development, it also plays a key role in their populations' wellbeing.

Quality of the external coatings that protect pipes against the damaging effects of the soil is crucial. PAM has developed zinc-based active protection solutions to ensure durability of its buried ductile iron pipes. Although these coatings originally used pure zinc, ZINALIUM zinc-aluminium alloys is now gradually being introduced into the ranges. However, in extremely aggressive soils with marine water table, acidic peaty soils, soils contaminated by industrial pollution or subject to stray currents, for example, these active protection systems do not ensure the required durability. In these circumstances, rarely encountered in practice, the solution is to use products with passive coatings that totally isolate the pipe network.

PAM is the only European and global manufacturer to offer customers passive coatings for all such situations. Our comprehensive range of solutions includes pipes, fittings, anchored and non-anchored joints from DN 80 to DN 2000.

PAM plants manufacturing these products work with a number of cutting-edge technologies, including:

- TT PE: polyethylene coatings for pipes from DN 80 to 700
- TT PUX: epoxy polyurethane coatings for pipes from DN 800 to 2000*
- Thick epoxy coating for fittings
- Polyurethane coating for large-diameter fittings

These products comply with recently-introduced European standards relating to special coatings for ductile iron pipes intended for highly corrosive soils: EN 14628 for TT PE, EN 15189 for TT PUX, EN 14901 for epoxy coating for fittings, and EN 15655 for polyurethane coating for large-diameter fittings.

Compliance with these standards is the guarantee of a highly demanding level in terms of performances, production and quality control.

* Available on request in DN 100 to 700.

Highly aggressive soils

Buried pipes are subjected to various loads and aggressions, including soil and backfill corrosivity. Standard version of PAM pipes feature either a conventional zinc coating or the new ZINALIUM coating, which provide a sufficient level of corrosion resistance for most situations. However, the soils' corrosivity must be assessed to determine whether special protective measures and high performance coatings are required. PAM engineering teams carry out soil analyses on customers' request.

General corrosion indicators

General corrosion indicators are determined with a detailed map which indicates:

- 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, as well as wetlands, ponds, marshes, lakes, peatlands 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 plans (available from public authorities), the following are determined:

- Areas polluted by various effluents, such as liquid manure, distillery, dairy, papermaking waste, or by sewage, mainly from households,
- Industrial wastes like slag, clinker, etc.,
- Nearby structures such as 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 crossed and provides information on the nature of the soil and its natural corrosivity





Highly aggressive soils

Based on an initial analysis, soil can be categorized as:

<p>> Low risk:</p> <ul style="list-style-type: none"> • Sand and gravel • Hardcore materials • Limestone 	<p>> High risk:</p> <ul style="list-style-type: none"> • Marl • Clay 	<p>> Very high risk:</p> <ul style="list-style-type: none"> • Gypsum • Pyrites (iron pyrite, chalcopyrite: copper pyrite) • Salts for chemical industries (sodium chloride, lime sulphate) • Fossil fuels (lignite, peat, coal, bituminous materials).
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Any information relating to fossil present in the soil is valuable. In particular, the presence of pyritised ammonites indicates that the soil contains pyrites (iron sulphide) and is consequently highly corrosive, especially with its associated anaerobiosis.

Hydrogeology

Moisture is an aggravating factor in soil aggressivity.

A hydrogeological study can be conducted to identify aquifers and areas of impermeable land likely to trap water. The boundary of such areas is often marked by springs. Particular attention must be paid to this boundary as impermeable land can be highly corrosive. The same applies to water-bearing land, if water drains into it from neighbouring areas of land that contain sodium chloride, calcium sulphate or other soluble minerals.

Topographical and geological data can be corroborated and supplemented by visual observations, resistivity measurements and soil sample analyses performed during a field study.

The resistivity of a soil is indicative of its ability to sustain electrochemical corrosion of the metal in a pipe. This is a particularly significant parameter, as:

- It includes nearly all the factors that influence corrosivity (salt content, presence of water, etc.),
- It is very easy to measure on-site (using the "four points" Wenner method).

The various measurement points are chosen along the pipeline's forecast route. They are spaced at intervals determined by the topography of the land and the measured values. Soils with low resistivity tend to be highly corrosive and vice versa. Where the measured resistivity is less than 3,000 Ω per cm, it may be necessary to confirm the measurements with a soil sample at the depth at which the pipe is to be laid, and having its pH and its gross and minimum resistivity measured in a laboratory.



Protection solutions for highly aggressive soils

Experience acquired by PAM over several decades shows that a large proportion of soils is only weakly or moderately corrosive, enabling PAM pipes to be safely used with their standard, zinc, or ZINALIUM external protection.

PAM's offering is structured around 2 levels of protection:

- Standard solution – ZINALIUM for DN 60 to 600 (700 to 1000 alternatively) range and zinc for DN 700 to 2000 products for the vast majority of circumstances
- Special solution – TT PE for the DN 80 to 700 range, and TT PUX for DN 800 to 2000 products

Active versus passive protections?

The standard external protection for ductile iron pipes is generally based on the "active protection" principle.

Active protections Zinc: 200 g/m ² • ZINALIUM		Passive protections TT PE • TT PUX	
Advantages	Limitations	Advantages	Limitations
<ul style="list-style-type: none"> Long service life in most soils Easy transport and installation Self-healing process if damaged Suitable for use with natural backfill Excellent value for money 	<ul style="list-style-type: none"> Not suitable for use in extremely aggressive soils (a few % of cases) Not suitable for use in the presence of stray currents 	<ul style="list-style-type: none"> Resistant to extremely aggressive soils Suitable for use in the presence of stray currents 	<ul style="list-style-type: none"> Susceptible to damage during transport Particular attention required when selecting and laying backfill No self-healing process Higher cost

The technical solutions implemented in the TT PE and PUX ranges are covered by the following European standards:

	DN 80 to 700	DN 800 to 1200	DN 1400 to 2000
Pipes / Standard	TT PE / EN 14628	TT PUX / EN 15189	TT PUX / EN 15189
Fittings / Standard	Epoxy / EN 14901	Epoxy / EN 14901	Polyurethane / EN 15655

Material	Specifications
Polyethylene	Polyethylene is produced by polymerization of ethylene monomer (CH ₂ = CH ₂) into a complex structure with the generic formula: – (CH ₂ – CH ₂) _n – High-density polyethylene has a density in excess of 0,94 g./cm ³
Polyurethane	Polyurethane is obtained by polymerizing urethane, an organic molecule. Urethanes are produced by a reaction between an isocyanate and an alcohol
EPOXY	Epoxy is the short form of the word epoxide. The term epoxy covers several epoxide molecules and, by extension, polyepoxide polymers. Once polymerized, epoxy is almost inert to oxygen and acts as a barrier

Tramways - TT PE and TT PUX offer the ideal solutions

Over the last few years, tramways have been making a comeback as a means of urban public transport. Stray currents generated by the tramway's electric power supply system can corrode metal unless appropriate protective measures are taken.

TT PE and TT PUX coatings are the best answer to this problem. The dielectric properties of the polyethylene or polyurethane layers dependably insulate ductile iron pipes against the effects of stray currents. Alternative coatings, particularly those based on cementitious materials, are unable to compete with this level of electrical insulation.



Field of use - Different coatings for different soil conditions

Specifications for ductile iron pipes' external coatings in accordance with the European Standard EN 545: 2010 and international Standard ISO 2531: 2009.

Location	External coating		Range TT, PE or PUX
	ZINALIUM ZnAl 85-15 400 g/m ²	Zn 200 g/m ²	
Above the water table	No limit (except specific situations described below)	Approved for soils with resistivity** greater than 1500 Ω.cm	APPROVED
In the water table	Approved for soils below the water table with resistivity greater than 500 Ω.cm	Approved for soils below the water table with resistivity** greater than 2500 Ω.cm	APPROVED
Acidic soils	PROHIBITED in acidic peaty soils	PROHIBITED in soils with pH ratings below 6 or with high acid reserves	APPROVED
Mixed soils	APPROVED	CAUTION! Additional analysis required on a case-by-case basis	APPROVED
Soils containing refuse, ash, slag or pollution resulting from solid or liquid industrial waste	PROHIBITED	PROHIBITED	APPROVED
Stray currents	PROHIBITED	PROHIBITED	APPROVED
Available in the PAM range	DN 60 to 600***	DN 700 to 2000*	DN 80 to 2000

* Available on request in DN 100 to 600

** Resistivity measured of the laying depth of the pipe

*** Available on request from DN 700 to 1000

New European standards

The TT range complies with the four recently-introduced European standards relating to special coatings for ductile iron pipe systems.

BRITISH STANDARD

BS EN
14628:2005

**Ductile iron pipes,
fittings and
accessories — External
polyethylene coating
for pipes —
Requirements and test
methods**

The European Standard EN 14628:2005 has the status of a
British Standard

ICS 23.040.10; 23.040.40

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BRITISH STANDARD

BS EN
15189:2006

**Ductile iron pipes,
fittings and
accessories — External
polyurethane coating
for pipes —
Requirements and test
methods**

The European Standard EN 15189:2006 has the status of a
British Standard

ICS 23.040.01; 23.020.00

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BRITISH STANDARD

BS EN
14901:2006

**Ductile iron pipes,
fittings and
accessories — Epoxy
coating (heavy duty) of
ductile iron fittings and
accessories —
Requirements and test
methods**

The European Standard EN 14901:2006 has the status of a
British Standard

ICS 23.040.10; 23.040.40; 23.220.00

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BRITISH STANDARD

BS EN 15655:2009

**Ductile iron
pipes, fittings and
accessories — Internal
polyurethane lining for
pipes and fittings —
Requirements and test
methods**

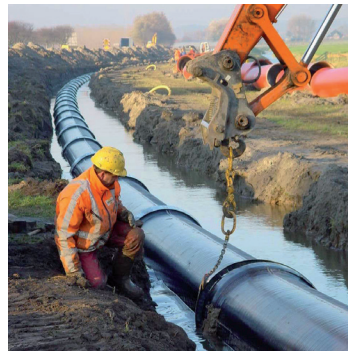
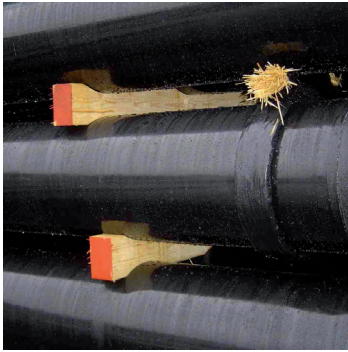
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Standards available at www.afnor.org
and www.bsigroup.com

The TT range on-site!





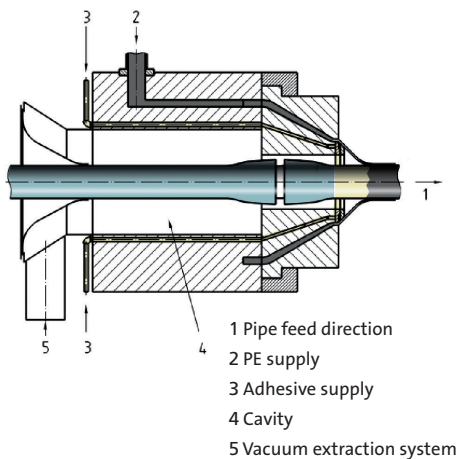
TT PE range - DN 80 to 700

A polyethylene coating applied in PAM factories

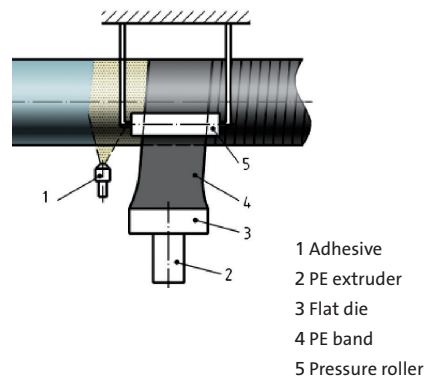
The polyethylene coating is extruded over the pipes at PAM plants. By performing this process in-house, the company is able to carefully monitor and control the conditions in which the coating is applied. After being coated, each pipe is individually tested using a holiday detector, to check that the coating affords uninterrupted protection by forming a sealed barrier against the external environment.

Two different manufacturing processes are used, depending on the diameter range:

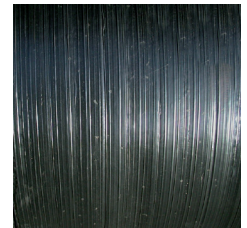
Annular coextrusion for DN 80 to 500



Lateral extrusion for DN 600 and 700



Appearance of the TT-PE coating for DN ≤ 500



Appearance of the TT-PE coating for DN > 500

Exacting specifications

The polyethylene layer is thick enough to totally protect ductile iron pipes both in extremely aggressive soils and during transport and handling operations.

Thickness of the HDPE layer, as specified in EN 14628

	DN 80 to 100	DN 125 to 250	DN 300 to 450	DN 500 to 700
Thickness (µm)	1800	2000	2200	2500

NB:
1 mm = 1000 µm

Beware of imitations!

Lateral extruded TT PE pipes should not be confused with pipes covered with self-adhesive strips of PE material.

Lateral extrusion ensures that pipes are continuously protected and the PE layers fully welded.

Only PE coatings applied by annular coextrusion or lateral extrusion comply with the European standard EN 14628.

TT PE range - DN 80 to 700

Coating of the TT PE range satisfies an extremely detailed set of specifications that ensure outstanding performances.

Technical specifications of the high-density polyethylene coating, as specified in EN 14628

N°	Parameter	Requirement Refer to EN 14628 for precise definition of the test methods
1	Peeling resistance	10 N (on zinc-plated surface)
2	Shock resistance	Figure 2, category A
3	Indentation resistance	< 0,3 mm
4	Rupture elongation	> 200 %
5	Specific resistance of the coating when placed in a 0.1 M NaCl solution	> 10 ⁸ Ωm ²
6	Ratio of resistance	> 0,8
7	Thermal ageing, 100 days, 100°C	< ±35 %
8	Light ageing, 100 days, xenon arc lamp	< ±35 %
9	Saponification properties of the adhesive	Saponification value < 3 mg KOH/g

High-density polyethylene specifications, as defined in EN 14628

Property	Standard	Requirement
Fluidity value	EN ISO 1133	0,2 g/10 min at 1,0 g/10 min
Density	EN ISO 1183-1	0,910 g/cm ³ at 0,960 g/cm ³

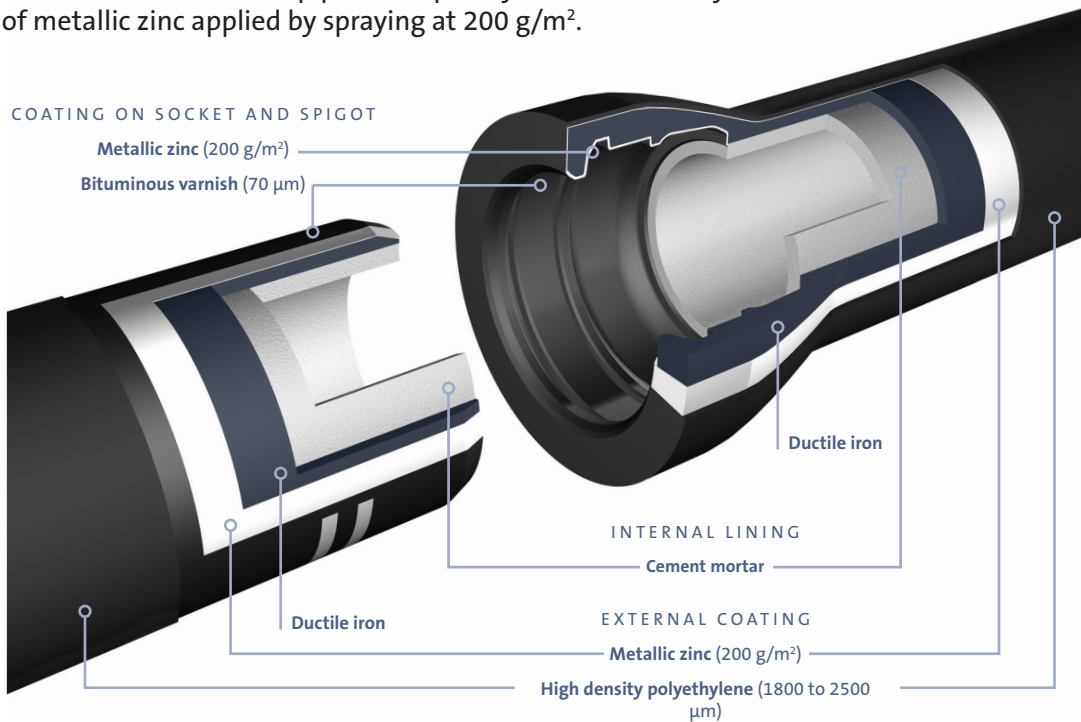
Polyethylene adherence is ensured on the whole surface of the pipe by a regular layer of high-performance adhesive, specially chosen for its durability.

Adhesive specifications, as defined in EN 14628

Property	Standard	Requirement
Softening point	EN 1238	70 to 112°C
Saponification value	EN ISO 3681	< 3 mg KOH/g
Viscosity	EN ISO 3219	> 4 000 mPa.s at 180 °C Thermosel Brookfield Sp 21/5 min ⁻¹

Detailed view of the TT PE pipe protection system

The outer surface of the pipe is completely coated with a layer of metallic zinc applied by spraying at 200 g/m².



The STANDARD TT PE coating is intended for use at permanent operating temperatures up to 50°C. For further information about applications involving high storage temperatures, please contact our sales engineers.

Joints' specific protection

Joints' protection system consists of:

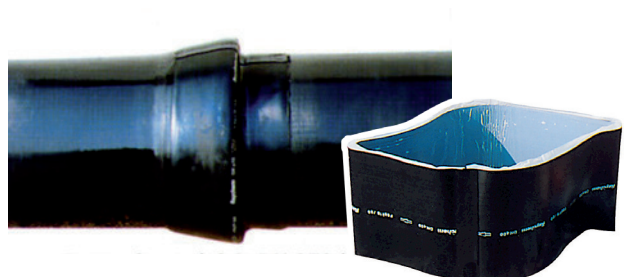
- An elastomer sleeve, for DN 80 to 300
- A heat-shrink collar, for DN 350 to 700

When using pipes with anchored joints (STANDARD Vi, UNIVERSAL Vi or STANDARD Ve) in a saline external environment, a heat-shrink collar must be used instead of the standard elastomer sleeve.



DN 80 to 300

Joints protected by an elastomer sleeve



DN 350 to 700

Joints protected by a heat-shrink collar



TT PUX range - DN 800 to 2000

A polyurethane coating applied in PAM factories

The polyurethane coating is applied on pipes at PAM plants. By performing this process in-house, the company is able to carefully monitor and control the conditions in which the coating is applied. After being coated, each pipe is individually tested using a holiday detector, to check that the coating affords uninterrupted protection by forming a sealed barrier against the external environment.

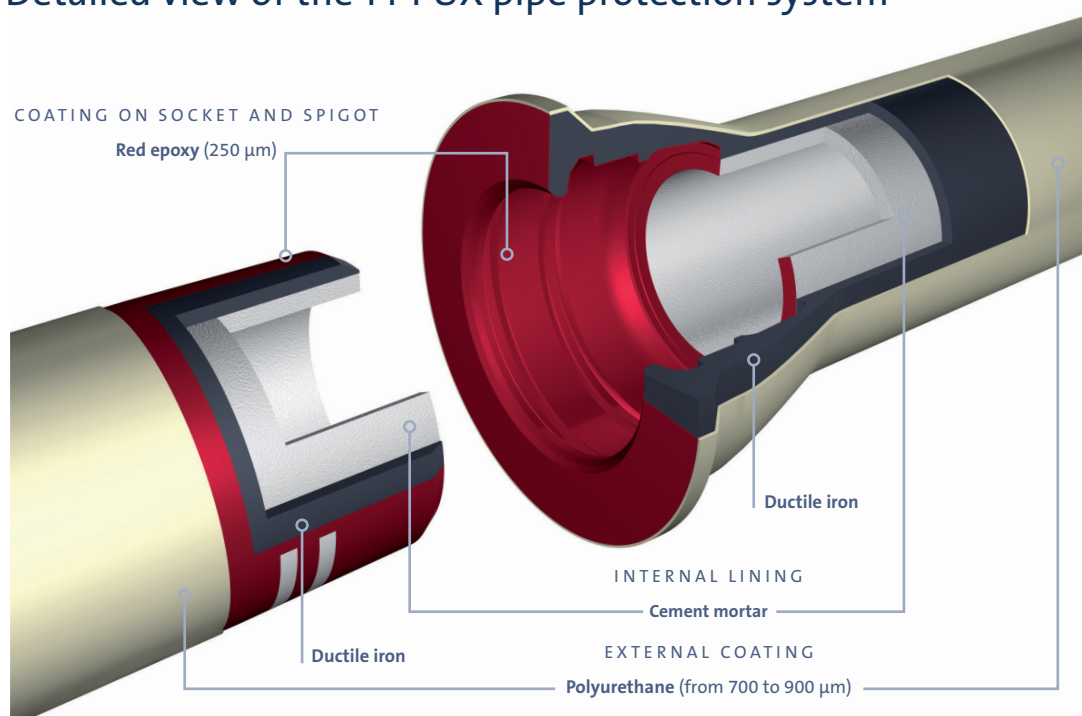
The polyurethane used by PAM is a solvent-free two-component system. The pipe is prepared by shotblasting it and then heating it to a temperature at which the coating can be applied by spraying it on.

For the pipes of PAM's TT PUX range:

- The pipe barrel is coated with polyurethane
- The spigot and socket are coated with epoxy resin

Epoxy resin (which complies with the standard EN 14901) is used instead of polyurethane at the spigot end and inside the socket as it provides equivalent protection with a thinner coating. This enables greater control over joint's insertion conditions.

Detailed view of the TT PUX pipe protection system





"Hot climate" applications

In countries with hot climates (in particular certain African and Middle Eastern countries), PAM can provide TT PUX pipes for DN 100 to 700.

Contact our sales engineers for more detailed specifications relating to these complementary products, and the situations in which it is better to choose the TT PUX range.

TT PUX range - DN 800 to 2000

Exacting specifications

The polyurethane layer is thick enough to totally protect ductile iron pipes both in extremely aggressive soils and during transport and handling operations.

Coating thickness of TT PUX pipes

	Barrel	Socket	Spigot
Average thickness (µm)	900	250	250
Minimum thickness (µm)	700	200	200
Material	Polyurethane	Epoxy	Epoxy

NB : 1 mm = 1000 µm

Technical specifications of the polyurethane coating, as per EN 15189

N°	Parameter	Requirement
		Refer to EN 15189 for precise definition of the test methods
1	Chemical resistance	Less than 15% weight increase after being submerged in deionised water. Less than 2% weight loss after drying.
1	Chemical resistance	Less than 10 % weight increase after being submerged in sulphuric acid. Less than 4 % weight loss after drying.
2	Shock resistance	8 J/mm of PU on the polyurethane-coated pipe barrel
3	Indentation resistance	< 10 % at 10 MPa
4	Rupture elongation	> 2.5 %
5	Specific resistance of the coating when placed in a 0.1 M NaCl solution	> 10 ⁸ Ω.m ²
6	Resistance ratio	> 0.8
7	Adherence	> 8 MPa at 23°C
8	Non-porosity	No electrical puncture when holiday detector is used

The TT PUX coating is suitable for use at permanent operating temperatures up to 50°C.

Simplified specific protection for joints

Like other ductile iron pipe systems, TT PUX pipes are easy to lay, thanks to the epoxy coating on both ends of pipes. No additional protection operations are required on site after pipe sections have been assembled, except where anchored joints are used. (a special coating must be applied on the joints, see the "Working with the TT PUX range" section).

Fittings coatings

An epoxy coating compliant with the European standard EN 14901

The epoxy coating process for fittings involves shotblasting and heating of the fitting before application of epoxy powder. Two processes can be used to apply the powder:

- Spraying with an electrostatic spray gun
- Dipping in a fluidized bed

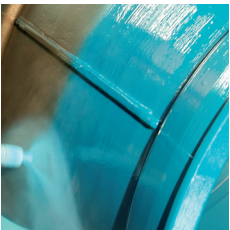
The blue epoxy coating has an average thickness of at least 250 μm (see technical specifications in the table below)

The surface to be coated must be perfectly clean and free from oil, grease and moisture. It must comply with the requirements for preparation standard Sa 2.5, as defined in EN ISO 8501-1.

Fittings coated with this type of coating are suitable for use buried in corrosive and highly-corrosive soils, or for carrying aggressive or corrosive water.

Technical specifications of the epoxy coating, as per EN 14901

N°	Parameter	Requirement Refer to EN 14901 for a precise definition of the test methods
1	Shock resistance	No electrical puncture permitted following a 5 J shock.
2	Indentation resistance	The measured indentation depth must not exceed 30% of the coating thickness initially measured.
3	Non-porosity	The coated surface must remain non-porous when subjected a voltage of 1,500 V (except in designated singular areas).
4	Epoxy coating cross-linkage	Methylisobutylcetone test.
5	Resistance to thermal ageing in air	No electrical puncture permitted.
6	Resistance to thermal ageing in water	Adherence ≥ 6 MPa.
7	Adherence	Average value ≥ 8 MPa.
8	Thickness	≥ 250 μm .



Applying powder using a spray gun



Applying powder by dipping in a fluidized bed

When used in the conditions for which they are designed, in permanent or temporary contact with water intended for human consumption, coatings applied to ductile iron fittings and accessories must not under any circumstances affect the quality of the piped water to the extent that it no longer satisfies national regulatory requirements. Powder-deposited blue epoxy coating is compatible with tap water and has been granted health approval certification in France (Attestation de Conformité Sanitaire) as well as in many other countries.

The epoxy coating is suitable for use at permanent operating temperatures up to 50°C.



A polyurethane coating compliant with the European standard EN 15655

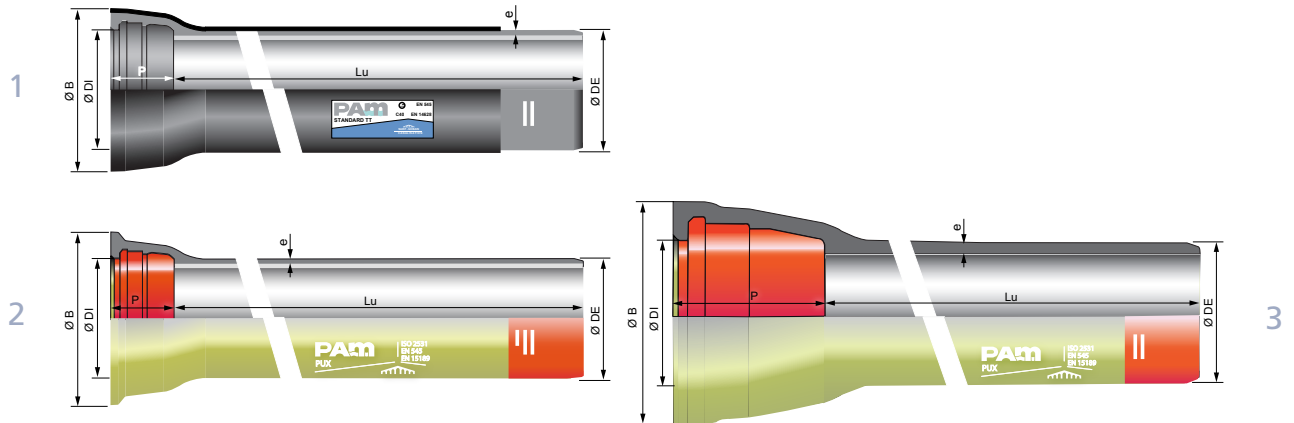
The polyurethane coating can be used as an alternative to the epoxy coating applied to fittings. Polyurethane is of particular benefit when manufacturing very large products.

The average thickness of the polyurethane coating is greater than 1300 µm in the case of products up to DN 200, and exceeds 1500 µm for larger diameters.* The polyurethane coating has very similar technical specifications to the epoxy coating, albeit adapted for the material's specificities (refer to the standard EN 15655 for detailed specifications). The polyurethane coating is suitable for use at permanent operating temperatures up to 45°C.



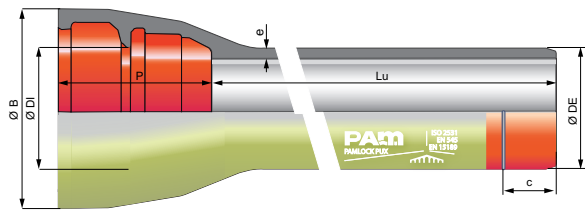
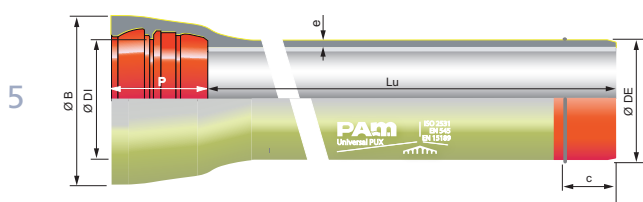
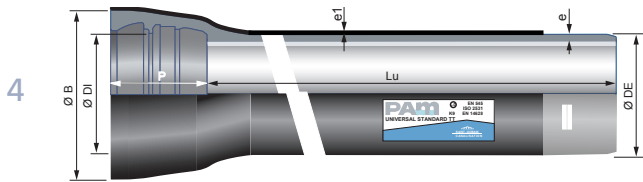
* Minimum thickness > 800 µm

Pipe specifications



STANDARD TT PE and PUX pipes

DN	L m	Class	e nominal mm	DE mm	DI mm	P mm	B mm	TT weight kg	Coating type	Min. thick coating µm
80	6.00	C40	4.4	98.0	101.4	92.5	167.0	76.8	PE	1800
100	6.00	C40	4.4	118.0	121.4	94.5	188.0	93.5	PE	2000
125	6.00	C40	4.4	144.0	147.4	97.5	215.0	115.3	PE	2000
150	6.00	C40	4.5	170.0	173.4	100.5	242.0	140.1	PE	2000
200	6.00	C40	4.7	222.0	225.2	106.5	295.0	190.8	PE	2000
250	6.00	C40	5.5	274.0	276.8	105.5	352.0	267.3	PE	2000
300	6.00	C40	6.2	326.0	328.8	107.5	409.2	351.1	PE	2200
350	6.00	C30	6.4	378.0	380.9	110.5	464.2	425.5	PE	2200
400	6.00	C30	6.5	429.0	431.9	112.5	516.2	501.7	PE	2200
450	6.00	C30	6.9	480.0	483.0	115.5	574.2	590.9	PE	2200
500	6.00	C30	7.5	532.0	535.0	117.5	629.2	704.7	PE	2500
600	6.00	C30	8.7	635.0	638.1	132.5	738.5	942.0	PE	2500
700	6.00	C25	8.8	736.6	741.0	145.0	863.0	1161.3	PE	2500
800	6.95	C25	9.6	840.4	845.0	145.0	974.0	1591.7	PUX	700
900	6.95	C25	10.6	943.2	948.0	145.0	1082.0	1940.2	PUX	700
1000	6.95	C25	11.6	1046.0	1051.0	155.0	1191.0	2323.0	PUX	700
1100	8.19	C25	12.6	1151.0	1154.0	160.0	1300.0	3238.1	PUX	700
1200	8.18	C25	13.6	1252.3	1258.0	165.0	1412.0	3775.9	PUX	700
1400	8.17	C25	15.7	1462.0	1465.0	245.0	1592.0	5182.5	PUX	700
1500	8.16	C25	16.7	1565.0	1568.0	265.0	1710.0	5877.8	PUX	700
1600	8.16	C25	17.7	1668.0	1671.0	265.0	1816.0	6589.4	PUX	700
1800	8.14	C25	19.7	1875.0	1878.0	275.0	2032.0	8109.7	PUX	700
2000	8.13	C25	21.8	2082.0	2085.0	290.0	2253.0	9837.6	PUX	700



6

UNIVERSAL and PAMLOCK TT PE and PUX pipes

DN	L m	Class	e* nominal mm	DE mm	DI mm	P mm	B mm	Bead length mm	TT weight kg	Coating type	Min. thick coating µm
80	6.00	C100	6.1	98,0	100.5	112.0	159.0	-	97.9		1800
100	5.95	C100	6.1	118.0	128.0	140.0	188.0	90	120.4	PE	2000
125	5.95	C64	6.1	144.0	153.0	140.0	215.0	87	149.4	PE	2000
150	6.00	C64	6.2	170.0	180.0	148.0	230.0	95	179.8	PE	2000
200	5.96	C64	6.5	222.0	232.0	155.0	290.0	100	246.9	PE	2000
250	5.95	C50	6.8	274.0	284.0	166.0	350.0	110	320.9	PE	2000
300	5.95	C50	7.4	326.0	336.0	180.0	408.0	115	413.9	PE	2200
350	5.97	C40	7.7	378.0	389.0	184.0	463.0	115	512.9	PE	2200
400	5.97	C40	8.1	429.0	440.0	176.0	510.0	113	602.9	PE	2200
450	5.97	C40	8.6	480.0	491.0	190.0	570.0	120	718.9	PE	2200
500	5.97	C40	9.3	532.0	544.0	200.0	625.0	125	854.2	PE	2500
600	5.97	C40	10.9	635.0	647.0	209.0	740.0	135	1148.8	PE	2500
700	5.97	C30	10.8	736.6	741.7	256.0	855.0	158	1399.9	PE	2500
800	6.89	C30	11.7	840.4	845.8	261.0	980.0	150	1915.5	PUX	700
900	6.87	C30	12.6	943.2	948.9	280.0	1087.0	155	2332.1	PUX	700
1000	6.88	C30	13.5	1046.0	1052.0	279.5	1191.0	165	2696.6	PUX	700
1200	8.15	C30	16.5	1252.3	1260.0	279.5	1415.0	170	4515.8	PUX	700
1400	8.12	C25	17.1	1462.0	1465.0	300.0	1620.0	170	5601.8	PUX	700
1500	8.11	C25	18.0	1565.0	1568.0	315.0	1758.0	180	6330.8	PUX	700
1600	8.11	C25	18.9	1668.0	1671.0	325.0	1868.0	195	7069.4	PUX	700
1800	8.08	C25	20.7	1875.0	1878.0	350.0	1950.0	222	8602.4	PUX	700
2000	Contact us	Contact us	Contact us	Contact us	Contact us	Contact us	Contact us	Contact us	Contact us	PUX	700

* : PAM internal specifications. Pipe wall thickness may be higher than the values specified in ISO 2531:2009 or EN 545:2010 in order to guarantee the PFA, PMA and PEA values given in tables pages 24 and 25 of the anchored joints.

Pipe specifications

Standard TT PE range DN 80 to 700

	STANDARD TT PE	UNIVERSAL TT PE ^A	Flange ^B
Pipe coating	PE	PE	Epoxy powder
Fittings coatings	Epoxy powder	Epoxy powder	Epoxy powder
Pipe	DN 80 to 700	DN 80 to 700	DN 40 to 700
Bend	DN 60 to 700	DN 80 to 700	DN 40 to 700
1/8 Bend	DN 60 to 700	DN 80 to 700	DN 40 to 700
1/12 Bend	-	DN 80 to 700	-
1/16 Bend	DN 60 to 700	DN 80 to 700	DN 40 to 700
1/32 Bend	DN 60 to 700	DN 80 to 700	DN 40 to 700
Duckfoot bend	-	-	DN 40 to 700
Taper	DN 60 to 700	DN 100 to 700	DN 40 to 700
Collar	-	-	DN 40 to 700
2-socket tee	DN 60 to 700	DN 100 to 700	-
3-socket tee	DN 60 to 700	DN 100 to 700	-
3-Spigot tee	-	-	DN 40 to 700
Washout tee	DN 250 to 700	-	DN 40 to 700
Level invert tee	DN 150 to 700	-	DN 40 to 700
Cross	-	-	DN 80 to 600
Flanged socket	DN 60 to 700	DN 80 to 700	-
Flanged spigot	DN 60 to 700	DN 80 to 700	-
Blank flange	-	-	DN 80 to 700
Reducing flange	-	-	DN 100 to 700
Non-anchored joint	STANDARD DN 60 to 700	DN 80 to 700	Reinforced flat joint
Anchored joint with inserts	STANDARD Vi DN 60 to 600	UNIVERSAL Vi DN 80 to 600	-
Anchored joint with bead	-	UNIVERSAL Ve DN 100 to 700	-

^A UNIVERSAL fittings DN 350 and 450 not yet available

^B Flanged parts with PN 10, 16 and 25 flanges. PN 40 flanges for certain DN's. Please contact us.

Other flanged parts also available. Please contact us. DN 40 to 600: Rotatable flanges. DN 700: Fixed flanges.

Joint's protection

-	DN 80 to 300	DN 350 to 700
STANDARD TT PE	Elastomer sleeve	Heat-shrink collar



Standard TT PUX range - DN 800 to 2000

	STANDARD TT PUX	UNIVERSAL/PAMLOCK TT PUX ^A	Flange ^B
Pipe coating	PU	PU	Epoxy powder or PU
Fittings coatings	Epoxy powder or PU	Epoxy powder or PU	Epoxy powder or PU
Pipe ^D	DN 800 to 2000	DN 800 to 1800	DN 800 to 2000
Bend	DN 800 to 1000	-	DN 800 to 1200
1/8 Bend	DN 800 to 2000	DN 800 to 1800	DN 800 to 2000
1/16 Bend	DN 800 to 2000	DN 800 to 1800	DN 800 to 2000
1/32 Bend	DN 800 to 2000	DN 800 to 1800	DN 800 to 2000
Duckfoot bend	-	-	DN 800 to 1200
Taper	DN 800 to 2000	DN 1400	DN 800 to 2000
Collar	Use EXPRESS collar ^C	-	DN 800 to 1200
2-Socket tee	DN 800 to 2000	DN 800 to 1800	-
3-Socket tee	DN 800 to 2000	-	-
3-Spigot tee	-	-	DN 800 to 2000
Washout tee	DN 800 to 2000	-	DN 800 to 1600
Level invert tee	DN 800 to 1600	-	DN 800 to 2000
Flanged socket	DN 800 to 2000	DN 800 to 1800	-
Flanged spigot	DN 800 to 2000	DN 800 to 1800	-
Blank flange	-	-	DN 800 to 2000
Reducing flange	-	-	DN 800 to 1600
Non-anchored joint	STANDARD DN 800 to 2000	DN 800 to 1800	Reinforced flat joint
Anchored joint with bead	STANDARD Ve DN 800 to 1200	UNIVERSAL Ve/PAMLOCK DN 700 to 1800	-

^A UNIVERSAL Ve from DN 800 to 1200 and PAMLOCK from DN 1400 to 1800. UNIVERSAL DN 1100 not available. For DN 2000, please contact us.

^B Flanged parts with PN 10, 16 and 25 flanges. PN 40 flanges for certain DN's. Other flanged parts also available. Please contact us.
DN 40 to 600: Rotatable flanges. DN 700 and above: Fixed flanges.

^C EXPRESS collar available in DN 800, 900, 1000, 1100, 1200, 1400 and 1600. The DN 1500, 1800 and 2000 are currently under development (release date: 2011)

^D For DN 80 to 700, Please consult us.

Note: Certain fittings may not exist in DN 1100. Please contact us.

Joint's protection

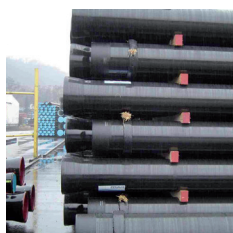
-	DN 80 to 300	DN 350 to 700	DN 800 to 2000
STANDARD TT PUX	No additional protection	No additional protection	No additional protection

However, where anchored joints are used, a special coating must be applied on the joints (see the "Working with the TT PUX range" section).



Joins and anchoring solutions' performances

TT PE range - DN 80 to 700

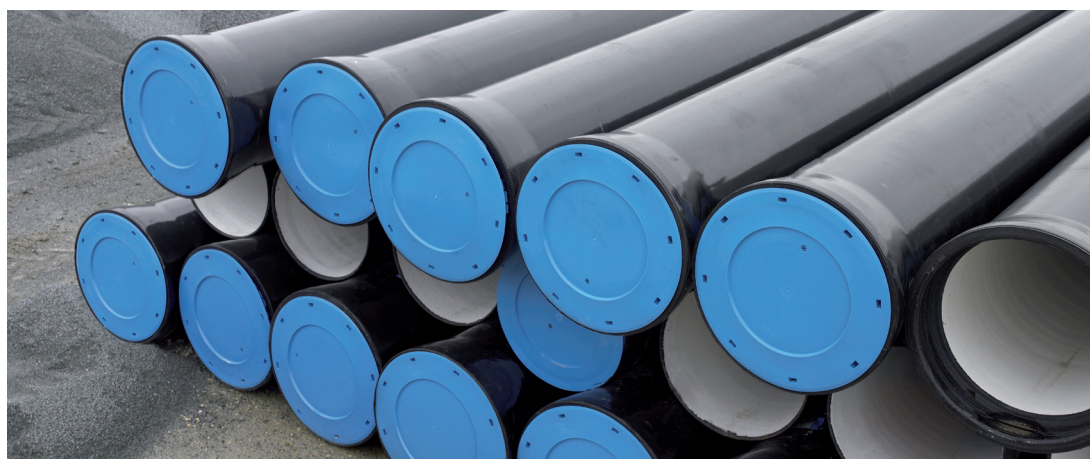


Protection of TT PE pipes for transport

DN	Class				PFA bar				PMA bar				PEA bar				Angular deflection (°)			
	STANDARD TT PE	STANDARD TT PE Vi	UNIVERSAL TT PE Vi*	UNIVERSAL TT PE Ve*	STANDARD TT PE	STANDARD TT PE Vi	UNIVERSAL TT PE Vi	UNIVERSAL TT PE Ve	STANDARD TT PE	STANDARD TT PE Vi	UNIVERSAL TT PE Vi	UNIVERSAL TT PE Ve	STANDARD TT PE	STANDARD TT PE Vi	UNIVERSAL TT PE Vi	UNIVERSAL TT PE Ve	STANDARD TT PE	STANDARD TT PE Vi	UNIVERSAL TT PE Vi	UNIVERSAL TT PE Ve
80	C40	C40	C100	-	40	16	60	-	48	19	72	-	53	24	77	-	5	5	3	-
100	C40	C40	C100	C100	40	16	56	64	48	19	67	77	53	24	72	82	5	5	3	3
125	C40	C40	C64	C64	40	16	52	64	48	19	62	77	53	24	67	82	5	5	3	3
150	C40	C40	C64	C64	40	16	48	60	48	19	58	72	53	24	63	77	5	5	3	3
200	C40	C40	C64	C64	40	16	43	52	48	19	52	62	53	24	57	67	5	4	3	3
250	C40	C40	C50	C50	40	16	39	46	48	19	47	55	53	24	52	60	5	4	3	3
300	C40	C40	C50	C50	40	16	34	41	48	19	41	49	53	24	46	54	5	4	3	3
350	C30	C30	C40	C40	30	16	25	38	36	19	30	46	41	24	35	51	4	3	3	3
400	C30	C30	C40	C40	30	16	20	35	36	19	24	42	41	24	29	47	4	2	3	3
450	C30	C30	C40	C40	30	13	16	32	36	16	19	38	41	21	24	43	4	2	3	3
500	C30	C30	C40	C40	30	11	16	30	36	13	19	36	41	18	24	41	4	2	2	3
600	C30	C30	C40	C40	30	10	16	30	36	12	19	36	41	17	24	41	4	2	2	2
700	C25	C25	C30	C30	25	-	-	27	30	-	-	32	35	-	-	37	4	-	-	2

* : refer to note page 21

Note: Contact us for Standard TT PUX Ve in diameter 100 to 700.



TT PUX range - DN 800 to 2000

DN	Class				PFA bar			PMA bar				PEA bar			Angular deflection (°)					
	STANDARD TT PUX	STANDARD TT PUX Ve	UNIVERSAL TT PUX Ve*	PAMLOCK TT PUX*	STANDARD TT PUX	STANDARD TT PUX Ve	UNIVERSAL TT PUX Ve	PAMLOCK TT PUX	STANDARD TT PUX	STANDARD TT PUX Ve	UNIVERSAL TT PUX Ve	PAMLOCK TT PUX	STANDARD TT PUX	STANDARD TT PUX Ve	UNIVERSAL TT PUX Ve	PAMLOCK TT PUX	STANDARD TT PUX	STANDARD TT PUX Ve	UNIVERSAL TT PUX Ve	PAMLOCK TT PUX
800	C25	C25	C30	-	25	16 ^A 20 ^B	25	-	30	19 ^A 24 ^B	30	-	35	24 ^A 29 ^B	35	-	4	2	2	-
900	C25	C25	C30	-	25	16 ^A 20 ^B	25	-	30	19 ^A 24 ^B	30	-	35	24 ^A 29 ^B	35	-	4	1.5	1.5	-
1000	C25	C25	C30	-	25	16 ^A 20 ^B	25	-	30	19 ^A 24 ^B	30	-	35	24 ^A 29 ^B	35	-	4	1.5	1.2	-
1100	C25	C25	-	-	25	16 ^A 20 ^B	-	-	30	19 ^A 24 ^B	-	-	35	24 ^A 29 ^B	-	-	4	1.5	-	-
1200	C25	C25	C25/ C30**	-	25	16 ^A 20 ^B	20/25	-	30	19 ^A 24 ^B	24/29	-	35	24 ^A 29 ^B	29/55	-	4	1.5	1.2	-
1400	C25	-	-	C25	25	-	-	25	30	-	-	30	35	-	-	35	3	-	-	1
1500	C25	-	-	C25	25	-	-	25	30	-	-	30	35	-	-	35	3	-	-	1
1600	C25	-	-	C25	25	-	-	25	30	-	-	30	35	-	-	35	3	-	-	1
1800	C25	-	-	C25	25	-	-	16	30	-	-	19	35	-	-	24	2.5	-	-	0.8
2000	C25	-	-	C25	25	-	-	-	30	-	-	-	25	-	-	-	2	-	-	-



Protection of TT PUX pipes for transport

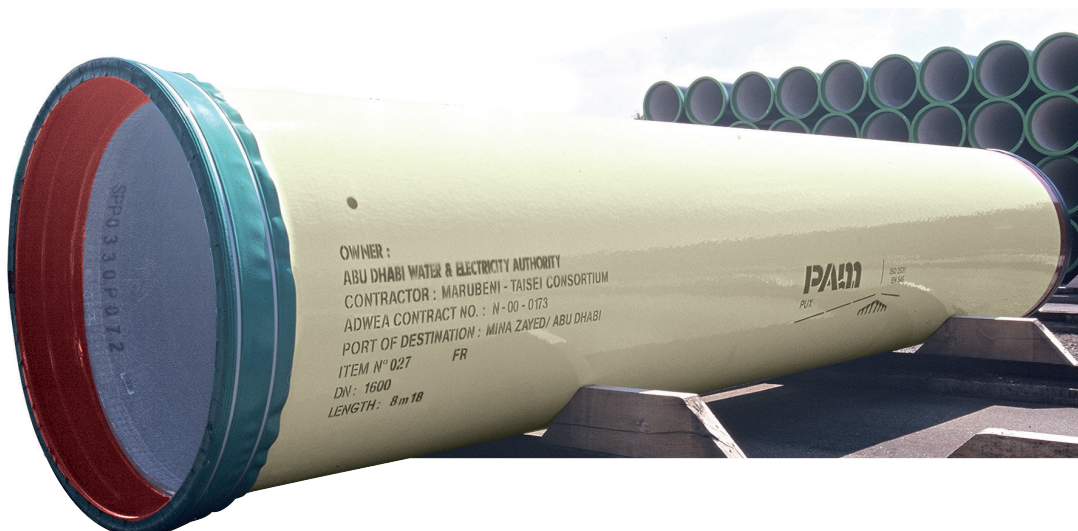
* : Refer to note page 21

** : available in C25 or C30

^A Values obtained with iron bolts

^b Values obtained with specific bolts and support plates

The EXPRESS joint of collars has a PFA of 25 bar.





Working with the TT PE range

Storing pipes and fittings

Pipes and fittings must be stored on flat ground that has been cleared of any projecting stones.

Fittings should be stored arranged by type and by diameter, on planks or timber supports. They should not be stacked unless suitable protection is inserted between its parts to prevent damage to the epoxy coating.

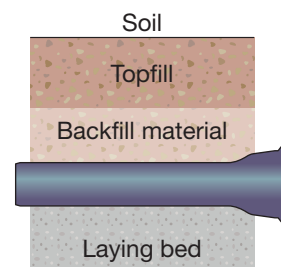
Earthworks

If the ground at the site is likely to damage the coating (due to the presence of rocks, blocks of stone, etc.), a laying bed of at least 10 cm deep should be prepared.

After laying the pipeline, the same precautions apply to the backfill with which the pipeline is covered.



Markings
on TT PE pipes



Protection of joints - pipes and fittings from DN 80 to 300

- Check the chamfer at the spigot end.
- Slide the sleeve onto the pipe's spigot (phases 1 and 2).
If necessary, use lubricant paste.
- Socket the pipe and inspect the joint (phase 3).
- Fold back the sleeve (phase 4).
- Slide the sleeve over the socket to protect the joint (phases 5 and 6).



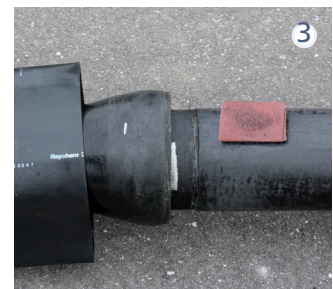
These holes make the sleeve
easier to fit. Handy!



Working with the TT PE range

Protection of joints - Pipes and fittings from DN 350 to 700

- Check the chamfer at the spigot end.
- Mark the heat-shrink collar, dividing it into three thirds (phase 1).
- Slide the collar behind the socket (phase 2).
- Socket the pipe and inspect the joint (phase 3).
- Use a cloth to clean the area to be protected.
- Use abrasive paper to key an area of the polyethylene equivalent to the width of the collar, on spigot and socket (phase 3).
- Use a gas burner to warm the keyed polyethylene area (phase 4). Warm the area but do not allow the temperature to exceed 60°C.
- Remove the protective sheet inside the collar.
- Centre the collar on the joint to be protected (phase 5), with one third over the socket.
- Using a gas burner (set to low heat), heat-shrink the collar by sweeping the flame across its entire surface several times, starting at the large-diameter end of the socket (phases 6 7 8).
- The procedure is complete when adhesive can be seen overlapping slightly on each side of the sleeve (phase 9).



Cutting DN 80 to 700 pipes

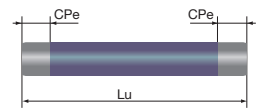
Pipe sections cannot be assembled with the polyethylene coating. The polyethylene coating must be removed and the cut prepared for as follows:

- When cutting pipes with DN up to 300, use only 2/3 of the pipe; when DN 350 or larger pipes must be cut, use only "calibrated" pipes.
- These pipes should be specified when ordering.
- Draw the cut (along the working length (Lu)), taking into account the socket's depths.
- Cut the pipe



Cutting the polyethylene coating

- Mark the boundaries of the area of polyethylene to be cut off (CPe)



Polyethylene removal area ("CPe") (mm)

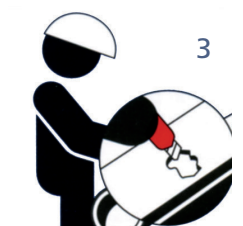
DN	80	100	125	150	200	250	300	350 - 400	450	500	600	700
STANDARD TT pipes	95	100	105	105	110	115	120	120	125	125	140	200
UNIVERSAL TT pipes	115	145	145	155	160	170	185	190	200	210	220	270

- Cut the polyethylene coating back to the metal. Use a coal chisel, cutter or pipe cutter, taking care not to chip or gouge the iron. 1
- If using a pipe cutter, bring the wheels into contact with the iron and then back them off a half-turn before making the cut.
- Make a longitudinal cut to enable the polyethylene to be lifted off.



Pre-heating and removing the polyethylene

- Use a gas burner to warm the area of polyethylene to be removed from the inside of the pipe, taking care to avoid damaging the cement mortar lining.
- Slowly raise the temperature without exceeding 40°C (it should be possible to place your bare hand on the cement lining).
- After allowing the heat to diffuse, use a coal chisel to lift the polyethylene and tear it off with pliers. The adhesive should also be removed, remaining bonded to the polyethylene. 2



Repairing DN 80 to 700 pipes

- Cut the damaged PE coating evenly and cleanly. It is essential to remove any torn polyethylene. 1 2
- Clean and dry the damaged area.
- Preheat the ductile iron to 60°C and apply mastic M to the bare metal. 3
- Smooth the mastic with a knife.
- Place the repair strip over the area thus prepared. This strip should extend for 50 mm on either side of the repair. 4
- Use a gas burner to heat the repair strip until the heat-sensitive paint changes colour. 5
- Complete the procedure by pressing down firmly on the strip, wearing a glove.





Working with the TT PUX range

Storing pipes and fittings

Pipes and fittings must be stored on flat ground that has been cleared of any projecting stones.

Fittings should be stored arranged by type and by diameter, on planks or timber supports.

They should not be stacked unless suitable protection is inserted between its parts to prevent damage to the polyurethane or epoxy coatings.

Earthworks

If the ground at the site is likely to damage the coating (due to the presence of rocks, blocks of stone, etc.), a laying bed of at least 10 cm deep should be prepared.

After laying the pipeline, the same precautions apply to the backfill with which the pipeline is covered.

Protection of joints

Considering the nature of the coating applied to these pipes and fittings, no additional protection is required for the standard joints used with these products. In case of anchored joint, a protection of the junction by a heat-shrink collar must be applied (see p.28).

Cutting DN 800 to 2000 pipes

Pipe sections can directly be assembled with the polyurethane coating.

Unless "calibrated" pipes have been ordered, a circumference meter must be used to measure the external diameter of the pipe before cutting.

Maximum external diameter, including the polyurethane coating (mm)

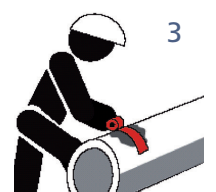
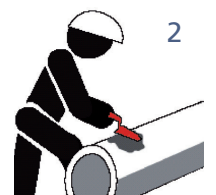
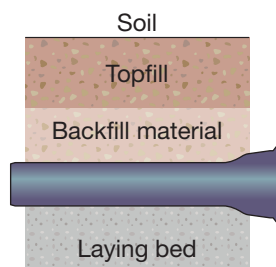
DN	800	900	1000	1100	1200	1400	1500	1600	1800	2000
Max. DE	844.2	947.2	1050.2	1153.2	1257.0	1464.2	1567.2	1670.2	1877.2	2084.2

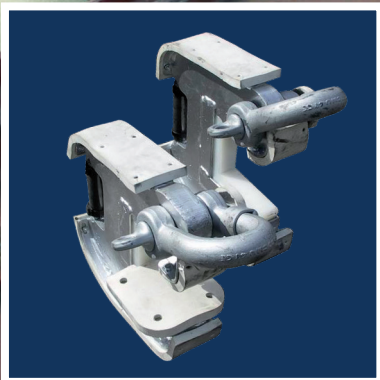
Repairing DN 800 to 2000 pipes

- Strip the damaged area, removing any areas of coating that do not adhere to the metal. Clean any surface oxidation. 1
- Use abrasive paper to key the coating around the damaged area to form a good bonding surface. 2
- Clean, degrease and preheat the surface before applying the repair product (at a temperature of approximately 50°C). 1
- Mix equal quantities of resin and hardener. Prepare small amounts at a time because the repair material remains usable for only 30 minutes at 40°C.
- Apply the mixture using a spatula. 2
- Self-adhesive strip may be applied to protect the repair, provided that the polymerization reaction is already well underway, i.e. if the product feels dry to the touch. 3



Markings
on TT PUX pipes





PAM packages TT range products with great care, to ensure that they are supplied in perfect conditions. These products should be handled using appropriate tools.

PAM supplies special handling hooks designed specifically for the TT product range. Contact us for more information.

Bred last

Working with TT fittings

Repairing the epoxy coating on DN 60 to 2000 fittings and accessories

- Strip the damaged area and clean any surface oxidation.
- Use abrasive paper to key the coating around the damaged area to form a good bonding surface.
- Clean, degrease and preheat the surface before applying the epoxy resin (at a temperature of approximately 50°C).
- Mix equal quantities of resin and hardener.
Prepare small amounts at a time because the repair material remains usable for only 30 minutes at 40°C.
- Apply the epoxy compound using a spatula or paintbrush.
- Allow to dry, away from moisture. Do not handle while the epoxy is drying



Packaging and repairing

- Packaging of TT fittings is designed to keep the protective coating intact all along the supply chain.
- In the event of damage despite these precautions, PAM supplies a range of repair products for TT pipes and fittings, to ensure that affected areas are once again fully protected.



Connecting TT PE pipes

Connecting collars, available in sizes DN 80 to 250, can be fitted directly over the HDPE coating on TT PE pipes. Bolts should be tightened to at least 8 m.daN.

For DN 300 to 700 pipes, the PE polyethylene coating must be removed before fitting the collar. The assembly must then be corrosion-protected with a heat-shrink collar (or equivalent protection).

PAM supplies a range of connecting collars with reinforced coatings for TT products.



Depending on the corrosivity risk of the soil, a heat-shrink collar may be required to provide additional protection to the connection. For further information, please contact our sales engineers.

Horizontal directional drilling

Innovative technology to minimize pipelaying-related nuisances

Economic development, technological advances and population growth have led to a huge increase in the number and diversity of buried networks' systems.

If required, trenchless pipelaying techniques such as guided horizontal directional drilling and pipe bursting offer an effective, targeted solution for limiting the impact of pipelaying works.

The pipes fitted with UNIVERSAL Ve joints and coated with special external coating of type TT PE and TT PUX are ideally suited for horizontal directional drilling and in situ laying.

The exceptional 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 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 - in 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	Contact us								

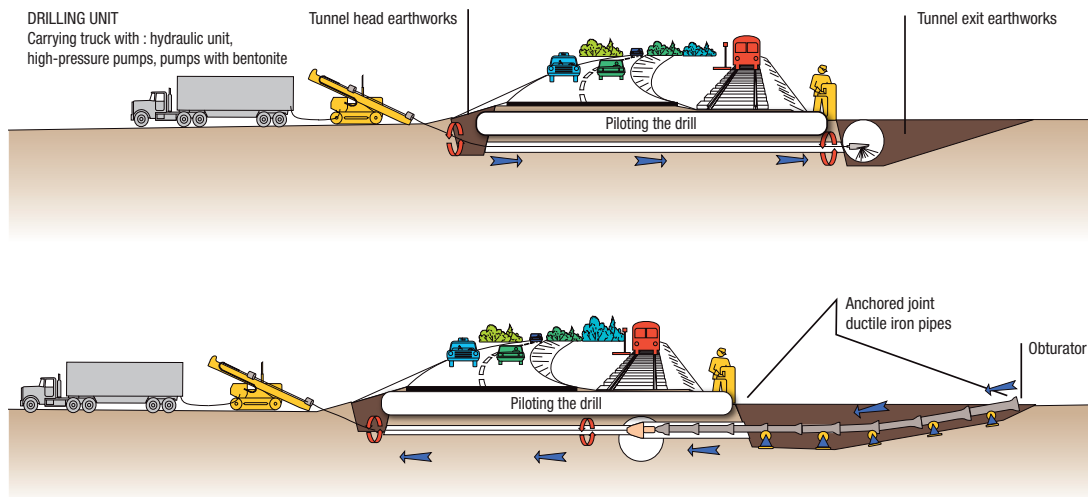


TT PE pipe train ready to be pulled by horizontal directional drilling

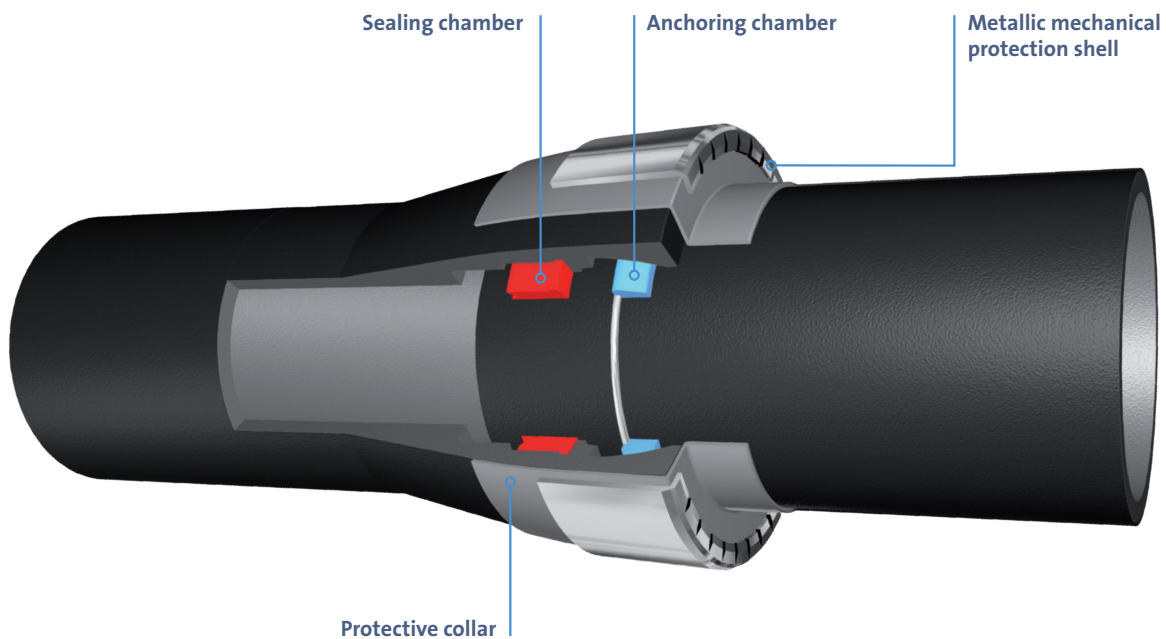
For DN exceeding 300, ballasting of pipes is a solution which allows the contractor to reduce the pulling forces.

These recommendations are based upon PAM knowledge of the products and their use. It is the contractor's responsibility to ensure that installation is carried out according to the best rules of practice.

Refer to our brochure "There are places where discretion is a paramount" for further information about PAM horizontal directional drilling range.



Detailed view of a joint used in horizontal directional drilling



Quality and environmental organization

ISO 9001

PAM develops pipe systems solutions within the framework of an ISO 9001-compliant quality management system. ISO 9001 compliance is certified by Bureau Veritas, an independent organization. This certification covers an extremely wide scope, including design, manufacturing and sales activities.

ISO 14001

As of 2009, Saint-Gobain's French facilities have all been awarded ISO 14001 certification by accredited independent organizations (Bureau Veritas and AFAQ). The Group has introduced an environmental policy with regularly-monitored, measurable objectives. This approach has set in motion a virtuous circle of continuous improvement in terms of environmental performances. This certification system is the bedrock of the environmental aspect of PAM's commitment to sustainable development

EN 545, EN 14901, EN 14628, EN 15189 and EN 15655

TT range coatings are compatible with the general standard relating to ductile iron pipelines dedicated to water supply and distribution. They also comply with the standards EN 14901, EN 14628, EN 15655 and EN 15189 (see page 8)

ACS health approval certification

TT range coatings comply with French statutory requirements relating to materials in contact with tap water. The (epoxy and black varnish) external coatings liable to come into contact with tap water (in particular at the spigot end of pipes) have been awarded a certificate of conformity (*Attestation de Conformité Sanitaire - ACS*). The same applies in the other European countries that have equivalent systems (Germany, UK, Italy, Belgium, Netherlands, etc.).



BUREAU VERITAS
Certification

Certification
Attribuée à

SAINT-GOBAIN PAM
91, Avenue de la Libération
54000 NANCY
FRANCE

SAINT GOBAIN PAM ITALIA
Via E Romagnoli 6
20146 MILANO
ITALIE

Et les sites listés en annexe

Bureau Veritas Certification certifie que le système de management de la qualité de l'entreprise susmentionnée a été évalué et jugé conforme aux exigences de la norme :

Standard

NF EN ISO 9001 : 2008

Domaine d'activité

CONCEPTION, PRODUCTION ET COMMERCIALISATION DE PRODUITS POUR CANALISATIONS ET ACCESSOIRES, APPARELS DE ROBINETTERIE ET PIÈCES DE VOIRIE.
DESIGN, MANUFACTURE AND MARKETING OF PRODUCTS FOR PIPELINES AND ACCESSORIES, VALVES AND MUNICIPAL CASTINGS.

Date de certification originale : **11 février 2009**

Sous réserve du fonctionnement continu et satisfaisant du système de management de la qualité de l'entreprise, ce certificat est valable jusqu'au : **18 janvier 2011**

Pour vérifier la validité du certificat appelez au : +33(0)4 78 66 82 40

Tout éclaircissement sur cette certification peut être obtenu auprès de l'entreprise certifiée.

Date : 15 janvier 2010
Numéro d'affaire : 1767700-A/REV1

Bruno LABARRE
Directeur Général




BUREAU EN CHINAISE : Bureau Veritas Certification France - 91, Avenue de la Libération de Metz - 54000 Nancy La Sèille
BUREAU EN ANGLAIS : Bureau Veritas Certification France - 91, Avenue de la Libération de Metz - 54000 Nancy La Sèille



BUREAU VERITAS
Certification

Certification
Attribuée à

SAINT GOBAIN PAM

Usine de Pont-à-Mousson - Avenue Camille Cavallier - BP 129 - 54700 PONT-A-MOUSSON
FRANCE

Bureau Veritas Certification certifie que le système de management de l'environnement de l'entreprise susmentionnée a été évalué et jugé conforme aux exigences de la norme :

Standard

NF EN ISO 14001 : 2004

Domaine d'activité

Conception de canalisations pour l'eau et l'assainissement, fabrication de tuyaux en fonte.
Concepción de canalizaciones para el agua y el saneamiento, fabricación de tuberías en fundición.
Design of pipelines for water and sewage, manufacture of cast iron pipes.
Progettazione di condotte per l'acqua e la fognatura, fabbricazione di tubazioni in ghisa.
Konzeption von Rohrleitungsbauanteilen für Wasser- und Abwasserentsorgung, Herstellung von Rohren aus Guss Eisen.

Date de certification originale : **17 février 2009**

Sous réserve du fonctionnement continu et satisfaisant du système de management de l'environnement de l'entreprise, ce certificat est valable jusqu'au : **17 février 2012**

Pour vérifier la validité du certificat appelez au : +33(0)4 78 66 82 40


Tout éclaircissement sur cette certification peut être obtenu auprès de l'entreprise certifiée.

Date : 15 avril 2009
Numéro d'affaire : 1 624 326 A

Bruno LABARRE
Directeur Général




BUREAU EN CHINAISE : Bureau Veritas Certification France - 91, Avenue de la Libération de Metz - 54000 Nancy La Sèille
BUREAU EN ANGLAIS : Bureau Veritas Certification France - 91, Avenue de la Libération de Metz - 54000 Nancy La Sèille



ATTESTATION DE CONFORMITE
ATTESTATION OF CONFORMITY
N° CB188/09/1861611.C.TG N° 40

Le soussigné, Thierry GARCIA, Expert.
The undersigned, Thierry GARCIA, Surveyor.

Agissant dans le cadre des conditions générales d'intervention de la Division France de Bureau Veritas, et à la demande de la société
Acting within the scope of the general conditions of the division France of Bureau Veritas and at the request of



SAINT GOBAIN PAM
91, Avenue de la Libération
54076 NANCY CEDEX

Certifie que :
Certifies that :


Les tuyaux, raccords et accessoires en fonte ductile et leurs assemblages pour canalisation d'eau diamètre DN 60 à DN 2000 de SAINT-GOBAIN PAM
The ductile iron pipes, fittings and accessories and their joints DN 60 to DN 2000 from SAINT-GOBAIN PAM

Sont conformes aux exigences de la Norme Européenne EN545-2006.
Complies with the requirements of the European Standard EN545-2006.

Fait à Saint Julien Les Metz, le 12/05/2008
Issued at Saint-Julien-Les-Metz on 12/05/2008

Thierry Garcia
Inspecteur Sct Industrie de Metz
Surveyor Industry Department Metz



ATTESTATION
Issuing center : METZ
CB188/10/2139190/8.C.TG n° 2

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 and HYDROCLASS
- ISOPAM,
- TT PE and TT PUX,
- 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 N2007-49 du 11 janvier 2007, article R. 1321-48", and can be fully used for the distribution of drinking water.

Nota : SAINT-GOBAIN PAM is ISO9001:2008 awarded by BUREAU VERITAS CERTIFICATION Certificate n°1767700-A/REV1, issued on January 15th 2010.

Metz on 21st January 2011
Surveyor : Thierry GARCIA

HOW TO CONTACT PAM

AUSTRIA

Saint-Gobain Rigips AUSTRIA GesmbH
Vertriebsbüro PAM
Archenweg 52
6020 Innsbruck
Tel: + 43 512 34 17 17 -0

BELGIUM

Saint-Gobain PAM BELGIUM
Raathshovenstraat, n°2
3400 – LANDEN
Tel: + 32 11 88 01 00

FINLAND

Saint-Gobain PAM FINLAND
Strömberginkuja 2
00380 HELSINKI
Tel: +358 207 424 600

GREECE

Saint-Gobain HELLAS
5 KLEISOURAS STR,
14452 METAMORGOSI ,ATHENS GREECE
Tel: +30 210 2831804

NORWAY

Saint-Gobain BYGGEVARER
Nils Hansens vei 13,
0667 OSLO
Tel: + 47 23 17 58 60

THE NETHERLANDS

Saint-Gobain PAM Netherlands
Markerkant 10-17
1316 AB ALMERE
Tel: + 31 36 53 333 44

POLAND

Saint-Gobain Construction Products POLSKA SP Z O.O.
Ul. Cybernetyki 9
PL - 02-677 WARSZAWA
Tel: + 48 22 751 41 72

PORTUGAL

Saint-Gobain PAM PORTUGAL, S.A.
Rua das Marinhas do Tejo , n° 15
2690-361 SANTA IRIA DE AZÓIA
Tel: + 351 218 925 000

CZECH REPUBLIC

Saint-Gobain PAM CZ
Budova DOCK II,
Smrčková ulice,
Praha 8 – Libeň
Tel: + 420 311 712 611

ROMANIA

Saint-Gobain Construction Products Romania S.r.l.
SGCPRo SRL
Soseaua Pipera nr.43, Cladirea Floreasca Park,
corpul A, etajul 3, birourile 25-41, cod 014254,
sector 2, Bucuresti, Romania
Tel: + 40 21 207 57 29

SLOVAKIA

Saint-Gobain Construction Products, s.r.o.
Dlha 1780/6
90031 Stupava
Tel: +421 (0) 2 654 569 61

Enquiries from other EU and overseas countries:
please consult Saint-Gobain PAM Canalisation



**Saint-Gobain PAM Canalisation •
Head office**

21, avenue Camille Cavallier
54705 Pont-à-Mousson Cedex • FRANCE
Phone : +33 (0) 383 807 350
www.pamline.com