

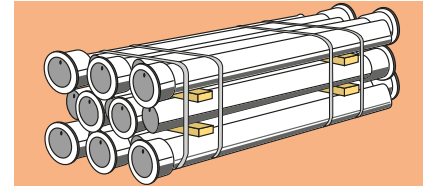


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## Storage



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

### 1 PREPARE THE STORAGE AREA

The storage area for pipes, fittings and accessories must be organized for each type of products and also by diameter.

**Do not store** products on unstable or sloping ground.

**Avoid:**

- Marshy ground
- Contaminated ground
- Placing pipes directly on the ground

Support beams, spacers and chocks must be made from construction-grade lumber without any brittle knots. The minimum dimensions are specified in the following tables.

### 2 STORE THE GASKETS

(according to the latest version of ISO 2230)

In particular **avoid:**

- Removing gaskets from their bags
- Exposing gaskets to sunlight
- High storage temperatures



**Restrict** storage times.

Storage life: in 10 years for unlocked EPDM, 7 years old for locked EPDM NBR and locked NBR in optimal storage conditions (contact us for our recommendations).

Refer to ISO 2230:2002 - Rubber products - Guidelines for storage

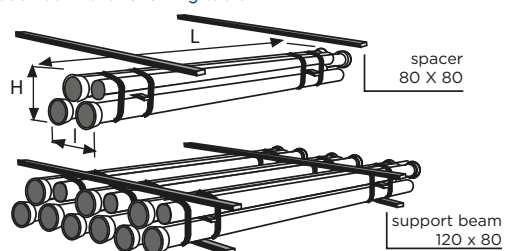


When installing pipes at low temperatures, bring rings up to a temperature of 20°C to ensure maximum flexibility (such as by immersing them in warm water).

# Storage

## 3 DN 60 TO 300: DELIVERY IN BUNDLES

Stack while keeping the bundles perfectly square. Do not exceed the maximum heights specified in the following table.



Always ensure a good tension of the bundle straps. Never lift a bundle with hooks or vacuum pads. Use slings that support the bundle from underneath (the straps used to secure the bundles are not slings and are not designed to withstand the load).

### Bundle stack heights

Maximum number of stackable bundles

Type of pipe	DN	Number of bundles on the ground	Max. no. stacked bundles	Bundle contents and dimensions					
				L m	I m	H m	Bundle weight (kg)		
							NATURAL	INTEGRAL	INTEGRAL DUCTAN
NATURAL	60 (24 pipes/bundle)	6	6	6.3	0.54	0.49	1356	-	-
	80 (15 pipes/bundle)	5	6	6.3	0.57	0.42	1098	980	980
	100 (15 pipes/bundle)	5	6	6.3	0.67	0.50	1337	1190	1190
INTEGRAL	125 (12 pipes/bundle)	4	5	6.3	0.65	0.58	1040	1175	1175
INTEGRAL DUCTAN	150 (9 pipes/bundle)	3	5	6.3	0.59	0.66	1196	1290	-
	200 (6 pipes/bundle)	3	5	6.3	0.75	0.56	1087	1134	-
	250 (4 pipes/bundle)	2	4	6.3	0.63	0.67	1013	984	-
	300 (4 pipes/bundle)	2	4	6.3	0.74	0.77	1333	1234	-

Type of pipe	DN	Number of bundles on the ground	Max. no. stacked bundles	Bundle contents and dimensions			
				L m	I m	H m	Bundle weight (kg)
BIOGAN	150 (9 pipes/bundle)	3	5	6.3	0.59	0.66	950
	200 (6 pipes/bundle)	3	5	6.3	0.75	0.56	871

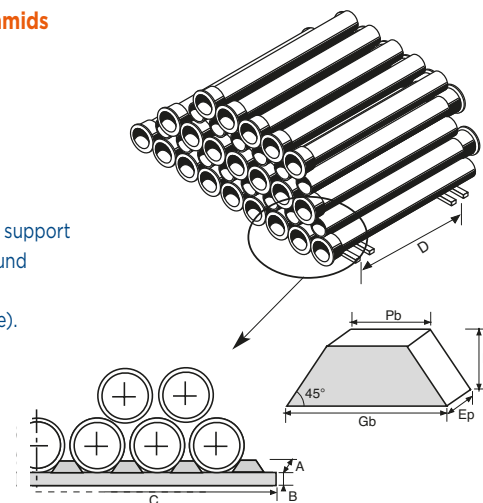
# Storage

## 4 DN 350 TO 2000: LOOSE DELIVERIES

Stack pipes into pyramids or use spacers without exceeding the maximum heights specified in the tables on page 6 to avoid damaging the products.

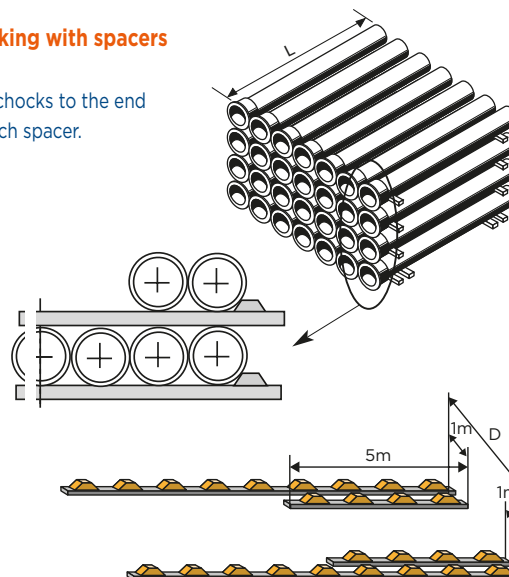
### Stacking in pyramids

Nail chocks to the support beams on the ground (at the ends and between each pipe).



### Stacking with spacers

Nail chocks to the end of each spacer.



# Storage



To improve storage safety, add two extra support beams at the ends of the stack as shown above.

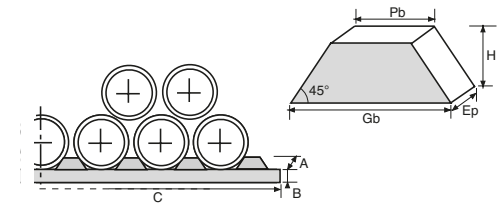
## Bundle stack heights (DN350 to 2000)

Pyramid - Standard Pipes			Spacers - Standard Pipes		
DN	Number of layers	Stack height (m)	DN	Number of layers	Stack height (m)
350	13	3.90	350	6	2.81
400	11	3.82	400	6	3.12
450	10	3.92	450	5	2.87
500	9	3.92	500	5	3.13
600	7	3.72	600	4	2.93
700	6	3.74	700	4	3.36
800	5	3.61	800	3	2.89
900	4	3.31	900	3	3.18
1000	4	3.67	1000	3	3.51
1100	3	3.10	1100	2	2.58
1200	3	3.38	1200	2	2.79
1400	3	3.95	1400	2	3.21
1500	2	2.95	1500	2	3.42
1600	2	3.13	1600	2	3.53
1800	2	3.52			
2000	2	3.91			

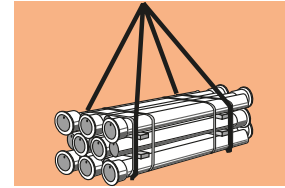
# Storage

## Stack chocks (DN350 to 2000)

DN	Trapezoidal chocks				Support beams			
	G <sub>b</sub> mm	P <sub>b</sub> mm	H <sub>c</sub> mm	E <sub>p</sub> mm	A mm	B mm	C m	D m
350	330	170	80	80	100	100	5	4
400	360	200	80	80	100	100	5	4
450	400	200	100	80	100	100	5	4
500	430	230	100	80	100	100	5	4
600	490	250	120	80	100	100	5	4
700	570	330	120	100	120	100	5	4.5
800	640	340	150	100	120	100	5	4.5
900	710	410	150	100	130	120	5	4.5
1000	780	380	200	100	130	120	5	4.5
1100	850	450	200	100	130	120	5	5
1200	910	510	200	120	150	120	5	5
1400	1010	610	200	120	150	120	5	5
1500	1080	580	250	120	150	120	5	5
1600	1140	540	300	120	150	120	5	5
1800	1300	700	300	150	180	120	5	5
2000	1350	750	300	150	180	120	5	5



# Handling



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## 1 BASIC ADVICE

To avoid damaging the products:

- **Use** lifting equipment that is capable of supporting the weights specified in the tables below.
- **Prevent** pipes from banging or rubbing against the trailer's sides and pillars.
- **Lift and move** the pipes gently to prevent any swinging.
- **Do not drag** pipes across the ground and do not let pipes fall to the ground.

## 2 BUNDLE WEIGHTS AND DIMENSIONS

DN	No. layers x no. pipes	L	W	H	NATURAL bundle weight	INTEGRAL bundle weight
		m	m	m	kg	kg
<b>60</b>	4 x 6	6.33	0.54	0.49	1356	
<b>80</b>	3 x 5	6.33	0.56	0.42	1098	980
<b>100</b>	3 x 5	6.33	0.67	0.50	1337	1190
<b>125</b>	3 x 4	6.33	0.65	0.58	1040	1175
<b>150</b>	3 x 3	6.3	0.59	0.66	1196	1290
<b>160</b>	3 x 4	6.3	0.63	0.63	901	907
<b>200</b>	2 x 3	6.3	0.75	0.56	1087	1134
<b>250</b>	2 x 2	6.3	0.63	0.67	1013	984
<b>300</b>	2 x 2	6.3	0.74	0.77	1333	1234

## 3 PIPE UNIT WEIGHT

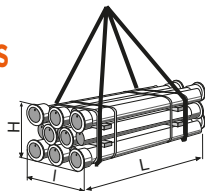
DN	pipe length (m)		pipe weight (kg)			
	working	overall	NATURAL CLASSIC	UNIVERSAL All versions	INTEGRAL PLUVIAL	
60	6.00	6.09	56.5			
80	6.00	6.09	73.2	94.8	C100	65.3
100	6.00	6.09	89.10	116.7	C100	79.3
125	6.00	6.10	109.8	144.3	C64	97.6
150	6.00	6.10	132.9	173.8	C64	143.3
200	6.00	6.10	181.2	239.2	C64	192.1
250	6.00	6.10	253.3	311.4	C50	254.9
300	6.00	6.11	333.3	401.3	C50	308.1
350	6.00	6.11	413.0	498.5	C40	393.4
400	6.00	6.11	476.4	586.5	C40	465.0
450	6.00	6.11	562.8	700.3	C40	506.5
500	6.00	6.12	666.9	831.2	C40	632.4
600	6.00	6.12	903.4	1121.2	C40	821.4
700	7.00	7.15	1295.1	1368.0	C30	1383.8
800	7.00	7.15	1591.7	1915.5	C30	1692.9
900	7.00	7.15	1940.2	2332.1	C30	2025.7
1000	7.00	7.16	2323.0	2696.6	C30	2386.5
1000	8.27	8.43	2712.3		C30	2787.3
1100	8.27	8.43	3238.1			3605.8
1200	8.26	8.43	3775.9	4250.8	C25	4154.9
1400	8.19	8.44	5182.5	5601.8	C25	5546.9
1500	8.18	8.45	5877.8	6330.8	C25	6240.1
1600	8.18	8.45	6589.4	7069.4	C25	6946.4
1800	8.17	8.45	8109.7	8602.4	C25	8444.9
2000	8.17	8.45	9837.6	10486.1	C25	10099.3

The preferred classes for NATURAL and CLASSIC pipes are as follows:

- C40 for DN 60 to 300
- C30 for DN 350 to 600
- C40 for DN 700 to 2000

## 4 DN 60 TO 300: LIFTING BUNDLES

Use textile slings suited to the load.  
Ensure that the slings support the bundle from underneath.

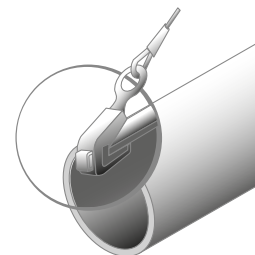


**Caution! Never lift a bundle with hooks or vacuum pads. The straps used to secure the bundles are not designed to withstand the load.**

## 4 DN 350 TO 2000: LIFTING BY THE ENDS

Use hooks that are suited to the load. Hooks must offer a secure attachment and a **protective surface\*** (such as polyamide).

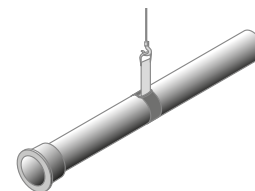
\*Hooks available on order.



**Caution:** hooks are designed to lift single pipes and not a bundle of several pipes.

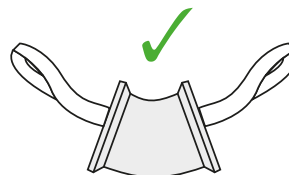
## 5 DN 350 TO 2000: LIFTING BY THE PIPE BARREL

Use a **textile sling** suited to the load.  
Attach the belt to the **center of gravity** and ensure that it does not slip.

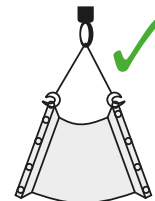


## 6 HANDLING FITTINGS

Use textile slings to avoid damaging the internal lining and the external coating of the fittings.



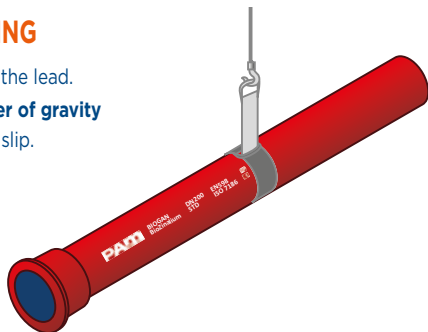
Flanged fittings can be lifted using hooks attached to the holes in the flanges.



# Handling

## 8 BIOGAN HANDLING

Use a textile sling suited to the lead.  
**Attach** the belt to the **center of gravity** and ensure that it does not slip.



An indication of the **theoretical center of gravity** is marked on the *BIOGAN pipe*.

**PAM**

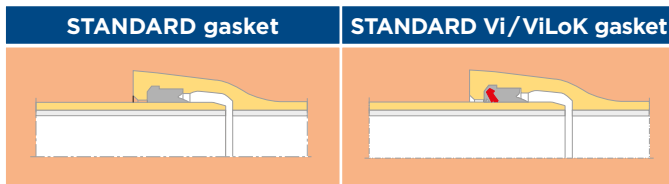
BIOGAN  
BioZinalium

DN200  
STD

EN598  
ISO 7186



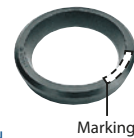
# STANDARD joint / STANDARD Vi/ViLoK joint



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

Using the marking as a reference, **check** that the gasket is suited to the project specifications:

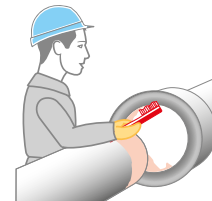
- DN
- Material:
  - For drinking water: EPDM
  - For sewage: NBR + yellow marking (stripes or dots)
- Storage life: in 10 years for unlocked EPDM, 7 years for locked EPDM NBR and locked NBR in optimal storage conditions (contact us for our recommendations).
- Refer to ISO 2230:2002 - Rubber products - Guidelines for storage



## 1 CLEAN

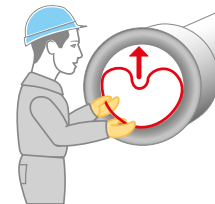
Carefully **clean** the inside of the socket, the spigot and the gasket.

**Keep** all parts clean until assembly has been completed.



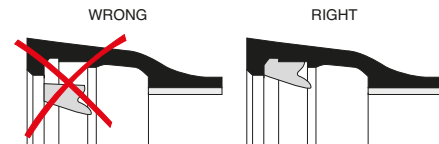
## 2 INSERT THE GASKET

**Insert** the joint ring before the pipe is laid in the trench.

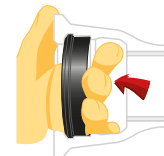


## 3 CHECK THE GASKET

**Ensure** that the gasket is properly seated in its groove and especially on the inner loop.



Always **pull** the gasket towards the outside to ensure that it is correctly positioned.

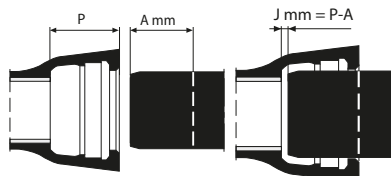


# STANDARD joint / STANDARD Vi/ViLoK joint

## 4 MARK THE INSERTION DEPTH

(if there is no original marking, i.e. if the pipe has been cut or a spigot is used from a different range).

Mark the spigot at a distance of A mm.



*Caution: failure to adhere to the insertion depth will affect the performance of any angular deflections.*

DN (mm)	P (mm)	J (mm)	A (mm)
60	89.5	15	74.5
80	92.5		77.5
100	94.5		79.5
125	97.5		82.5
150	100.5		85.5
200	106.5		91.5
250	105.5		90.5
300	107.5	20	92.5
350	110.5		90.5
400	112.5		92.5
450	115.5		95.5
500	117.5		97.5
600	132.5		112.5
700	192		25
800	197	172.0	
900	200	175.0	
1000	203	173.0	
1100	225	195.0	
1200	235	205.0	
1400	245	40	
1500	265		225.0
1600	265		225.0
1800	275		235.0
2000	290		250.0

# STANDARD joint / STANDARD Vi/ViLoK joint

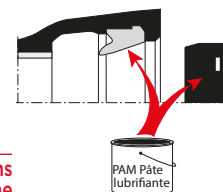
## 5 LUBRICATE

Coat:

- The exposed surface of the gasket
- The pipe chamfer and spigot

Never lubricate the interior of the gasket groove.

Apply a sufficient amount of lubricant paste with a paintbrush (refer to the quantities table on the next page).



Comply with the recommended applications specified in the safety data sheets available in the Downloads section on [www.pamline.com](http://www.pamline.com).

## DIFFERENT MARKINGS

DN60 to 600 and DN1400 to 2000

DN 700 to 1200



## 6 ASSEMBLE

Center and introduce the spigot into the perfectly aligned socket:

- Up to the marked line corresponding to "P-J mm"
- Up to the area between the white lines

**DN60 to 600 and 1400 to 2000:**

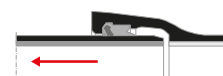
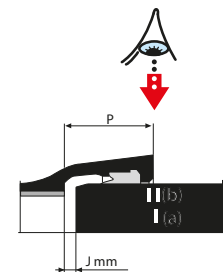
After joining two pipes or after joining a pipe with a fitting, only one line can be seen.

**DN 700 to 1200: three lines present on the pipe**

- After joining two pipes (spigot and socket), only one line can be seen.

- After joining a pipe with a fitting, two lines can be seen.

For **STD Vi and ViLoK joints**, extend the gasket by pulling the spigot out of the socket until correctly seated.

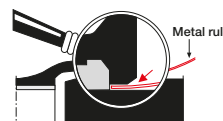


Failure to observe the insertion depths could lead to the risk of leaks.

## 7 CHECK THE ASSEMBLY

Before angular deflection, insert a metal rule into the socket gap and ensure that the depth of penetration is the same around the whole circumference.

PAMmetal rule ref: **241031**

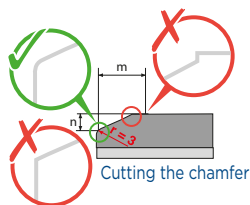


- In cold temperatures and especially with small diameters, store joints in a heated room.
- Gaskets can be soaked in water for easier set up.

# STANDARD joint / STANDARD Vi/ViLoK joint

## 8 INFORMATION

### Cuts and chamfers



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

### Lubricant paste (LUB A)

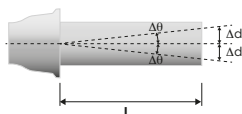
#### Number of boxes for 100 joints

DN	No.	DN	No.	DN	No.	DN	No.
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

### Angular deflection

Pipes must be connected together while keeping them perfectly aligned with their centerlines.

The joint must only be deflected when fully assembled and before pressurizing the system.



#### Maximum admissible deflection: STD pipes

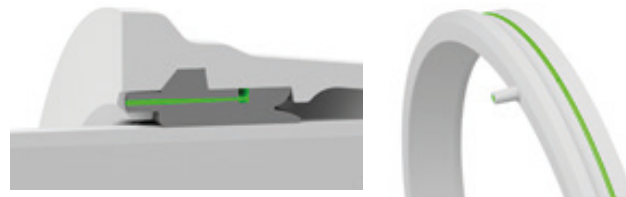
DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
60 to 300	5	6	52
350 to 600	4	6	42
700 to 1000	4	7	49
1100 to 1200	4	8	56
1400 to 1600	3	8	42
1800	2.5	8	35
2000	2	8	28

#### Maximum admissible deflection: STD Vi/ViLoK pipes

DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
60 to 150	5	6	52
200 to 250	4	6	42
300 to 350	3	6	31
400 to 600	2	6	21
700	2	7	24

# STANDARD CONTROL+ joint

The **STANDARD CONTROL+** gasket is an automatic joint that allows self-testing the sealing is achieved by the compression of the elastomer seal ring obtained at the time of assembly by simply inserting the spigot into the socket. It has a valve for injecting compressed air.



Using the marking, check that the joint is suitable for the project application:

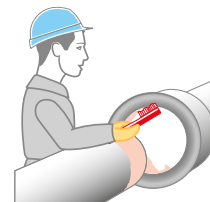
- DN
- Material : EPDM + STD Surejoint marking
- Presence of connection valve
- Shelf life: 7 years in good storage conditions (consult us for recommendations)
- See standard ISO 2230/2002 Elastomer-based products - Guidelines for the storage



## 1 CLEAN

**Thoroughly clean** the inside of the socket, the pipe spigot and gasket. Keep them clean until the assembly operation.

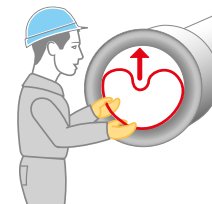
**Keep** all parts clean until assembly has been completed.



## 2 INSERT THE GASKET

**Place** the gasket outside the excavation.

- **Manually shape** the gasket into a heart form so that the gasket's connection valve points toward the tip of the heart.
- **Start fitting** the gasket in the groove, positioning the valve in a notch in the pipe.
- **Select** a notch at the top of the pipe, so that the valve is accessible in the trench, to carry out the test.

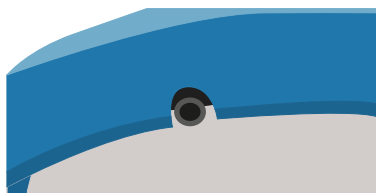


- In cold temperatures and especially with small diameters, store joints in a heated room.
- Gaskets can be soaked in water for easier set up.
- The gasket groove must not be lubricated before installation.

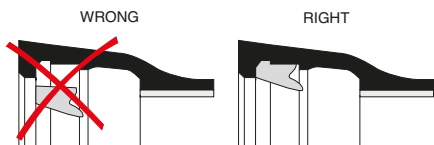
# STANDARD CONTROL+ joint

## 3 CHECK THE INSTALLATION

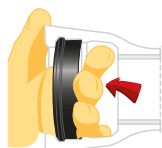
Ensure that the connection valve is correctly positioned in a notch in the pipe, without deformation.



Make sure that the gasket ring is properly seated in its housing, particularly on the heart loop



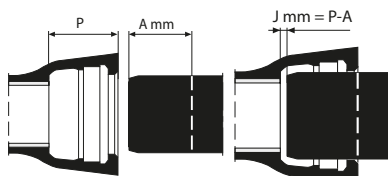
Always pull the gasket outward to ensure it is properly seated.



## 4 MARK THE DEPTH

(When it is not originally marked: on a cut section or when using a solid end from a different range)

Mark the spigot at a distance of A mm.



Caution: failure to adhere to the insertion depth will affect the performance of any angular deflections

DN (mm)	P (mm)	J (mm)	A (mm)
200	106.5	15	91.5
250	105.5		90.5
300	107.5		92.5
350	110.5		90.5
400	112.5	20	92.5
450	115.5		95.5
500	117.5		97.5
600	132.5		112.5

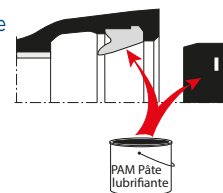
# STANDARD CONTROL+ joint

## 5 LUBRICATE

Coat:

- the visible surface of the joint with lubricating paste
- the chamfer and spigot of the pipe with lubricating paste.

Never lubricate the interior of the gasket groove. Apply a sufficient amount of lubricant paste with a paintbrush (refer to the quantities table below)



### Number of boxes for 100 joints

DN (mm)	Nb	DN (mm)	Nb
200	3	400	6
250	4	450	6
300	5	500	7
350	5	600	9



To prevent dirt or sand from entering the socket, replace the plug on the socket side and leave it in place until the next pipe is inserted.

Comply with the recommended applications specified in the safety data sheets available in the Downloads section on [www.pamline.com](http://www.pamline.com).

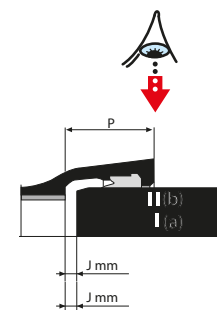
## 6 ASSEMBLE

Centre and fit the spigot into the socket in perfect alignment :

- to the line marked «A mm»,
- in the area between the white marking lines.



Proper insertion depth must be strictly observed to ensure the joint's performance.



# STANDARD CONTROL+ joint

## 7 CHECK ASSEMBLY: STANDARD CONTROL+ GASKET TEST

Use Standard CONTROL + Gasket test device.

The **Standard CONTROL + Gasket** test device case includes :

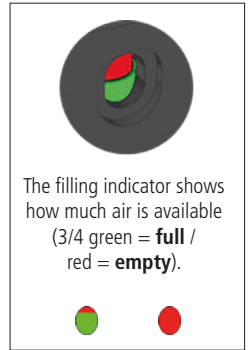
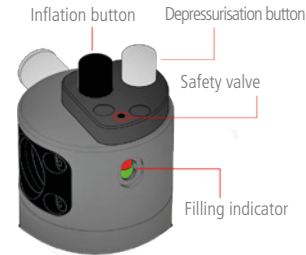
- The test device with a cartridge, on a blue stand
- The charger (red) with a second cartridge and :
  - A 220 V power supply for the charger.
  - A cigarette lighter socket for the charger.
- Instructions.



# STANDARD CONTROL+ joint

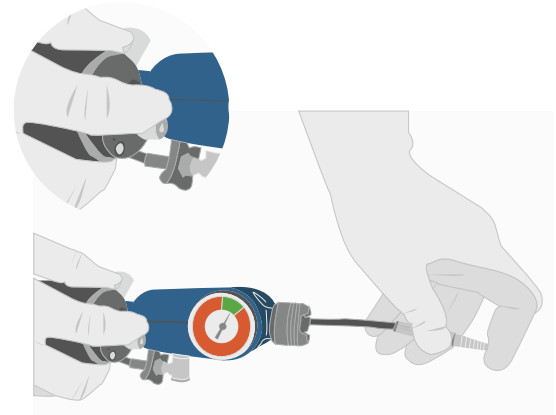
## 8 PERFORMING THE CONTROL+ STANDARD JOINT TEST: CHECK THE FILLING LEVEL.

Check the air filling level of the cartridge.



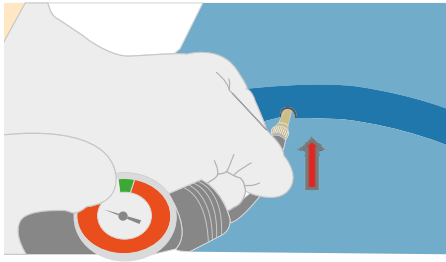
## 9 CHECK FOR LEAKS

Check the tightness of the test device hoses by obstructing the nozzle orifice with a finger while pressing the black button and ensuring that the needle on the manometer remains stabilised in the green sector for at least 10 seconds.



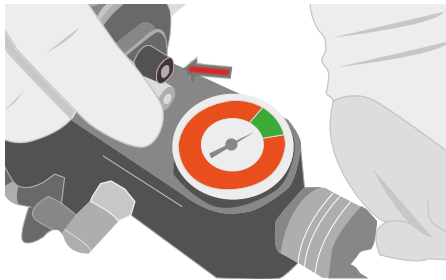
## 10 INSERT THE NOZZLE

Insert the appliance nozzle into the gasket connection valve.



## 11 PERFORMING THE AIR TEST

Press the black button.  
Air is sent into the gasket groove.



## 12 RESULT OF THE CONTROL+ STANDARD JOINT TEST

**OK Test** : If the needle on the manometer remains stable in the green sector.  
**NOK Test** : If the needle does not pass or remain less than 10s in the green sector.



### In the event of a NOK TEST

Repeat the test to confirm the result.  
Dismantle the joint to identify the problem, correct it and re-assemble.

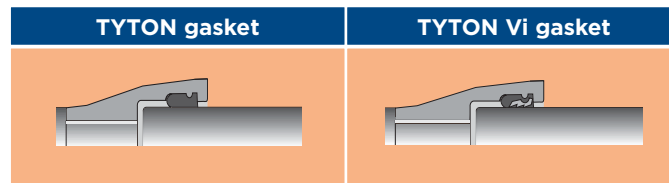
The main causes of a NOK test are :

1. Gasket pushed back out of its housing during fitting.
2. Foreign bodies in the groove groove
3. Gasket damaged

After the **OK test**, the device is removed and the junction is validated. The device can be used for the next junction.

**Note** : After the test, when the nozzle of the device is removed from the valve, the gasket groove is no longer under pressure.

# TYTON Joint / TYTON Vi Joint (Sit-Plus)



*The contractor is responsible for analyzing and eliminating risks during installation (especially the use of personal protective equipment.)*

Using the marking as a reference, **check** that the gasket is suited to the project specifications.

- DN
- Material:
  - for drinking water: : EPDM
  - for sewage: NBR+yellow marking (stripes or dots)
- Storage life in 10 years for unlocked EPDM. 7 years for locked EPDM NBR and locked NBR in optimal storage conditions (contact us for our recommendations).
- Refer to ISO 2230/2002 - Rubber products - Guidelines for storage.

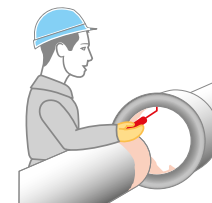


## 1 CLEAN

Carefully **clean** the inside of the socket, the spigot, and the gasket.

Clean the TYTON or TYTON VI joint groove with an elbow screwdriver (kit ref. 110477)

**Keep** all parts clean until assembly has been completed.



## 2 INSERT THE GASKET

**Insert** the joint ring before the pipe is laid in the trench..

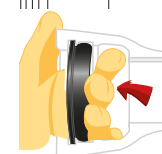


## 3 CHECK THE GASKET

**Ensure** that the gasket is properly seated in its groove and especially on the inner loop..



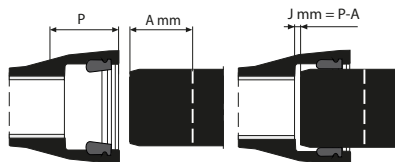
**Always** pull the gasket towards the outside to ensure that is correctly positioned.



# TYTON Joint / TYTON Vi Joint (Sit Plus)

## 4 MARK THE INSERTION DEPTH

(If there is no original marking, i.e. if the pipe has been cut or a spigot is used from a different range).



Mark the spigot at A mm.

Caution: failure to adhere to the insertion depth will affect the performance of any angular deflections.

DN (mm)	P (mm)	J (mm)	A (mm)
80	92.5	15	77.5
100	94.5		79.5
125	97.5		82.5
150	100.5		85.5
200	106.5		91.5
250	105.5		90.5
300	107.5		92.5

# Joint TYTON / Joint TYTON Vi (Sit Plus)

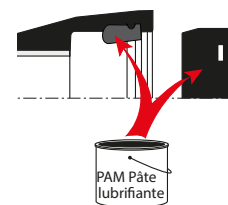
## 5 LUBRICATE

Coat:

- The exposed surface of the gasket,
- The pipe chamfer and spigot.

**Never lubricate the inside of the seal groove.**

Apply a sufficient amount of lubricant paste with a paintbrush (refer to the quantities table on the next page).



Comply with the recommended applications specified in the safety data sheets available in the downloads section on [www.pamline.com](http://www.pamline.com)

## 6 ASSEMBLE

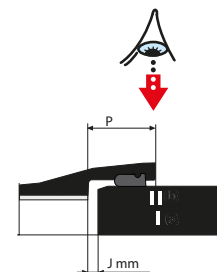
Center and introduce the spigot into the perfectly aligned socket:

- Up to the marked line corresponding to "A mm".
- Up to the area between the white lines.

- After joining two pipes (spigot and socket), only one line can be seen.
- For TYTON VI joint, extend the gasket by pulling the spigot out of the socket until correctly seated.



Failure to observe the insertion depths could lead to risk of leaks.



## 7 CHECK THE ASSEMBLY

Before angular deflection, insert a metal rule into the socket gap and ensure that the depth of penetration is the same around the whole circumference. PAM metal rule ref: **241031**

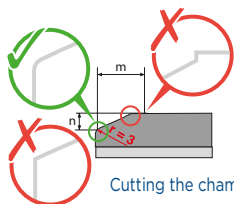


- In cold temperatures and especially with small diameters, store joints in a heated room.
- Gaskets can be seated in water for easier set up.

# TYTON Joint / TYTON Vi Joint (Sit Plus)

## 8 INFORMATIONS

### Cutting and chamfering



Cutting the chamfer

DN	m (mm)	n (mm)
80 to 300	9	3

### Lubricant paste

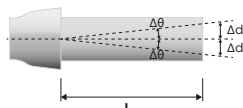
#### Number of boxes for 100 joints

DN	Nb	DN	Nb
80	2	150	3
100	2	200	3
125	2	300	5

### Angular deflection

Pipes must be connected together while keeping them perfectly aligned with their centerlines.

The joint must only be deflected when fully assembled and before pressurizing the system.



#### Maximum admissible deflection: TYTON pipes

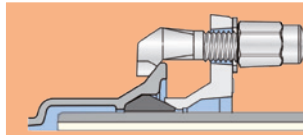
DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
80 to 300	5	6	52

#### Maximum admissible deflection: TYTON Vi pipes

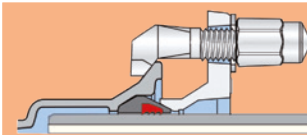
DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
80 to 150	3	6	52
200 to 250	3	6	42
300	3	6	31

# EXPRESS New joint / EXPRESS New Vi joint

## EXPRESS New joint DN 60 to 150



## EXPRESS New Vi joint DN 60 to 300



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## 1 CLEAN

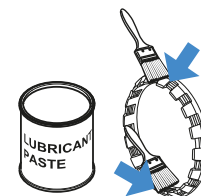
Carefully **clean** the inside of the socket, the spigot and the gasket.

Keep all parts clean until assembly has been completed.



## 2 LUBRICATE

Using a clean paintbrush, **lubricate** the inside of the socket, the inside of the gland and the gasket.

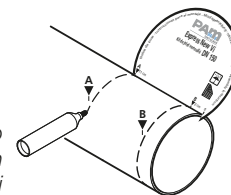


## 3 MARK THE INSERTION DEPTH

**Mark** distances A and B from the spigot end of the pipe using a measuring tape or the provided template according to the values below.



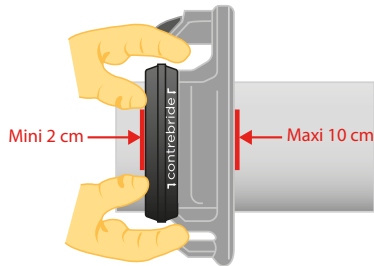
After cutting a pipe, there is no need to recreate the chamfer on the spigot when using EXPRESS New or EXPRESS New Vi joints; only deburring is required.



DN	maxi A	mini B
60-150	10	2
200-300	11	2

# EXPRESS New joint / EXPRESS New Vi joint

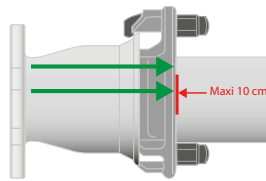
## 4 MOUNT THE ELEMENTS ON THE SPIGOT



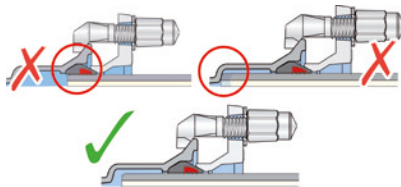
The joint must be properly installed (gland position is specified)

## 5 ASSEMBLE THE ELEMENTS

Joint the socket and the spigot (with gland position according to the mark)



ENSURE THE CORRECT DEPTH

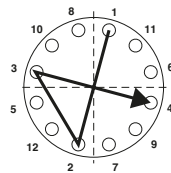
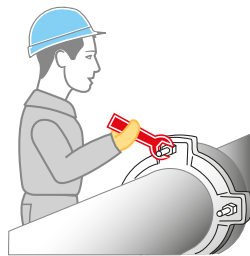


## 6 TIGHTEN THE BOLTS

Tighten the bolts with a torque wrench in successive passes.

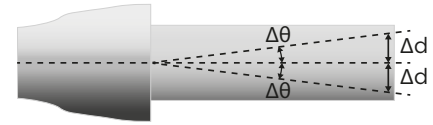
Bolt torque values:

DN	Exp New	Exp New Vi
60-150	2 m.daN	2 m.daN
200-300	-	3 m.daN



# EXPRESS New joint / EXPRESS New Vi joint

## Angular deflection



DN	Exp New $\Delta\theta$ (°)	Exp New Vi $\Delta\theta$ (°)
60-150	5	5
200-300	-	3

The assembly with the pipe must be carried out with a perfectly aligned position. The pipe must be deflected after pre-tightening but before final tightening.

•Final tightening :

DN	Exp New	Exp New Vi
60-150	14 m.daN	10 m.daN
200-300	-	16 m.daN

Tightening of the bolts on the EXPRESS NEW and EXPRESS NEW Vi requires a 27 mm wrench.

## 7 INFORMATION

Check that bolts are properly tightened.

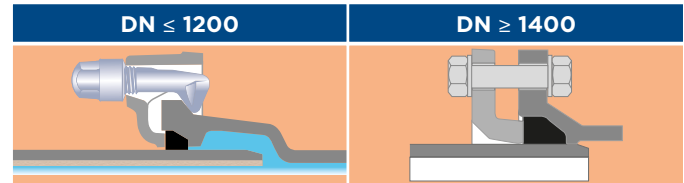
- When installing several successive fittings
- After hydraulic testing

Re-tighten if necessary.



Failure to observe the tightening rules could lead to the risk of leaks.

# EXPRESS joint

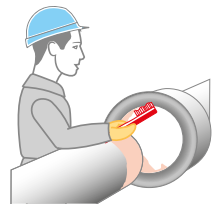


The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## 1 CLEAN

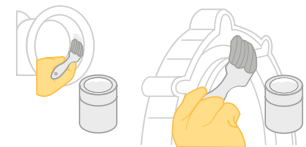
Carefully **clean** the inside of the socket, the spigot and the gasket.

**Keep** all parts clean until assembly has been completed.



## 2 LUBRICATE

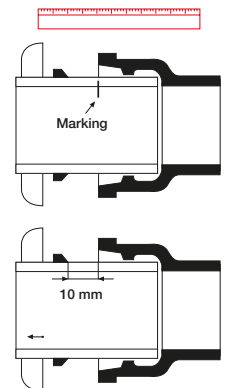
Using a clean paintbrush, **lubricate** the fitting's gasket groove and the inside of the gland.



## 3 MARK THE INSERTION DEPTH

**Introduce** the spigot fully while ensuring that both parts are perfectly aligned.

**Mark** a line to represent the insertion depth.



**Place** the gasket approximately 10 mm from the line. It can be done easily by using light lubrication.

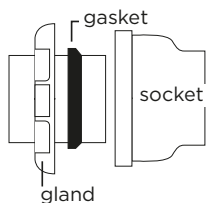


After cutting a pipe, EXPRESS joints can be mounted directly, i.e. there is no need to chamfer the spigot; only deburring is recommended.

## 4 MOUNT THE ELEMENTS



Position the beveled edge of the gasket towards the fitting's socket.

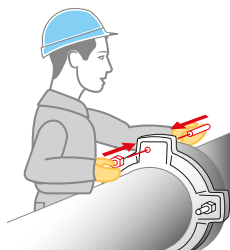


## 5 ASSEMBLE

Slide the gasket onto the pipe barrel until properly seated and bring the gland into contact.

Ensure that the gland and gasket are perpendicular to the pipe centerline.

Insert the bolts and **pre-tighten while keeping the joint in alignment.**



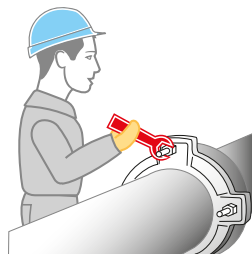
## 6 TIGHTEN THE BOLTS

Check the position of the gland.

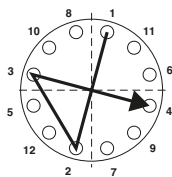
Tighten the bolts with a torque wrench in successive passes as shown in the diagram.

**Bolt torque values:**

- DN 200 to 400: 12 daN.m Ø22 bolts;
- DN 400 to 1200: 30 daN.m Ø27 bolts;
- DN1400 to 2000: consult us.



Check that bolts are properly tightened before hydraulic testing. Re-tighten if necessary.



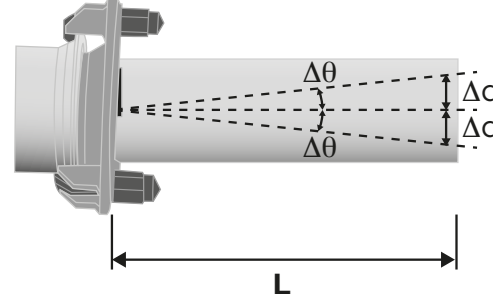
Comply with the insertion depths, otherwise the required angular deflection might not be achieved.

Tools required for tightening bolts:

- Ø22: 30 spanner
- Ø27: 36 spanner

## 7 INFORMATION

### Angular deflection



Pipes must be connected together while keeping them perfectly aligned with their centerlines.

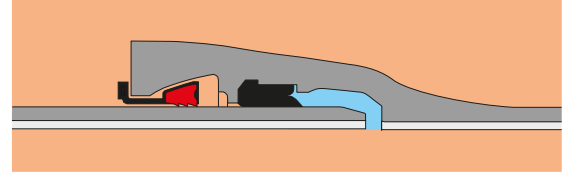
**The pipe must be deflected after pre-tightening but before final tightening.**

### Maximum admissible deflection:

DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
200 to 300	4°	6	42
350 to 600	3°	6	32
700 to 800	2°	7	25
900 to 1000	1°5'	7	19
1000 to 1200	1°5'	8	21
1400	3°	8	42
1500 to 1600	2°	8	28
1800	1.5°	8	21
2000	1°	8	14

# UNIVERSAL Vi joint

Range of DN 80 to 700 pipes and fittings



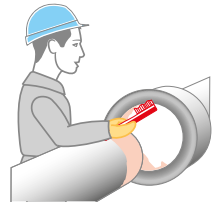
This joint requires the use of **UNIVERSAL STANDARD pipes** featuring a double chamber **socket** to receive the:

- **STANDARD gasket**, which ensures a watertight seal
- **UNIVERSAL Vi locking ring with inserts**; the inserts anchor the assembly during interlocking.

## 1 CLEAN

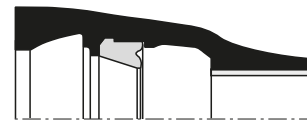
Carefully **clean** the inside of the socket, the spigot, the gasket and the locking ring.

**Keep** all parts clean until assembly has been completed.

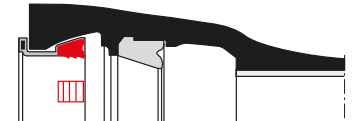


## 2 POSITION THE RINGS

The joint must be **perfectly aligned** during assembly.



STANDARD gasket

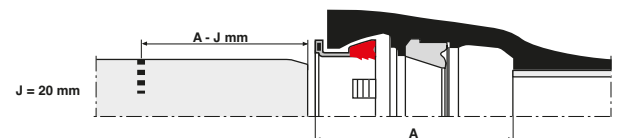


UNIVERSAL Vi locking ring with inserts

## 3 MARK THE INSERTION DEPTH

Mark the spigot if there is no original marking.

DN	A (mm)	DN	A (mm)	DN	A (mm)	DN	A (mm)
80	147	200	162	400	186	700	263
100	147	250	173	450	198		
125	147	300	187	500	210		
150	155	350	192	600	217		

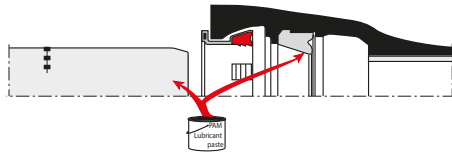


# UNIVERSAL Vi joint

## 4 LUBRICATE

Using the lubricant paste, **coat** the:

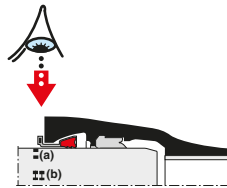
- **Exposed side** of the gasket
- **Chamfer and spigot**



## 5 ASSEMBLE

**Center** and **introduce** the spigot into the perfectly aligned socket:

- Up to the line corresponding to A-20 mm** in case of a cut pipe or STANDARD spigot
- Between the two lines** if they are original markings on the UNIVERSAL pipes



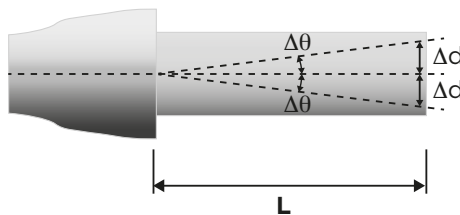
For the UNIVERSAL Vi joint, extend the joint by removing the spigot from the joint until it is permanently fixed.

## 6 INFORMATION

### Angular deflection

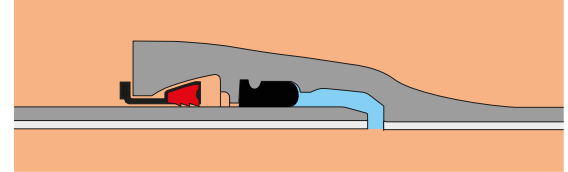
#### Maximum admissible deflection:

DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
80 to 450	3°	5.95	32
500 to 600	2°	5.97	21
700	2°	6.90	24



# UNIVERSAL TYTON Vi Joint (Novo-Sit)

## Range of DN80 to 300 pipes and fittings

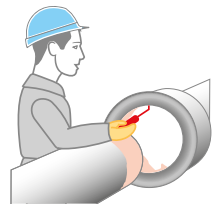


This joint requires the use of **UNIVERSAL TYTON Vi** pipes featuring a double **chamber socket** to receive the:

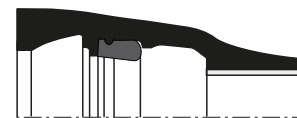
- **TYTON gasket**, which ensures a watertight seal
- **UNIVERSAL NOVO-SIT locking ring** with inserts; the inserts anchor the assembly during interlocking.

## 1 CLEAN

- **Carefully** clean the inside of the socket, the spigot, the gasket, the locking ring and the using the elbow screwdriver (kit reference 110477).
- **Keep** all parts clean until assembly has been completed.



## 2 POSITION THE RINGS



TYTON gasket



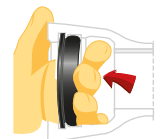
UNIVERSAL TYTON Vi locking ring with inserts.

## 3 CHECK THE GASKET

- **Ensure** that the gasket is properly seated in its groove and especially on the inner loop.



- Always **pull the gasket** towards the outside to ensure that is correctly positioned..

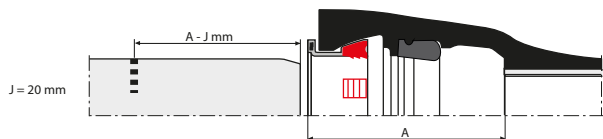


# UNIVERSAL TYTON Vi joint (Novo-Sit)

## 4 MARK THE INSERTION DEPTH

Mark the spigot if there is no original marking.

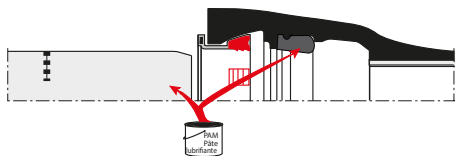
DN	A (mm)	DN	A (mm)	DN	A (mm)	DN	A (mm)
80	147	125	147	200	162	300	187
100	147	150	155	250	173		



## 5 LUBRICATE

Using the lubricant paste, coat the:

- **Exposed** side of the gasket,
- **Chamfer** and **spigot**

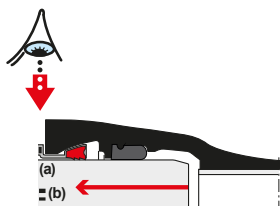


## 6 ASSEMBLE

**Center** and **introduce** the spigot into the perfectly aligned socket:

- Up to the line corresponding to A-20 mm** in case of a cut pipe or STANDARD spigot.
- Between the two lines** if they are original markings on the UNIVERSAL pipes.

For the UNIVERSAL TYTON Vi joint, extend the joint by removing the spigot from the joint until it is permanently fixed.



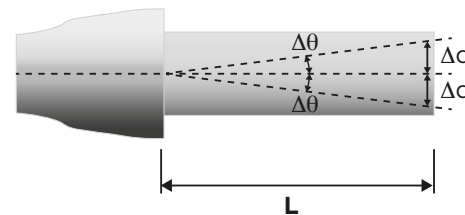
*The correct fitting depth is imperative to ensure the performance of the joint.*

# UNIVERSAL TYTON Vi joint (Novo-Sit)

## 7 INFORMATIONS

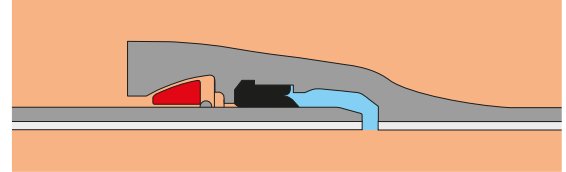
**Maximum permissible angular deflection.**

DN	$\Delta\theta$ (°)	L m	$\Delta d$ (cm) for L
80 à 300	3°	5,95	32



# UNIVERSAL Ve joint

Range of DN 100 to 1600 pipes and fittings



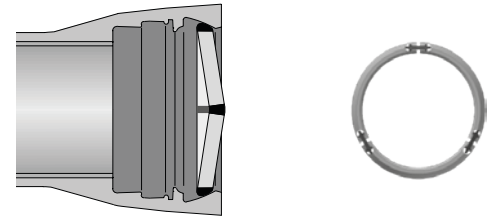
This joint requires the use of UNIVERSAL STANDARD pipes featuring:

- A **weld bead** on the spigot
- A double chamber socket to receive the **STANDARD gasket** and the **UNIVERSAL Ve locking ring**

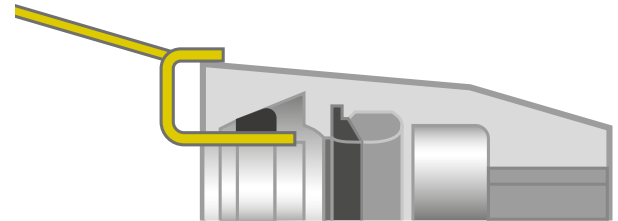
## 1 POSITION THE LOCKING RING

DN 100 to 200

Fit the locking ring into its groove.



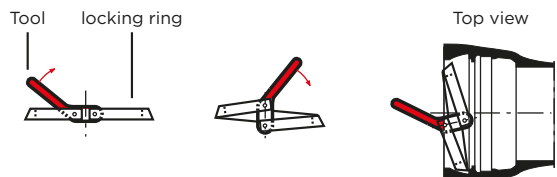
Hold the locking ring in place with the mounting wedges.



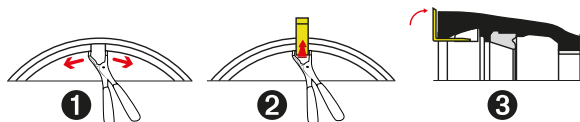
# UNIVERSAL Ve joint

## DN 250 to 700

Fit the locking ring into its groove by reducing its external diameter using the appropriate tool.



Once the ring has been inserted into the socket, **remove the lever** used for insertion. Spread the ring in the socket again with the pincer (1) and insert the wedge into the gap in the ring until the face of the socket. (2)(3)



In both cases, **place** the opening of the locking ring at the top of the pipe (for easier removal).

## DN 800 to 1600

**Insert** a connector at the end of a first segment on the flat side (internal).

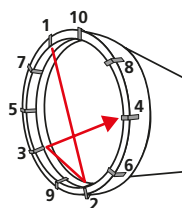


**Line** up a pin (previously covered in lubricant paste) opposite its groove and **point** its inclined face like that of the connector.

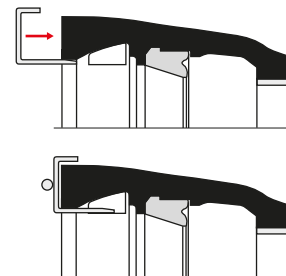


**Drive** in the pin with a hammer and Ø3.9 mm punch.

To keep the tension evenly balanced in the elastomer connectors, **proceed** in the specified order.



# UNIVERSAL Ve joint



## Locking ring accessories according to DN

DN	Assembly				
	Locking ring	Lever	Wedge	Clamp	Number
100					3
125					4
150					
200					
250					1
300					
350					
400					
450					
500			Réf : 266560		
600					
700					
800					7
900					8
1000					9
1200					10
1400					10
1500					12
1600					12

# UNIVERSAL Ve joint

## 2 INSERT THE GASKET

## 3 LUBRICATE

Using the lubricant paste, **coat** the:

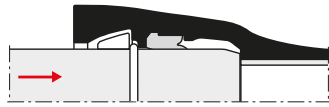
- Exposed side of the gasket
- Chamfer and spigot

## 4 ASSEMBLE

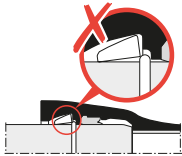
The joint must be **perfectly aligned** during assembly.



Introduce the spigot in the locking ring and then remove the wedge (the weld bead is approximately 50 mm from the socket).

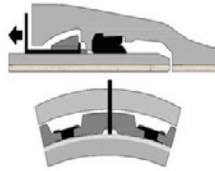


Introduce the spigot fully into the socket. When the locking ring is open, it opens when the weld bead passes through and then clamps to the barrel.

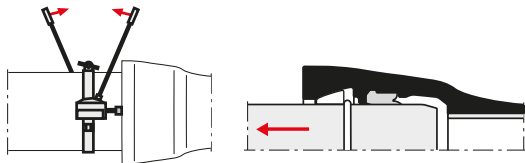


**Check** that the locking ring is not partially touching the weld bead due to insufficient insertion of the spigot or an excessive angular deflection.

**Pull** on each part of the locking ring with the mounting hook to ensure that it is properly positioned.



## 5 EXTEND THE JOINT



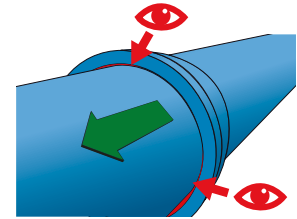
**Extend the joint** by pulling the spigot out of the socket until the locking ring comes into contact with its groove in the socket.

To do so, **use** a collar fitted with hydraulic jacks or **pull** with the bucket of a digger using a suitable textile strap.

# UNIVERSAL Ve joint

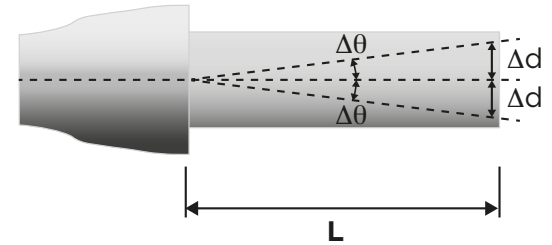
## 6 CHECK THE POSITION OF THE LOCKING RING

**Ensure** that the full circumference of the metal locking ring is in contact with the pipe.



## 7 INFORMATION

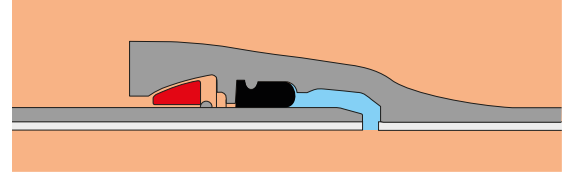
**Maximum permissible angular deflection**



DN	$\Delta\theta$ (°)	$\Delta d$ (cm) pour L	L m
100	3°	32	
125	3°	32	
150	3°	32	
200	3°	32	
250	3°	32	
300	3°	32	5.97
350	3°	32	
400	3°	32	
450	3°	32	
500	3°	21	
600	2°	21	
700	2°	21	6.89
800	2°	25	6.87
900	1.5°	18	6.88
1000	1.2°	15	8.15
1200	1.1°	15	
1400	1.2°	10	8.08
1600	0.9°	7	

# UNIVERSAL TYTON Ve joint (Tis-K)

Range of DN80 to 300 pipes and fittings



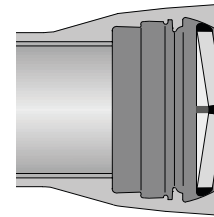
This joint requires the use of the UNIVERSAL TYTON pipes featuring :

- A **weld bead**, on the spigot
- A double chamber socket to receive the **TYTON gasket** and the **UNIVERSAL Ve locking ring**.

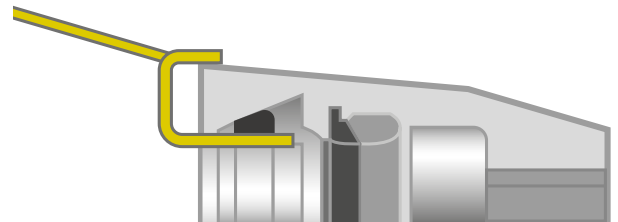
## 1 POSITION THE LOCKING RING

DN 80 to 200

**Fit** the locking ring into its groove at the location of the elastomers.



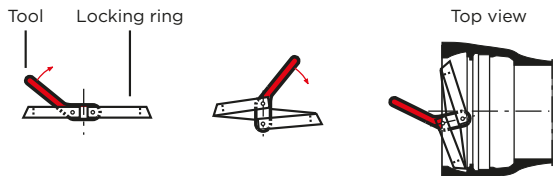
**Hold** the locking ring in place with the mounting wedges.



# UNIVERSAL TYTON Ve joint (Tis-K)

DN 250 to 300

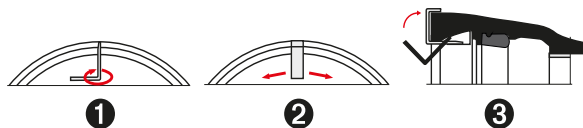
Fit locking ring into its groove by reducing its external diameter using the appropriate tool.



Insert the wedge (sideways) between the end edge of the locking ring.

Twist by 90° to create a gap between the two ends.

Fold down the wedge against the face of socket.



In both cases, place the opening of the locking ring at the top of the pipe (for easier removal).

## Locking ring accessories according to DN

DN	Assembly			
	Locking ring	Lever	Wedge	Number
100				3
125				
150				
200			Ref : 110280	4
250				1
300				

Ref : 110279

DN250 Ref : 266560  
DN300 Ref : 266560

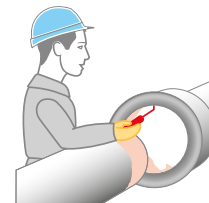
# UNIVERSAL TYTON Ve joint (Tis-K)

## 2 CLEAN

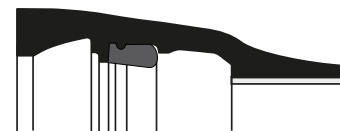
Carefully clean the inside of the socket, the spigot and the gasket.

Clean the TYTON or TYTON VI joint groove with an elbow screwdriver (kit ref. 110477)

Keep all parts clean until assembly has been completed.



## 3 INSERT THE GASKET

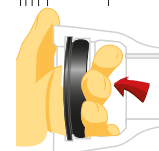


## 4 CHECK THE GASKET

Ensure that the gasket is properly seated in its groove and especially on the inner loop.



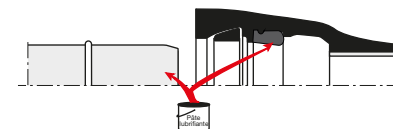
Always pull the gasket towards the outside to ensure that it is correctly positioned.



## 5 LUBRICATE

Using the lubricant paste, coat the:

- Exposed side of the gasket,
- Chamfer and spigot



# UNIVERSAL TYTON Ve joint (Tis-K)

## 6 ASSEMBLE

The joint must be **perfectly aligned** during assembly.



Introduce the spigot in the locking ring and then remove the wedge (the weld bead is approximately 50 mm from the socket).

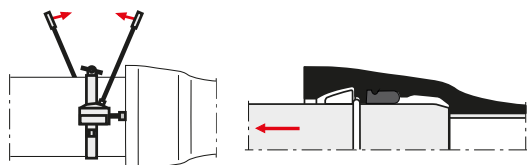


Introduce the spigot fully into the socket when the locking ring is open, it opens when the weld bead passes through and then clamps to the barrel.



**Check** that the locking ring is not partially touching the weld bead due to insufficient insertion of the spigot or an excessive angular deflection.

## 7 EXTEND THE JOINT

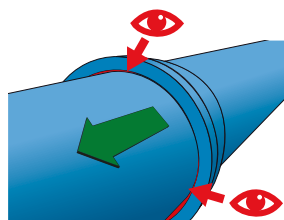


**Extend the joint** by pulling the spigot out of the socket until the locking ring comes into contact with its groove in the socket.

To do so, **use** a collar fitted with hydraulic jacks or **pull** with the bucket of a digger using a suitable textile strap

## 8 CHECK THE POSITION OF THE LOCKING RING

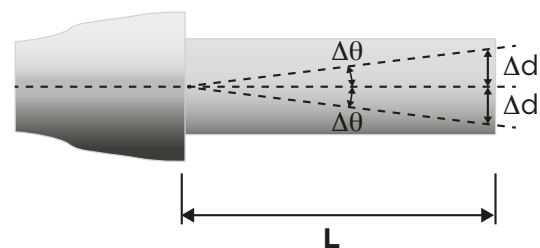
**Ensure** that the full circumference of the metal locking ring is in contact with the pipe.



# Joint UNIVERSAL TYTON Ve (Tis-K)

## 9 INFORMATIONS

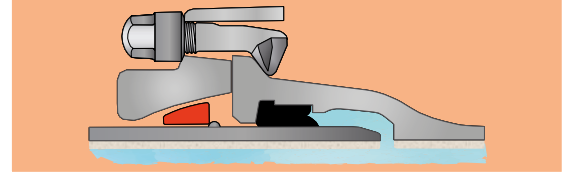
**Maximum permissible angular deflection**



DN	$\Delta\theta$ (°)	$\Delta d$ (cm) for L	L m
100	3°	32	5.97
125	3°	32	
150	3°	32	
200	3°	32	
250	3°	32	
300	3°	32	

# STANDARD Ve joint

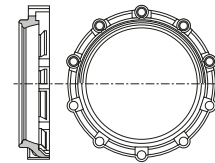
Range of DN 80 to 1200 pipes and fittings



This joint **requires a:**

- STANDARD pipe with a weld bead on the spigot
- STANDARD VE gland
- STANDARD VE locking ring
- STANDARD gasket

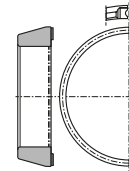
**STANDARD gland**



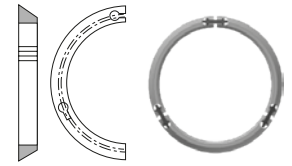
**STANDARD VE locking ring: one-piece or segmented**

One-piece: DN 80 to 200

Segment: DN 250 to 700

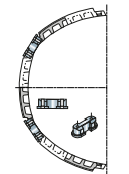


*The one-piece locking ring is an open ring*



*The locking ring is supplied preassembled*

**Segment to be assembled: DN 800 to 1200**



**Insert** a connector at the end of a first segment on the flat side (internal).



**Line** up a pin (previously covered in lubricant paste) opposite its groove and point its inclined face like that of the connector.

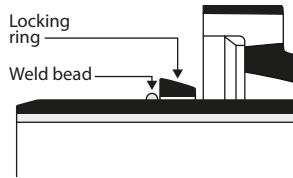
**Drive** in the pin with a hammer and Ø3.9 mm punch.



# STANDARD Ve joint

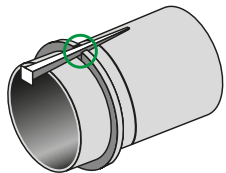
## 1 POSITION THE GLAND AND LOCKING RING

Slide the gland and locking ring over the weld bead.



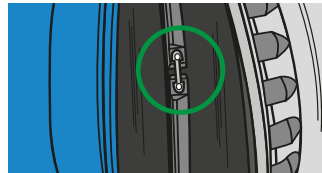
To pass the locking ring over the weld bead.

DN250 à 700

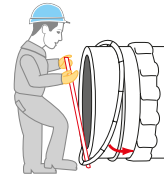
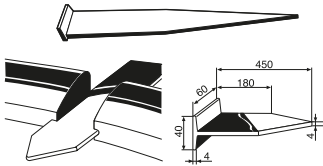


Use a trapezoidal wedge

DN80 à 1200



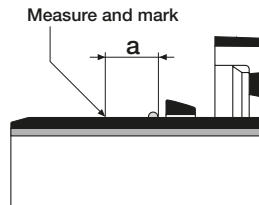
Pass the ring over the weld bead using a crowbar or similar tool



## 2 MARK THE INSERTION DEPTH

DN	a (mm)
80 to 125	20
150 to 200	25
250 to 500	30
600 to 1100	35
1200	25

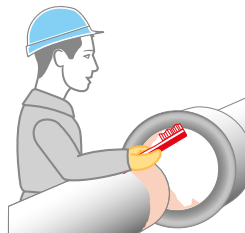
Measure and mark from the weld bead according to dimension "a"



## 3 CLEAN

Carefully **clean** the inside of the socket, the spigot and the gasket.

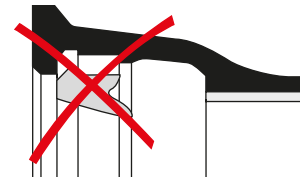
**Keep** all parts clean until assembly has been completed.



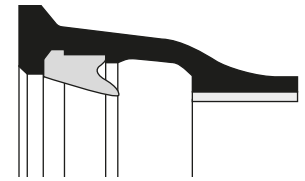
# STANDARD Ve joint

## 4 POSITION AND CHECK THE GASKET

Wrong



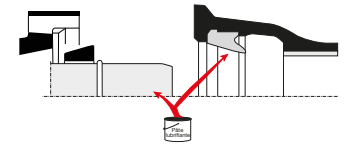
Right



## 5 LUBRICATE

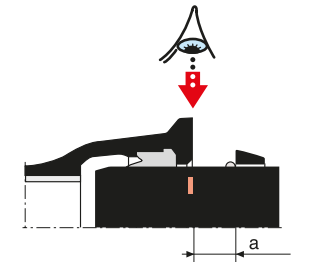
Using the lubricant paste, **coat** the:

- Exposed side of the gasket
- Chamfer and spigot



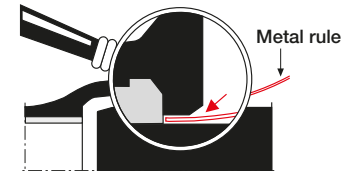
## 6 ASSEMBLE

**Center** and **introduce** the spigot into the perfectly aligned socket up to the line corresponding to "a".



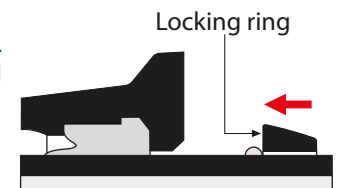
## 7 CHECK THE ASSEMBLY

The metal rule must **enter** the same depth all the way around the circumference.



## 8 POSITION THE LOCKING RING

**Move** the locking ring forward until it comes into contact with the weld bead. **Check** that it is touching the weld bead around the entire circumference of the spigot.



# STANDARD Ve joint

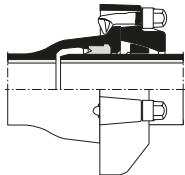
## 9 POSITION THE GLAND

**Position** the gland so that it is in contact with the locking ring.

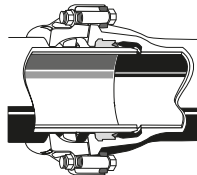
**Insert** the bolts and nuts.

**Screw** by hand until in contact with the gland.

**Tighten** the bolts diagonally until the gland touches the socket face.

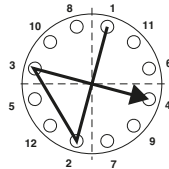


Iron nuts and bolts  
DN 80 to 1200



Steel nuts and bolts  
DN800 to 1200 (16bar < PFA 25bar)

**Tighten** the bolts in the order indicated in the diagram opposite and according to the recommended torque values.

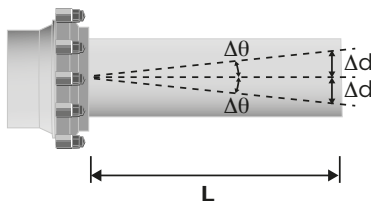


DN	Torque (daN.m)	spanner type and Ø
80 to 200	12	Ø22: 30 spanner
200 to 600	30	Ø27: 36 spanner
700 to 1200		

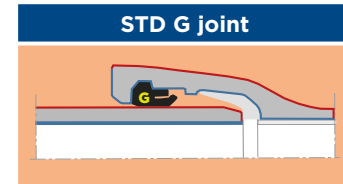
## 10 INFORMATION

**Maximum permissible angular deflection**

DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
60 to 150	5°	6	52
200 to 300	4°	6	42
350 to 600	3°	6	32
700 and 800	2°	7	25
900 and 1000	1.5°	7	19
1100 and 1200	1.5°	8	21



# STANDARD GRAVITY Joint (STD G)



Using the marking as a reference, **check** that the gasket is suited to the project specifications:

- DN
- Material: NBR + yellow marking: presence of yellow "G"s.
- Storage life: seven years for NBR (sewage) subject to optimal storage conditions (contact us for our recommendations).

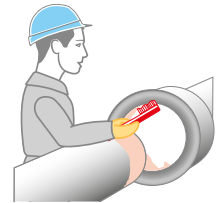
See Norm ISO 2230/2002 Elastomeric Products - Guidelines for storage



## 1 CLEAN

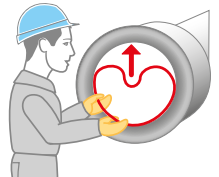
Carefully **clean** the inside of the socket, the spigot, and the gasket.

**Keep** all parts clean until assembly has been completed.



## 2 INSERT THE GASKET

**Insert** the gasket before the pipe or the fitting is laid in the trench.



*In cold temperatures and especially with small diameters, store joints in a heated room.*

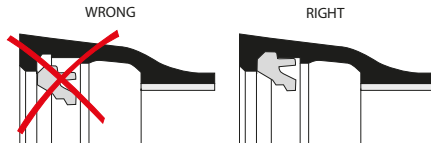


- Gaskets can be soaked in water for easier set up.
- The joint track should not be lubricated before installation.

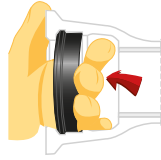
# STANDARD Gravity joint (STD G)

## 3 CHECK THE GASKET

Ensure that the gasket is properly seated in its groove and especially on the inner loop.



Always **pull the gasket** towards the outside to ensure that is correctly positioned.



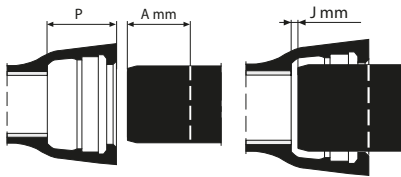
## 4 MARK THE INSERTION DEPTH

Nota :The BIOGAN ring is used to guarantee the depth of insertion. When it is present in the socket, proceed to step 5 "Lubricate".

If the insertion depth is not marked (on a cut or when using a spigot of a different range) and when there is no BIOGAN ring:

**Mark** the spigot at  $A = P - J$  mm.

*Caution: Failure to observe the insertion depth will affect the angular deviation performance.*



DN (mm)	P (mm)	J (mm)	A (mm)
150	100.5	15	85.5
200	106.5	15	91.5

# STANDARD Gravity joint (STD G)

## 5 LUBRICATE

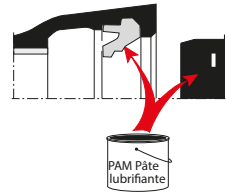
Coat :

- the exposed surface of the joint with lubricant paste.
- coat with lubricant paste: the visible surface of the joint and the spigot of the pipe.

Never lubricate the inside of the joint groove. The lubricate paste is applied with a brush in sufficient quantity (see quantity table on page 13).



To limit the introduction of dirt or sand into the socket, replace the plug on the socket side and leave it in place until the introduction of the pipe.



Follow the recommendation for using the safety datasheets available in the Documentary Space on [www.pamline.fr](http://www.pamline.fr).

## 6 ASSEMBLE

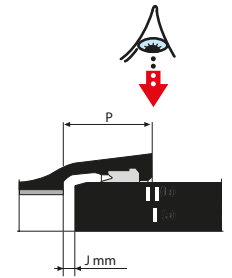
**Center** and **introduce the** spigot into the socket (the pipes must be perfectly aligned):

- Up to the marked line corresponding to the distance A,
- Up to the area between the white lines.

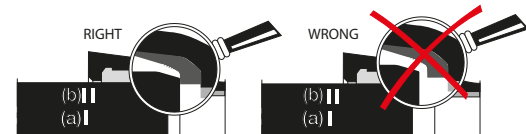


Good respect for the insertion depth is imperative to ensure the performance of the joint.

The presence of the BIOGAN ring makes it to facilitate the respect of the insertion depth.



**After joining**, the spigot comes to rest on the BIOGAN ring, even on cut pipes.



## 7 CHECK THE ASSEMBLY

Before the angular deflection, use a ruler to check that the depth of the gasket is the same all around the periphery

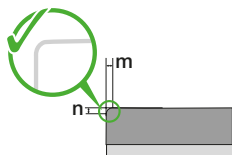


Ref of the PAM rule : **241031**

# STANDARD Gravity joint (STD G)

## 8 INFORMATIONS

Cut



DN	m (mm)	n (mm)
150 and 200	1	1

Break the angle with a file or grinder

### Angular deflection

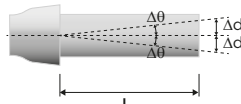
#### Number of boxes per 100 joints

DN	Nb
150	3
200	3

### Angular deflection

Pipes must be connected together with keeping them perfectly aligned with their centerlines.

**The pipe must be deflected after pre-tightening but before final tightening.**



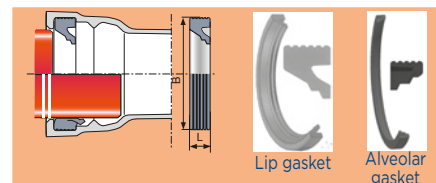
#### Maximum permissible deviation: BIOGAN pipes

DN	$\Delta\theta$ (°)	L m	$\Delta d$ (cm) for L
150 to 200	4	6	42



To limit the introduction of dirt or sand into the socket, replace the plug on the socket side and leave it in place until the introduction of the pipe.

# IM joint for gravity fittings (former TAG 32, joints)



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

Using the marking as a reference, **check** that the gasket is suited to the project specifications:

- DN
- Material:
  - For sewage: NBR + yellow marking (stripes or dots)
- Storage life: seven years for NBR (sewage) subject to optimal storage conditions (contact us for our recommendations)



## 1 CLEAN

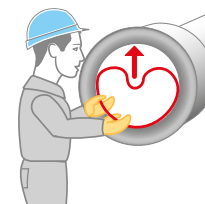
Carefully **clean** the inside of the socket, the spigot and the gasket.

**Keep** all parts clean until assembly has been completed.



## 2 INSERT THE IM GASKET

**Insert** the gasket before the pipe is laid in the trench.



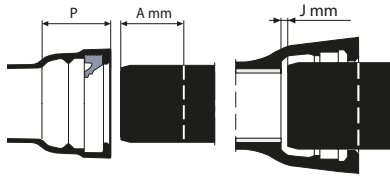
## 3 CHECK THE JOINT

**Ensure** that the gasket is properly seated in its groove.

# IM joint for gravity fittings (former TAG 32, joints)

## 4 MARK THE INSERTION DEPTH

(if there is no original marking, i.e. if the pipe has been cut or a spigot is used from a different range).



Mark the spigot at  $A = P - J$  mm.

DN (mm)	P (mm)	J (mm)	A (mm)
150	98	15	83
200	104	15	89
250	104	15	89
300	105	15	90

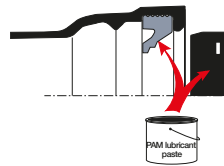
## 5 LUBRICATE

### Coat:

- The exposed surface of the gasket
- The pipe chamfer and spigot

Apply a sufficient amount of lubricant paste with a paintbrush (refer to the quantities table).

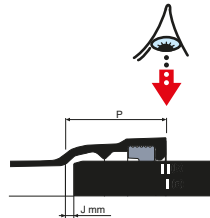
Comply with the recommended applications specified in the safety data sheets available in the Downloads section on [www.pamline.com](http://www.pamline.com).



## 6 ASSEMBLE

**Center** and **introduce** the spigot into the perfectly aligned socket:

- Up to the marked line corresponding to "A mm"
- Up to the area between the white lines



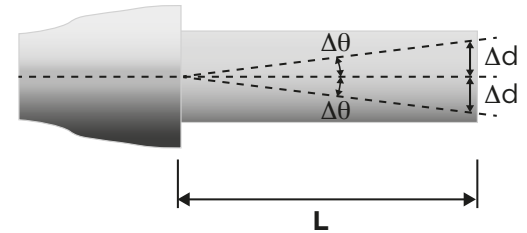
# IM joint for gravity fittings (former TAG 32, joints)

## 7 INFORMATION

### Lubricant paste

Number of boxes for 100 joints			
DN	No.	DN	No.
125	2	250	4
150	3	300	5
200	3		

### Maximum permissible angular deflection

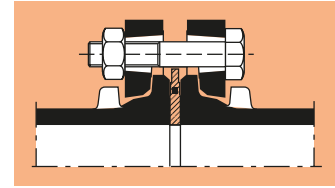


Pipes must be connected together while keeping them perfectly aligned with their axes.

**The joint must only be deflected when fully assembled and before pressurizing the system.**

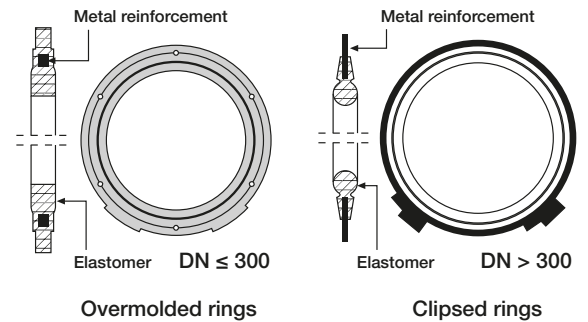
DN	$\Delta \theta$ (°)	L m	$\Delta d$ (cm) for L
125 to 300	4	6	42

# Flanged joint



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## 1 METAL-REINFORCED GASKETS

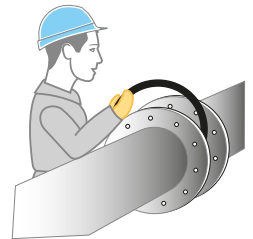


## 2 CLEAN AND ALIGN THE FLANGES

- **Check** the appearance and cleanliness of the flange and flange gasket
- **Align** the parts to be mounted.
- **Leave** a large enough **gap** for the flange gasket between the two flanges.

**Flange gasket thickness:**

**DN ≤ 300: 10 mm; DN ≥ 300: 16 mm**



# Flanged joint

## 3 POSITION THE REINFORCED GASKET

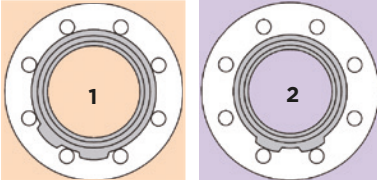
Center the reinforced gasket according to the method specified in the tables:

DN	PN 10	PN 16	PN 25	PN 40	PN 63
40	1	1	1	1	
50	1	1	1	1	
60	1	1	1	1	
65	1	1	1	1	
80	1	1	1	1	
100	1	1	2	2	
125	1	1	2	2	
150	1	1	2	2	
200	1	1	2		
250	1	1	2		
300	1	1	2		
350	3	6	4		
400	3	6	4		
450	3	6	4	5	
500	3	6	4	5	
600	3	6	4	5	
700	3	3	4	5	
800	3	3	4		
900	3	3	4		
1000	3	3	4		
1100	3	3	4		
1200	3	3	4		
1400	3	3	4		
1500	3	3	4		
1600	3	3	4		
1800	3	3	4		
2000	3	3	4		

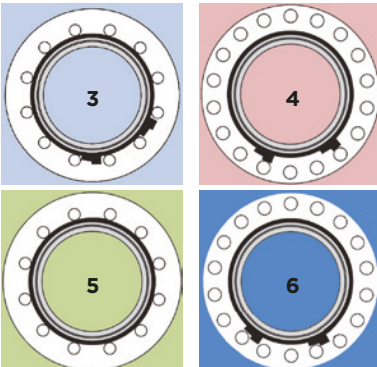
Consult us

Gasket resting on the bolts      Pins resting on the lower bolts

Overmolded gaskets DN ≤ 300



Clipped gaskets DN > 300



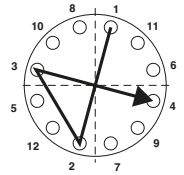
# Flanged joint

## 4 TIGHTEN THE BOLTS

Grease the threads of the bolts.

Insert the bolts.

Tighten the bolts in the order indicated in the diagram opposite and according to the recommended torque values.



Do not exert any tractive force on the junction when tightening the bolts.

## 5 COMPLY WITH THE TIGHTENING TORQUE VALUES

The recommended torque values are for greased threads (mechanical grease).

The bolts are only tightened to compress the reinforced gasket and not exert any tractive force on the pipeline elements.

DN	Metal-reinforced gasket				
	Bolt tightening torque values for flanges				
	PN 10 daN.m	PN 16 daN.m	PN 25 daN.m	PN 40 daN.m	PN 63 daN.m
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	18
300	6	8	12	15	18
350	6	8	15	18	30
400	8	12	18	30	40
450	8	12	18	30	
500	8	15	18	40	50
600	12	18	30	50	
700	12	18	40	60	
800	15	30	50		
900	15	30	50		
1000	18	40	60		
1100	18	40	60		
1200	30	50	60		
1400	40	50	70		
1500	40	60	70		
1600	50	60	70		
1800	50	60	80		
2000	50	70	80		

# Flanged joint

## 6 SOCKET DIMENSIONS

DN	PN 10		PN 16		PN 25	
	Bolt	Socket	Bolt	Socket	Bolt	Socket
40	M16	24	M16	24	M16	24
50	M16	24	M16	24	M16	24
60	M16	24	M16	24	M16	24
65	M16	24	M16	24	M16	24
80	M16	24	M16	24	M16	24
100	M16	24	M16	24	M20	30
125	M16	24	M16	24	M24	36
150	M20	30	M20	30	M24	36
200	M20	30	M20	30	M24	36
250	M20	30	M24	36	M27	41
300	M20	30	M24	36	M27	41
350	M20	30	M24	36	M30	46
400	M24	36	M27	41	M33	50
450	M24	36	M27	41	M33	50
500	M24	36	M30	46	M33	50
600	M27	41	M33	50	M36	55
700	M27	41	M33	50	M39	60
800	M30	46	M36	55	M45	70
900	M30	46	M36	55	M45	70
1000	M33	50	M39	60	M52	80
1100	M33	50	M39	60	M52	80
1200	M36	55	M45	70	M52	80
1400	M39	60	M45	70	M56	85
1500	M39	60	M52	80	M56	85
1600	M45	70	M52	80	M56	85
1800	M45	70	M52	80	M64	95
2000	M45	70	M56	85	M64	95

Other PN: please contact us.

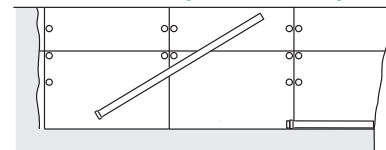
# Assembly equipment

The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## Descent into the trench between shoring

**Interpose** a wooden plank against the socket of the installed pipe.

**Descent** the pipe between the shoring without touching the installed pipe.

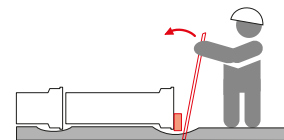


Pipes must be **connected** together while keeping them perfectly aligned with their axes.

**The joint must only be deflected when fully assembled and before pressurizing the system.**

## 1 CROWBAR

Pipes and fittings - DN 125 and BIOGAN pipes DN 150 and 200

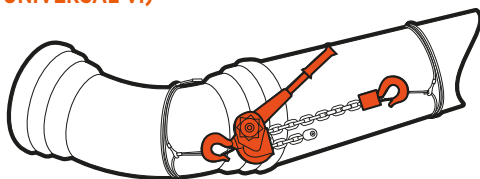


**Interpose** a wooden plank between crowbar and pipe.

# Assembly equipment

## 2 RATCHET CHAIN WINCH OR PULL LIFT.

Pipes and fittings with non-restrained joints or anchored joints (STANDARD Vi and UNIVERSAL Vi)



DN	Pipe / Pipe Ratchet chain winch	Number	Pipe / Fitting Ratchet chain winch	Number
<b>WITH FLAT STRAPS 2t Chain length 2m</b>				
125	750 kg	1	750 kg	1
140	--	--	250 kg	2
150	750 kg	1	750 kg	1
160	--	--	250 kg	2
200	1500 kg	1	1500 kg	2
250	1500 kg	1	1500 kg	2
300	1500 kg	2	1500 kg	2
350	1500 kg	2	1500 kg	3
<b>WITH FLAT STRAPS 3t Chain length 3m</b>				
400	1500 kg	2	1500 kg	3
450	1500 kg	2	1500 kg	3
500	1500 kg	2	1500 kg	3
600	3000 kg	2	1500 kg	3
700	3000 kg	2	3000 kg	2
800	3000 kg	2	3000 kg	2
<b>WITH FLAT STRAPS 6t Chain length 5m</b>				
900	6000 kg	2	6000 kg	3
1000	6000 kg	2	6000 kg	3
1100	6000 kg	2	6000 kg	3
1200	6000 kg	2	6000 kg	3
<b>WITH FLAT STRAPS 8t Chain length 6m</b>				
1400	6000 kg	3	6000 kg	3
1500	6000 kg	3	6000 kg	3
1600	6000 kg	3	6000 kg	3
1800	6000 kg	3	6000 kg	3
2000	6000 kg	3	6000 kg	3



These values are provided for guidance only and may vary according to the installation conditions (temperature, lubrication, assembly of cut sections, etc.).

# Assembly equipment

## Ratchet chain winches

Maximum service load	Reference
250	265417
750	265418
1500	158511
3000	158513
6000	158518



## 3 ACCESSORIES

### Flat textile straps

Color	Max. load	Length	Reference
Purple	1.5 t	2 m	158511
Green	2 t	2 m	158512
		8 m	158380
Yellow	3 t	3 m	158514
		4 m	158515
		5 m	158516
Gray	4 t	5 m	158517
		8 m	219996
Red	5 t	6 m	158388
Brown	6 t	5 m	158519
Blue	8 t	4 m	158383
		6 m	199148
		7 m	199201
		10 m	158520



To recognize the straps, count the number of seams (e.g. 3 seams = 3 t).

### Hooks for connecting pipes

DN	Visual	Reference
60 to 300		158 021
350 to 600		158 025
700 to 1200		158 026
1400 to 2000		158 605

## 4 DIGGER BUCKET DN 125 AND OVER

When socketing with a digger, insert a wooden batten between the bucket and the pipe.

# Pipe cutting

The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## 1 EQUIPMENT AND TOOLS REQUIRED

- Gloves, protective mask and goggles
- Brush, abrasive paper and cutter
- Paintbrushes, roller
- Gas burner

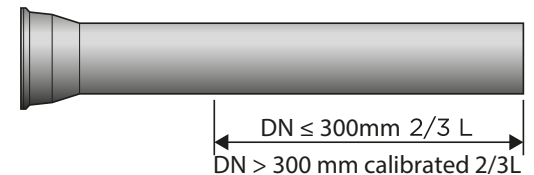
## 2 CHECK THE EXTERNAL DIAMETER

Before cutting, use a circometer to **check** that the OD measured is less than the OD + 1mm (see table below).

DN	DE	DN	DE	DN	DE	DN	DE
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	170	450	480	1000	1048	1800	1857
200	222	500	532	1100	1151	2000	2082

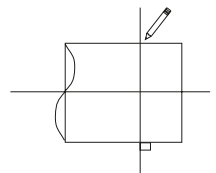
**DN ≤ 300 mm:** preferably cut within 4m of the spigot.

**DN ≥ 350 mm:** preferably cut pipes that have been calibrated (to be specified when ordering). These pipes are marked with metallic gray paint on the socket face.



## 3 DRAW THE CUTTING LINE

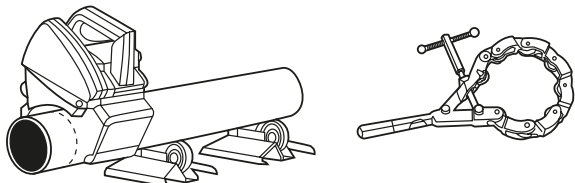
**Draw** the cutting plane perpendicular to the pipe centerline.



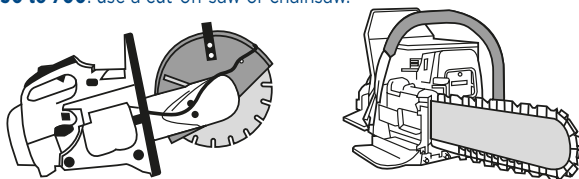
# Pipe cutting

## 4 CUTTING

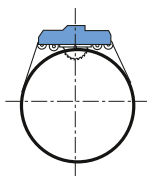
**DN 60 to 300:** cut the pipe with an electric, heat or manual pipe cutting machine. When the cut is made **with an electric or pneumatic pipe cutting and chamfering machine such as Pamcut**, the equipment must be set to cut without chamfering.



**DN 350 to 700:** use a cut-off saw or chainsaw.



**DN ≥ 700:** use a compressed air saw (e.g. FEIN) with a special attachment for chamfering the pipe.



*Irrespective of the cutting tool used, always fit a diamond disc. Limit the projection of fittings inside the pipe, especially particularly under the action of the wind.*

# Pipe cutting

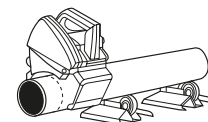
## 5 DUCTAN COATED PIPE CUTTING (INTEGRAL DUCTAN, BIOGAN)

**Make** the cut with an electric or thermal pipe cutting machine.



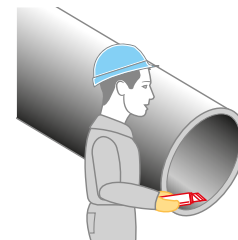
*Irrespective of the cutting tool used, always fit a diamond disc. Limit the projection of filings inside the pipe, especially particularly under the action of the wind.*

When the cut is made **with an electric or pneumatic pipe cutting and chamfering machine such as Pamcut**, the equipment must be set to cut without chamfering

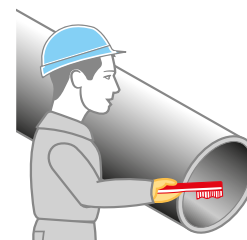


Cutting a DUCTAN pipe with a chainsaw no watercooled is to be avoided..

**Deburr** with a cutting tool any defects at the edge of the cut.



Immediately **clean** the inside of the pipe: after cutting, ensure that there are no filings inside.



*If a little bit of sticky, non-transferable filings remain in the coating interior DUCTAN, it may be visible to ITV, but this does not in question the integrity of the coating.*

# Pipe Cutting

## 6 CUTTING SPECIAL COATINGS

### TT PE AND TT PUX PIPES

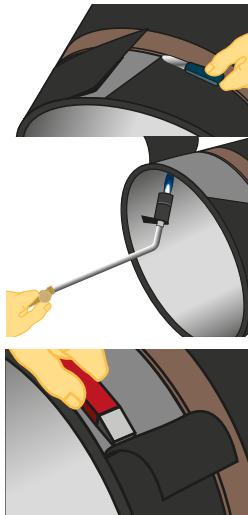


Draw the cutting marks (CPe) according to the following table:

DN	STD	UNI
60	95	-
80	95	150
100	100	145
125	105	155
150	105	155
200	110	160
250	115	170
300	120	185
350	120	190
400	120	190
450	125	200
500	125	210
600	140	220
700	200	270
800	205	270
900	210	290
1000	210	290

**Cut** the PE/PUX coating with a cutter through to the iron, but without damaging the iron.

**Make** a lengthwise cut to strip off the PE.



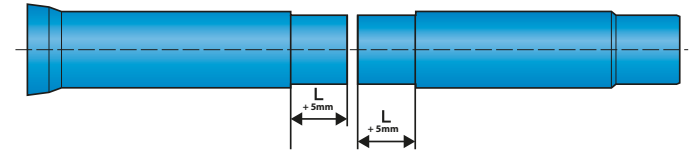
**Preheat** the area to be cut from the inside. Max 80°C.

**Remove** the PE/PUX with a chisel. By heating the pipe, the adhesive remains on the PE/PUX.

# Pipe Cutting

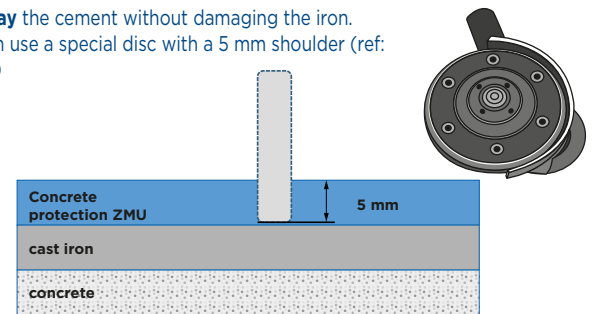
## ZMU PIPES

Draw the cutting marks (L) according to the following table:



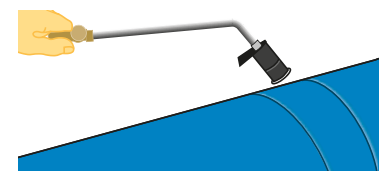
	DN	80	100	125	150	200	250	300	350	400	500	600	700
STD / TYT / TYTON Vi / STD VI	L	95	100	105	110	115		120		130	145	200	
UNIVERSAL	L	130	155	170	165	170	180	195	225	190	215	230	265
	DN	800	900	1000	1200								
STD	L	210	210	220	250								
UNIVERSAL	L	276	295	295	295								

**Cut away** the cement without damaging the iron. You can use a special disc with a 5 mm shoulder (ref: 185104)



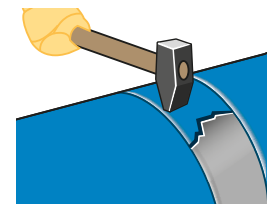
**Preheat** the area between the cuts in the cement coating Max 80°C..

**Create** a lengthwise cut with a chisel.



**Remove** the cement coating with a small hammer and chip off any cement traces with a chisel.

**Repair** the cement coating with kit ref: 18842 (repair to the "Repair products" guide.)



# Pipe Cutting

## ISOPAM PIPES

Draw the cutting area according to the following table:

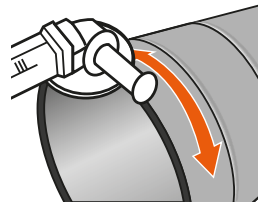
DN	Insulation to be removed A (mm)	DN	Insulation to be removed A (mm)
100	97	300	130
125	100	350	148
150	103	400	150
200	109	500	155
250	108	600	Contact us

Cut the polyethylene coating and insulation (be careful not to cut into the iron).

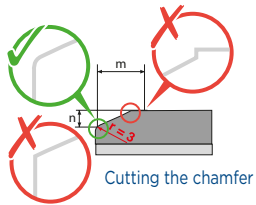
Remove the insulation and properly clean the spigot.

### 7 DEBURRING AND CHAMFERING

For mechanical joints (EXPRESS, COLLARS, etc.), **deburr** the cut edge with a grinder.



For push-in joints (STANDARD, STANDARD Vi, ViLok, UNIVERSAL Vi and UNIVERSAL Ve):



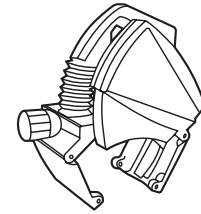
Cutting the chamfer

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

# Pipe cutting

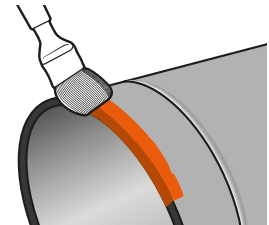


Remember to use the BLUCUT machine, which is capable of cutting and chamfering the pipe at the same time.



### 8 REPAIR THE EXPOSED IRON

Repair the protective coating on the exposed face and chamfer.



**Brush** to remove any dirt or loose particles.

**Dry** the surfaces to be coated (in case of low temperatures or high humidity, use a gas burner).

**Apply** high-zinc anticorrosion primer NATZINC (ref. 251222) with a paintbrush.

**Allow to dry** for a few minutes.

**Apply** the appropriate paint for the pipe coating:

Type of coating	Repair product
NATURAL	BLUE AQUACOAT 0.75 kg dose, ref. <b>240991</b>
	RED BROWN AQUACOAT 1 kg dose, ref. <b>184653</b>
INTEGRAL	AQUACOAT 0.75 kg dose ref. <b>240991</b>
CLASSIC / TT / ISOPAM / ZMU AQUACOAT	RED BROWN EUROKOTE 1 kg dose, ref. <b>184653</b>
TT PUX	

Also refer to the "Repair products" guide.

# Pipe cutting

## BIOGAN PIPES

**Check** the condition of the internal coating in the proximity of the cut:

• **Adherence:**

- **Remove** all non-adherent parts of the internal coating.

- **Repair** exposed cast iron :

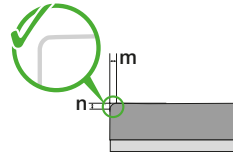
- 1) Defects less than 2 or 3 mm: according to the repair procedure of the section 6 "refurbishment exposed cast iron"
- 2) Defects greater than 2 or 3 mm: according to the procedure for repairing the internal coating (sheet Repair of internal coating)

• **No "blisters":**

- **Repair** when cast iron is exposed (through defect).

## 9 DEBURRING

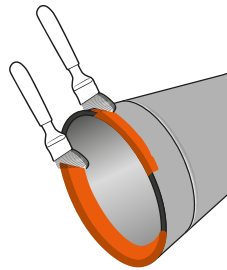
DN	m (mm)	n (mm)
150 à 200	1	1



**Break** the angle with a file or grinder.

## 10 REFURBISHMENT OF EXPOSED CAST IRON

**Reinstate** the protection on the exposed edge and on the spigot.



**Brush** to remove any dirt.

**Dry** the surfaces to be coated. In case of low temperatures or high humidity, use a gas torch to remove moisture.

**Shake** the container before use to ensure that the paint is homogenous..

**USING the brush, apply EXTREM 1\*** (on a clean, dry surface) in a thick layer on coatings existing inside, on the cut and outside the pipe.

The lap surface must be :

- at least 20 mm on the inner surface to ensure continuity of protection between DUCTAN and cast iron.
- 5 to 10 mm on the outer side.

see repair product sheet

# Pipe cutting

## PH1

**Clean** the surface to be coated.

**Brush** or rub with abrasive paper.

**Remove** any dust with a cloth.

**Clean** the inside of the pipe: after cutting, ensure that there are no filings inside the pipe.

**Preheat** the surface with successive sweeps across the entire surface with a brazing torch (2 min). Maximum temperature: 50°C.

**Apply an initial coat** of EUROKOTE 4820 paint ref. **184653** (1 kg dose) or **293825** (kit of five 50 ml syringes).

**Gently heat** the surface for three minutes after application to accelerate the drying time.

As soon as the first coat is tacky to the touch, **apply** the second coat of EUROKOTE 4820 paint.

**Heat** the surface for five minutes after applying the paint to dry it completely (the coat is dry to the touch without leaving any prints).

**Thickness after two coats: 250 µm**

## 11 REPAIRING SPECIAL COATINGS

### TT PE PIPES

**Clean** the surface to be coated.

**Brush** or **rub** with abrasive paper.

**Remove** any dust with a cloth.

**Apply** a coat of paint (**refer to the "Repair products" guide**).

**Allow to dry.**

# Pipe cutting

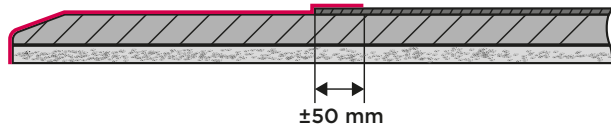
## TT PUX PIPES

**Clean** the surface to be coated.

**Brush** or **rub** with abrasive paper.

**Remove** any dust with a cloth.

**Apply** an initial coat of paint with a paintbrush (refer to the "Repair products" guide) by covering the end of the spigot and beyond the chamfer by overlapping the cement.



**Gently** heat the surface for three minutes after application to accelerate the drying time.

As soon as the first coat is tacky to the touch, **apply** the second coat of paint.

## ISOPAM PIPES

After assembling the junction, **cover** the exposed area with a foam spacer.

**Joint** the renovated part and the pipe coating using Impermastic sealing tape.

**Cover** the entire surface with a protective sleeve.

## PUR PIPES

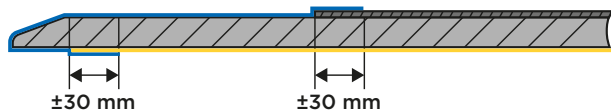
Thoroughly **water** the pipe while cutting.

**Clean** the surface to be coated.

**Brush** or **rub** with abrasive paper.

**Remove** any dust with a cloth.

**Apply** an initial coat of paint with a paintbrush or spatula in case of a small surface area (refer to the "Repair products" guide) by covering the end of the spigot and beyond the chamfer by overlapping the interior polyurethane.



**Gently** heat the surface for three minutes after application to accelerate the drying time.

# Locking weld bead on site

## Creating the weld bead

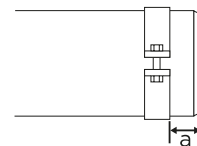
*The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).*

### 1 REQUIRED EQUIPMENT

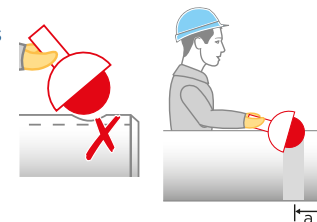
- Electric welding machine with a minimum capacity of 150 amperes.
- Electric or pneumatic grinder.
- Copper guide in accordance with the table on the next page.
- Recommended electrodes: ferro-nickel electrodes - Ø3.2 mm Solid wire: FeNi alloy with 55% Ni according to ISO 1071. Electrode grades are available as SC Ni Fe1 and SC Ni Fe2.
- Ref. **158179** 5 kg box of electrodes (160 electrodes).

### 2 SURFACE PREPARATION

**Draw** the position of the bead using the copper guide while complying with dimension a.

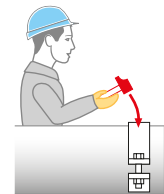


**Prepare** the surface to be welded by lightly grinding (i.e. grinding all coatings without affecting the thickness of the iron) over a strip of approximately 50 mm.



**Position** the copper guide ahead of the weld while complying with dimension a.

The guide must fit **snugly** around the whole circumference of the pipe. Tap with a hammer if necessary.



### 3 DEPOSIT THE LOCKING WELD BEAD

The surface must be free of moisture and oxidative.

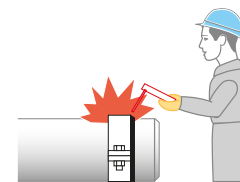
**Weld** against the guide to obtain a flat vertical face at right angles to the pipe's surface.

Preferably **work the weld** between marks A and B by turning the pipe.

The electrode must be positioned at an angle of 5°.

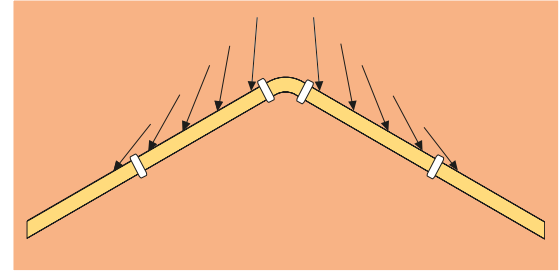
Number of passes: refer to the table on the following page.

**Caution:** the height of the copper guide does not correspond to the height of the weld bead (refer to the table on the following page).





# Anchoring



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment). All the values contained in this document are provided by PAM for guidance only. They are no substitute for carrying out prior studies or enlisting the services of a consultant.

## 1 CONSTRUCTION RECOMMENDATIONS

The self-anchoring of push-in joints represents an alternative technique to concrete anchor blocks for withstanding the hydraulic thrust of buried pipelines.

The anchoring lengths suggested below have been calculated for the most frequently encountered types of soil and laying conditions (minimum height of cover = 1 m).

**If the laying conditions are not covered by the following tables, contact PAM.**

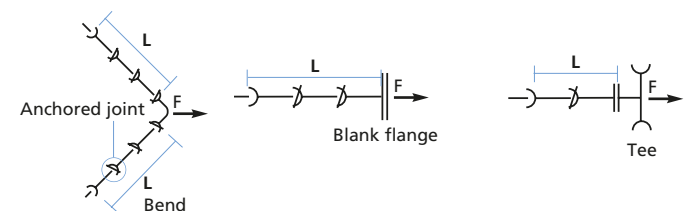
Anchoring is recommended in case of space constraints (urban areas) or non-cohesive soils.

The length to be anchored **does not depend on the anchoring joint used.**

The length to be anchored **depends on the pipe's type of external coating:**

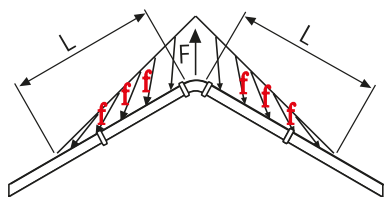
- Usual coatings: BioZinalium, Zinalium or Zinc
- Special coatings: Standard TT, PUX, ZMU or PE sleeve

Length **L** to be anchored according to the diagrams below:



## 2 ANCHORING PRINCIPLE

- F** : hydraulic thrust on the joint
- f** : soil/pipe friction
- L** : length to be anchored



The technique involves anchoring joints over a sufficient length L on both sides of a bend so as to harness the friction forces (f) between the anchored sections (L) and the soil to withstand the hydraulic thrust (F).

## 3 SOIL CHARACTERISTICS

The values below are those generally accepted for soil characterization. They are no substitute for actual site or laboratory measurements.

Soil type	Dry / wet		Submerged	
	$\phi$ degrees	$\gamma$ t/m <sup>3</sup>	$\phi$ degrees	$\gamma$ t/m <sup>3</sup>
Fragmented rock	40	2	35	1.1
Gravel, sands	35	1.9	30	1.1
Gravel, sands Silts / clays	30	2	25	1.1
Silts / clays	25	1.9	15	1.1
Humus Organic clays / silts	15	1.5	no mean characteristics	

$\phi$ : soil internal friction angle  
 $\gamma$ : soil density  
 (standard geotechnical data)



## 4 ANCHORING LENGTHS

### Assumptions for the calculation:

- Internal friction:  $\phi = 30^\circ$
- Soil strength:  $\sigma = 0.6 \text{ daN/cm}^2$
- Mass density:  $\gamma = 2 \text{ t/m}^3$
- No groundwater

### Usual coatings:

- BioZinalium

Anchoring lengths (in m) calculated with the above assumptions																
Joint type	1/4 bend			1/8 bend			1/16 bend			1/32 bend			Blank flange, valve or tee			
	Height of cover (m)	1	1.5	2	1	1.5	2	1	1.5	2	1	1.5	2	1	1.5	2
DN	Test pressure	Lengths to be anchored (m)														
60	10	4.6	3.1	2.4	2.9	1.9	1.5	1.6	1.1	0.8	0.8	0.6	0.4	5.8	4.0	3.0
	16	7.3	5.0	3.8	4.6	3.1	2.3	2.6	1.7	1.3	1.4	0.9	0.7	9.4	6.4	4.8
	25	11.5	7.8	5.9	7.1	4.8	3.7	4.0	2.7	2.1	2.1	1.4	1.1	14.6	9.9	7.5
80	10	5.8	4.0	3.0	3.6	2.5	1.9	2.0	1.4	1.0	1.1	0.7	0.6	7.4	5.0	3.8
	16	9.3	6.3	4.8	5.8	3.9	3.0	3.2	2.2	1.7	1.7	1.2	0.9	11.8	8.1	6.1
	25	14.5	9.9	7.5	9.0	6.1	4.7	5.1	3.4	2.6	2.7	1.8	1.4	18.5	12.6	9.5
100	10	7.0	4.7	3.6	4.3	2.9	2.2	2.4	1.7	1.3	1.3	0.9	0.7	8.9	6.0	4.6
	16	11.1	7.6	5.8	6.9	4.7	3.6	3.9	2.6	2.0	2.1	1.4	1.1	14.2	9.7	7.3
	25	17.4	11.9	9.0	10.8	7.4	5.6	6.1	4.1	3.1	3.2	2.2	1.7	22.1	15.1	11.5
125	10	8.4	5.8	4.4	5.2	3.6	2.7	2.9	2.0	1.5	1.6	1.1	0.8	10.7	7.3	5.6
	16	13.5	9.2	7.0	8.4	5.7	4.3	4.7	3.2	2.4	2.5	1.7	1.3	17.2	11.7	8.9
	25	21.1	14.4	10.9	13.1	8.9	6.8	7.3	5.0	3.8	3.9	2.7	2.0	26.8	18.3	13.9
150	10	9.9	6.8	5.1	6.1	4.2	3.2	3.4	2.4	1.8	1.8	1.2	0.9	12.6	8.6	6.5
	16	15.8	10.8	8.2	9.8	6.7	5.1	5.5	3.8	2.9	2.9	2.0	1.5	20.1	13.8	10.5
	25	24.7	16.9	12.9	15.3	10.5	8.0	8.6	5.9	4.5	4.6	3.1	2.4	31.4	21.5	16.4
200	10	12.7	8.7	6.7	7.9	5.4	4.1	4.4	3.0	2.3	2.3	1.6	1.2	16.2	11.1	8.5
	16	20.3	14.0	10.7	12.6	8.7	6.6	7.1	4.9	3.7	3.8	2.6	2.0	25.9	17.8	13.6
	25	31.8	21.9	16.7	19.7	13.6	10.4	11.1	7.6	5.8	5.9	4.0	3.1	40.4	27.8	21.2
250	10	15.4	10.7	8.1	9.6	6.6	5.1	5.4	3.7	2.8	2.8	2.0	1.5	19.6	13.6	10.4
	16	24.6	17.0	13.0	15.3	10.6	8.1	8.6	5.9	4.5	4.5	3.1	2.4	31.3	21.7	16.6
	25	38.5	26.6	20.4	23.9	16.5	12.7	13.4	9.3	7.1	7.1	4.9	3.8	49.0	33.9	25.9
300	10	18.0	12.5	9.6	11.2	7.8	6.0	6.3	4.4	3.3	3.3	2.3	1.8	22.9	15.9	12.2
	16	28.8	20.0	15.4	17.9	12.4	9.5	10.0	7.0	5.3	5.3	3.7	2.8	36.6	25.5	19.6
	25	45.0	31.3	24.0	27.9	19.4	14.9	15.6	10.9	8.4	8.3	5.8	4.4	57.2	39.8	30.6
350	10	20.5	14.4	11.0	12.7	8.9	6.9	7.1	5.0	3.8	3.8	2.7	2.0	26.1	18.3	14.1
	16	32.8	23.0	17.7	20.4	14.3	11.0	11.4	8.0	6.1	6.1	4.2	3.3	41.8	29.2	22.5
	25	51.3	35.9	27.6	31.9	22.3	17.1	17.9	12.5	9.6	9.5	6.6	5.1	65.3	45.7	35.1
400	10	23.0	16.1	12.4	14.3	10.0	7.7	8.0	5.6	4.3	4.2	3.0	2.3	29.3	20.5	15.8
	16	36.8	25.8	19.9	22.8	16.0	12.4	12.8	9.0	6.9	6.8	4.8	3.7	46.8	32.9	25.3
	25	57.5	40.3	31.1	35.7	25.1	19.3	20.0	14.0	10.8	10.6	7.5	5.7	73.1	51.4	39.6

# Anchoring

A **safety factor** may be applied to the length to be anchored, depending on the:

- **Laying conditions,**
- **Quality and compaction of the backfill,**
- **Uncertainties surrounding the physical characteristics of the backfill,**

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

## If using a polyethylene sleeve:

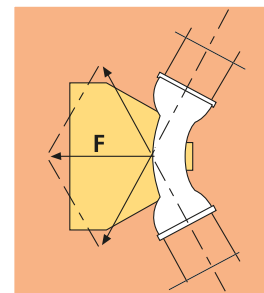
Apply a multiplier of 1.9 to the length to be anchored.

## If using pipes with a polyethylene (TT) or polyurethane (PUX) coating:

Apply a multiplier of 1.5 to the length to be anchored.

**Other cases: contact us.**

# Anchor blocks



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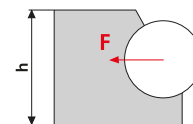
## 1 CONSTRUCTION RECOMMENDATIONS

The concrete anchor blocks presented hereinafter have been designed for the most frequently encountered types of soil and laying conditions.

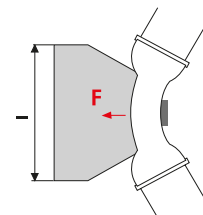
**If the laying conditions are not covered by the following tables, contact PAM.**



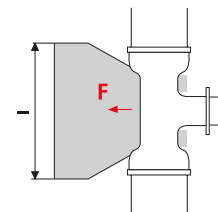
It is important to cast the concrete **directly against the surrounding soil** and use a concrete mix offering adequate strength.



When designing the anchor blocks, do not forget to leave the **gaskets exposed** for inspection during subsequent hydraulic testing.



*Caution! Never excavate in the immediate vicinity of an anchor block restraining thrust without having taken the precaution of sufficiently reducing the pressure in the main during work.*



# Anchor blocks

Install PAM TOOLS



## 2 HYDRAULIC THRUST

Thrust  $F = \text{test } P \times f$  (1 bar)

Example: 45° bend  
DN = 150  
Test P = 10 bar  
Thrust F = 1740 DaN

Thrust  $f$  for pressure of 1 bar

DN	Tee or blank flange (daN)	1/4 bend (daN)	1/8 bend (daN)	1/16 bend (daN)	1/32 bend (daN)
60	47	66	36	18	9
80	75	107	58	29	15
100	109	155	84	43	21
125	163	230	115	63	32
150	227	321	174	89	44
200	387	547	296	151	76
250	590	834	451	230	116
300	835	1180	639	326	164
350	1122	1587	859	438	220
400	1445	2044	1106	564	283

## 3 SOIL CHARACTERISTICS

The values below are those generally accepted for soil characterization. They are no substitute for actual site or laboratory measurements.

Soil type	Dry / wet		Submerged	
	$\phi$	$\gamma$	$\phi$	$\gamma$
	degrees	t/m <sup>3</sup>	degrees	t/m <sup>3</sup>
Fragmented rock	40	2	35	1.1
Gravel, sands	35	1.9	30	1.1
Gravel, sands Silts / clays	30	2	25	1.1
Silts / clays	25	1.9	15	1.1
Humus Organic clays / silts	15	1.5	no mean characteristics	

$\phi$ : soil internal friction angle  
 $\gamma$ : soil density  
(standard geotechnical data)

# Anchor blocks

## 4 ANCHOR BLOCK DIMENSIONS

Soil with HIGH mechanical strength

- Internal friction:  $\phi = 40^\circ$
- Soil strength:  $\sigma = 0.6 \text{ daN/cm}^2$
- Mass density:  $\gamma = 2 \text{ t/m}^3$
- Height of cover:  $H = 1 \text{ m}$
- No groundwater

Soil with high mechanical strength						
DN	Test pressure	1/32 bend w x h / V	1/16 bend w x h / V	1/8 bend w x h / V	1/4 bend w x h / V	Blank flange and tee w x h / V
	bar	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>
60	10	0.07x0.16/0.01	0.14x0.16/0.02	0.17x0.26/0.02	0.31x0.26/0.04	0.22x0.26/0.03
	16	0.11x0.16/0.02	0.14x0.26/0.02	0.27x0.26/0.04	0.48x0.26/0.07	0.35x0.26/0.04
	25	0.17x0.16/0.03	0.22x0.26/0.03	0.41x0.26/0.05	0.71x0.26/0.14	0.52x0.26/0.08
80	10	0.1x0.18/0.02	0.20x0.18/0.04	0.25x0.28/0.04	0.45x0.28/0.07	0.33x0.28/0.05
	16	0.16x0.18/0.03	0.21x0.28/0.03	0.39x0.28/0.06	0.68x0.28/0.14	0.50x0.28/0.08
	25	0.17x0.28/0.02	0.32x0.28/0.04	0.59x0.28/0.11	1.00x0.28/0.31	0.74x0.28/0.17
100	10	0.13x0.20/0.03	0.18x0.30/0.03	0.33x0.30/0.05	0.58x0.30/0.11	0.43x0.30/0.07
	16	0.20x0.20/0.05	0.28x0.30/0.05	0.51x0.30/0.1	0.88x0.30/0.25	0.65x0.30/0.14
	25	0.22x0.30/0.04	0.42x0.30/0.07	0.76x0.30/0.19	1.03x0.40/0.47	0.95x0.30/0.30
125	10	0.17x0.22/0.04	0.24x0.33/0.05	0.44x0.33/0.16	0.76x0.33/0.21	0.56x0.33/0.13
	16	0.19x0.33/0.04	0.37x0.33/0.07	0.67x0.33/0.16	0.94x0.43/0.41	0.85x0.33/0.26
	25	0.29x0.33/0.06	0.55x0.33/0.12	0.99x0.33/0.35	1.35x0.43/0.85	1.02x0.43/0.49
150	10	0.21x0.25/0.06	0.3x0.35/0.07	0.55x0.35/0.14	0.79x0.45/0.31	0.70x0.35/0.19
	16	0.24x0.35/0.05	0.46x0.35/0.11	0.83x0.35/0.27	1.17x0.45/0.67	0.88x0.45/0.38
	25	0.37x0.35/0.09	0.69x0.35/0.19	1.02x0.45/0.51	1.66x0.45/1.37	1.27x0.45/0.79
200	10	0.28x0.30/0.10	0.42x0.40/0.14	0.66x0.50/0.24	1.11x0.50/0.68	0.83x0.50/0.38
	16	0.35x0.40/0.11	0.65x0.40/0.22	0.99x0.50/0.53	1.44x0.60/1.37	1.23x0.50/0.83
	25	0.52x0.40/0.16	0.81x0.50/0.36	1.42x0.50/1.11	2.03x0.60/2.72	1.56x0.60/1.61
250	10	0.35x0.35/0.16	0.55x0.45/0.22	0.86x0.55/0.45	1.28x0.65/1.18	1.08x0.55/0.7
	16	0.45x0.45/0.18	0.72x0.55/0.31	1.27x0.55/0.98	1.71x0.75/2.4	1.42x0.65/1.43
	25	0.58x0.55/0.20	1.05x0.55/0.67	1.63x0.65/1.90	2.22x0.85/4.61	1.84x0.75/2.79
300	10	0.42x0.40/0.24	0.59x0.60/0.23	1.05x0.60/0.73	1.57x0.70/1.90	1.19x0.70/1.09
	16	0.55x0.50/0.29	0.89x0.60/0.52	1.40x0.70/1.52	1.96x0.90/3.79	1.60x0.80/2.26
	25	0.72x0.60/0.34	1.17x0.70/1.05	1.84x0.80/2.97	2.45x1.10/7.28	2.10x0.90/4.39
350	10	0.49x0.45/0.33	0.70x0.65/0.35	1.14x0.75/1.06	1.72x0.85/2.78	1.31x0.85/1.61
	16	0.58x0.65/0.24	0.96x0.75/0.76	1.54x0.85/2.22	2.20x1.05/5.58	1.78x0.95/3.33
	25	0.85x0.65/0.52	1.38x0.75/1.58	2.04x0.95/4.35	2.70x1.35/10.86	2.27x1.15/6.49
400	10	0.55x0.50/0.43	0.74x0.80/0.48	1.22x0.90/1.48	1.79x1.10/3.86	1.51x0.90/2.27
	16	0.66x0.70/0.38	1.10x0.90/1.07	1.68x1.00/3.09	2.28x1.40/8.01	1.96x1.10/4.64
	25	0.90x0.80/0.72	1.48x0.90/2.18	2.02x1.40/6.31	3.09x1.40/14.74	2.44x1.40/9.20

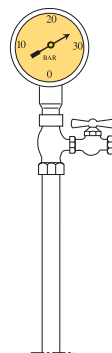
# Anchor blocks

## Soil with MEDIUM mechanical strength

- Internal friction:  $\phi = 30^\circ$
- Soil strength:  $\sigma = 0.6 \text{ daN/cm}^2$
- Mass density:  $\gamma = 2 \text{ t/m}^3$
- Height of cover:  $H = 1 \text{ m}$
- No groundwater

Soil with medium mechanical strength						
DN	Test pressure bar	1/32 bend	1/16 bend	1/8 bend	1/4 bend	Blank flange and tee
		w x h / V	w x h / V	w x h / V	w x h / V	
		m x m / m <sup>3</sup>	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>	m x m / m <sup>3</sup>
60	10	0.11x0.16/0.01	0.14x0.26/0.01	0.26x0.26/0.03	0.46x0.26/0.06	0.33x0.26/0.03
	16	0.17x0.16/0.02	0.21x0.26/0.02	0.40x0.26/0.05	0.69x0.26/0.14	0.51x0.26/0.07
	25	0.17x0.26/0.02	0.33x0.26/0.03	0.60x0.26/0.10	1.01x0.26/0.29	0.75x0.26/0.16
80	10	0.15x0.18/0.02	0.20x0.28/0.02	0.38x0.28/0.05	0.65x0.28/0.13	0.48x0.28/0.07
	16	0.16x0.28/0.02	0.31x0.28/0.04	0.57x0.28/0.10	0.97x0.28/0.29	0.73x0.28/0.16
	25	0.25x0.28/0.03	0.47x0.28/0.07	0.84x0.28/0.22	1.13x0.38/0.53	1.06x0.28/0.34
100	10	0.19x0.20/0.04	0.26x0.30/0.04	0.49x0.30/0.08	0.84x0.30/0.23	0.62x0.30/0.13
	16	0.21x0.30/0.03	0.41x0.30/0.06	0.74x0.30/0.18	1.01x0.40/0.45	0.93x0.30/0.29
	25	0.33x0.30/0.05	0.61x0.30/0.12	1.08x0.30/0.38	1.44x0.40/0.92	1.10x0.40/0.53
125	10	0.18x0.33/0.03	0.35x0.33/0.06	0.64x0.33/0.15	0.90x0.43/0.38	0.81x0.33/0.24
	16	0.29x0.33/0.05	0.54x0.33/0.10	0.96x0.33/0.33	1.32x0.43/0.81	0.99x0.43/0.46
	25	0.43x0.33/0.07	0.80x0.33/0.23	1.15x0.43/0.62	1.86x0.43/1.61	1.42x0.43/0.95
150	10	0.23x0.35/0.04	0.44x0.35/0.09	0.80x0.35/0.25	1.12x0.45/0.62	0.84x0.45/0.35
	16	0.36x0.35/0.07	0.67x0.35/0.17	0.99x0.45/0.49	1.62x0.45/1.30	1.23x0.45/0.75
	25	0.54x0.35/0.11	0.82x0.45/0.33	1.42x0.45/1	2.00x0.55/2.41	1.54x0.55/1.43
200	10	0.33x0.40/0.08	0.62x0.40/0.17	0.94x0.50/0.49	1.38x0.60/1.26	1.18x0.50/0.76
	16	0.51x0.40/0.13	0.79x0.50/0.35	1.38x0.50/1.05	1.97x0.60/2.57	1.52x0.60/1.52
	25	0.64x0.50/0.23	1.15x0.50/0.73	1.74x0.60/2.00	2.32x0.80/4.74	1.94x0.70/2.91
250	10	0.43x0.45/0.14	0.69x0.55/0.29	1.09x0.65/0.85	1.63x0.75/2.19	1.35x0.65/1.31
	16	0.57x0.55/0.20	1.03x0.55/0.64	1.59x0.65/1.80	2.16x0.85/4.35	1.79x0.75/2.64
	25	0.84x0.55/0.43	1.33x0.65/1.26	2.04x0.75/3.44	2.66x1.05/8.18	2.32x0.85/5.02
300	10	0.53x0.50/0.22	0.85x0.60/0.48	1.34x0.70/1.39	1.87x0.90/3.46	1.53x0.80/2.06
	16	0.70x0.60/0.33	1.14x0.70/1.00	1.79x0.80/2.81	2.38x1.10/6.86	2.05x0.90/4.15
	25	1.03x0.60/0.70	1.50x0.80/1.99	2.21x1.00/5.37	3.01x1.30/12.92	2.38x1.30/8.13
350	10	0.55x0.65/0.22	0.92x0.75/0.69	1.47x0.85/2.03	2.10x1.05/5.09	1.71x0.95/3.04
	16	0.83x0.65/0.50	1.25x0.85/1.47	1.89x1.05/4.13	2.62x1.35/10.22	2.13x1.25/6.22
	25	1.11x0.75/1.01	1.67x0.95/2.93	2.34x1.35/8.13	3.52x1.35/18.40	2.81x1.35/11.69
400	10	0.64x0.70/0.31	1.06x0.80/0.98	1.60x1.00/2.82	2.18x1.40/7.31	1.87x1.10/4.24
	16	0.88x0.80/0.68	1.44x0.90/2.07	1.97x1.40/5.96	3.00x1.40/13.87	2.37x1.40/8.68
	25	1.19x0.90/1.41	1.84x1.10/4.09	2.68x1.40/11.08	4.01x1.40/24.73	3.21x1.40/15.82

# Hydraulic testing



The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

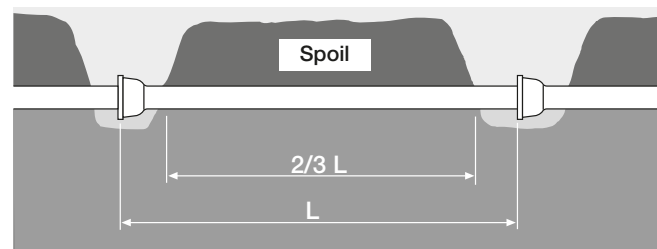
## 1 PREPARATION FOR THE TEST

### Recommendations

The recommendation is to not exceed a length of 2,000 meters.

The length of the section to be tested depends on the layout configuration and the project's technical specifications.

Depending on the type of worksite, it is better to pressurize the pipeline while leaving the joints exposed to check for leaks.



### Calculate the hydraulic forces

Developed at the ends of the main and install a suitably sized restraint system.

$$\text{Thrust } F = \text{test } P \times f \text{ (1 bar)}$$

Example : DN = 150      Test P = 10 bar      Thrust F 227 daN

DN	f(1bar) daN	DN	f(1bar) daN	DN	f(1bar) daN	DN	f(1bar) daN
60	47	250	590	600	3167	1200	12370
80	75	300	835	700	4278	1400	16787
100	109	350	1122	800	5568	1500	19236
125	163	400	1445	900	7014	1600	21851
150	227	450	1809	1000	8626	1800	27612
200	387	500	2223	1100	10405	2000	34045

# Hydraulic testing

## Calculate the volume of water

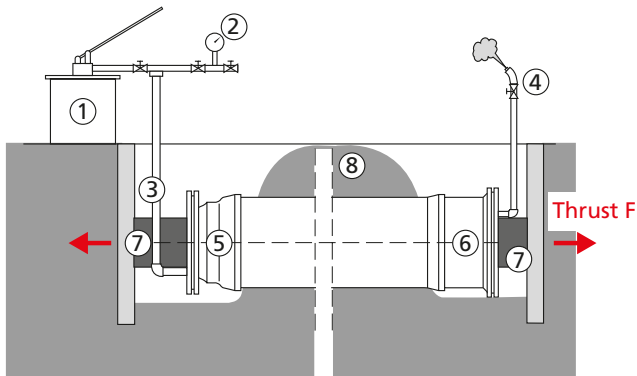
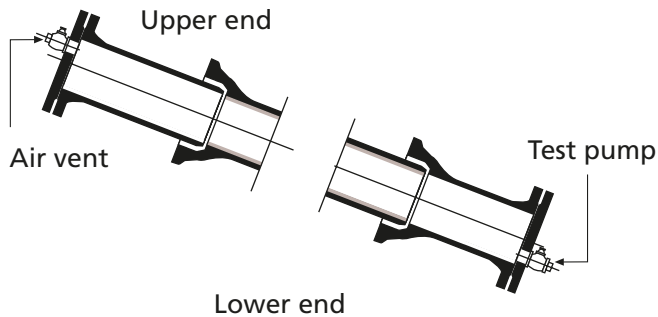
Calculation for the volume of water in m<sup>3</sup>

$\pi \times (\text{DN}/2000)^2 \times \text{pipeline length}$

Example: 1,850-metre section of DN 800 pipe

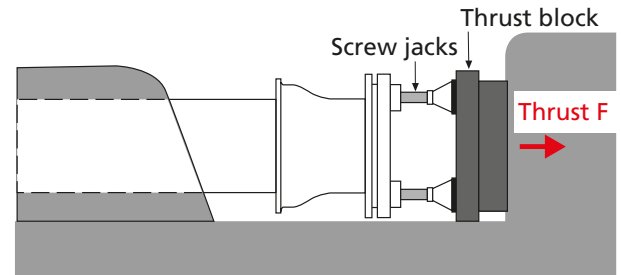
$$3.1415 \times (800/2000)^2 \times 1850 = 929.78 \text{ m}^3$$

**Block the ends** of the test section with blank flanges equipped with valves for water filling and air venting.



# Hydraulic testing

Pressurizing the pipe compresses the temporary end restraints. If necessary, use screw jacks to compensate for any compression.



**Absorb the forces** using timbers laid across the trench or by sheet piling (also provide lateral restraints).

**Avoid** using the end of a previously laid and hydraulically tested pipe section as a buttress.

## 2 PIPE FILLING AND TEST PREPARATION

**Gradually fill** the main from the low points.

**Increase to maximum pressure** and **leave for 24 hours** according to EN 805 before performing the test for the main to reach equilibrium (rehydration of the pipes' cement internal lining).

### Checking filling

Any air in the main must be **completely removed**.

**Check** that the air valves are functioning.

**Open** the wash-out valves to check the arrival of water.

## 3 PRESSURE TEST

With the pipes completely filled, slowly **increase** the pressure until the planned test pressure is reached.

**Keep** a constant eye on the restraints

**Apply** the defined test criteria.

The test pressure should not fall by more than 0.2 bar when maintained for one hour in accordance with EN 805.

**Empty** the main, **remove** the test equipment and, **connect** up the section.

**Flush** out the main thoroughly to remove any foreign bodies trapped during laying.

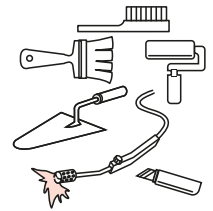
**Disinfect** before commissioning.

# External coating repairs

The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

## 1 EQUIPMENT AND TOOLS REQUIRED

- Gloves, protective mask and goggles
- Brush, abrasive paper and cutter
- Spatula, mastic knife
- Paintbrushes, roller
- Gas burner
- Adhesive roller



## 2 BIOZINALIUM EXTERNAL PIPES: NATURAL, INTEGRAL, BIOGAN, PLUVIAL.

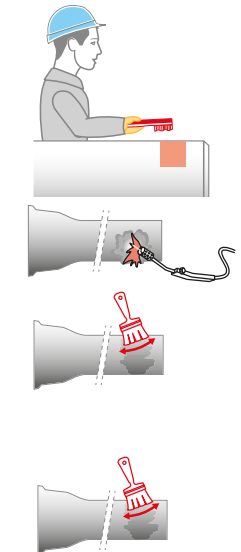
**Brush** to remove any dirt or loose particles.

**Dry** the surfaces to be coated (in case of low temperatures or high humidity, use a gas burner).

If the iron is exposed, **apply** high-zinc anticorrosion primer NATZINC (ref. **251222**) with a paintbrush with vertical and horizontal strokes.

Allow to **dry** for a few minutes.

**Apply** AQUACOAT paint with a paintbrush (NATURAL Blue ref. **240991** – INTEGRAL Red ref. **240990**) with vertical and horizontal strokes.



## 3 FITTINGS WITH AN EPOXY EXTERNAL COATING: NATURAL, INTEGRAL, (all versions).

**Brush** and clean the area to be touched up and then **dry**.

**Apply** the epoxy paint with a paintbrush or spatula with vertical and horizontal strokes.

- NATURAL** EUROKOTE 4820 Blue (1 kg dose: ref. **158255**)
- INTEGRAL**: EUROKOTE 4820 Red Brown (1 kg dose: 184653 or kit of five 50 ml syringes: ref. **293825**)
- STANDARD TT PUX and INTEGRAL TT PUX**: Eurokote 4820 Ivory (ref. **291855**)

# External coating repairs

## 4 PIPES WITH A POLYETHYLENE EXTERNAL COATING

### 5.1 Significant damage

**Roughen** the area to be repaired with abrasive paper.

**Clean and dry** the area.

**Preheat** to approximately 60°C.

**Fit** an open heat-shrink sleeve (reference on request).

**Wrap** the sleeve all around the pipe's circumference using a gas burner and then fit the closing strip.

### 5.2 Moderate damage

Repair kit ref. **111216** comprising abrasive paper, mastic and a repair strip.

**Clean and dry** the exposed area.

**Cut off and remove** the damaged PE.

**Preheat** to approximately 60°C.

**Apply** the mastic and smooth with a knife.

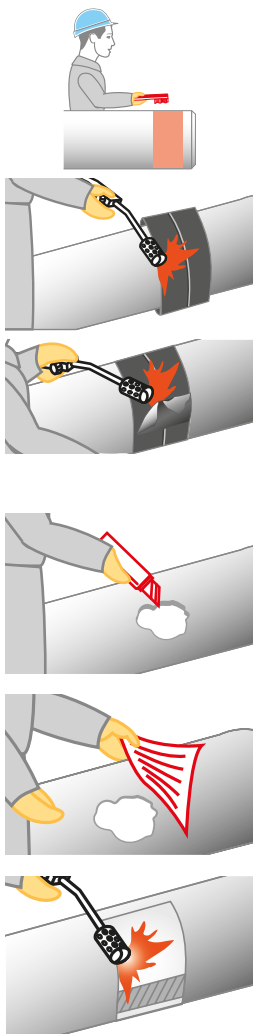
**Place the repair strip** with a 50mm overlap on the edges of the cut area.

**Heat** the strip with a gas burner until the heat-sensitive paint changes color.

**Press** the strip down wearing appropriate gloves.

### 5.3 Minor damage

In case of minor damage to the TT coating, use the **PE repair stick** (ref. **175507**). Using a brazing torch, heat the stick until it drips onto the damaged area and then smooth over.



# External coating repairs

## 5 PIPES WITH A POLYURETHANE EXTERNAL COATING

**Brush** to remove any dirt or loose particles and then **sand** to clean and roughen the surface.

**Remove** any dust from the surface to be coated.

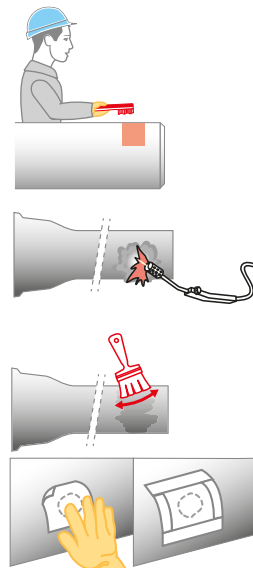
**Heat** with a gas burner to remove any traces of humidity.

**Apply** the product to the surface with a syringe (Eurokote 4820 Ivory - ref. **291855**).

**Cover** with a sheet of PVC to smooth out and protect the product.  
Close with adhesive.



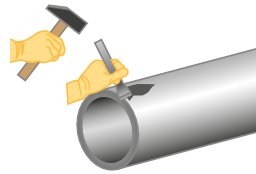
*In case of major damage to the PUX coating, follow procedure 5.1 in the previous chapter.*



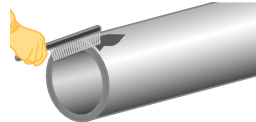
# External coating repairs

## 6 PIPES WITH A CEMENT EXTERNAL COATING

**Prepare** the affected surface by removing the damaged and loose mortar.



**Brush** to remove any dirt or loose particles and then **clean** the surface.

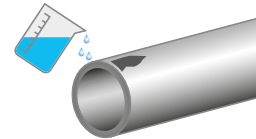


**Prepare** the ZMU repair kit (DN 80 to 600: ref. 218842).

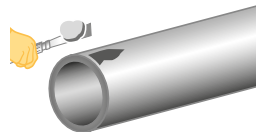
- Mix the dry components
- Add the liquid while stirring vigorously
- Leave for five minutes and then mix again



**Dampen** the surface.



**Fill** with mortar using a spatula and then smooth the surface.



(DN ≥ 700: ref. 158009)

**Prepare** the SIKADUR 31DW mixture with three parts R (resin) and one part H (hardener). **Mix** to an even consistency.

Preferably **position** the area to be repaired facing downwards.

**Remove** any damaged and loose mortar.

**Clean** until spotless.

**Apply** the mixture and compact to ensure the correct thickness.

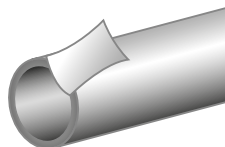
**Smooth** the surface.



**Minimum application temperature: + 5°C.**

**Cover** with plastic film or a damp cloth to maintain a high level of humidity and ensure that the mixture sets properly.

Optimal drying time: 2 hr 30 min.



# Internal lining repairs

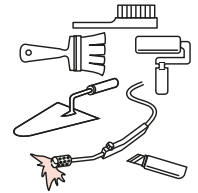
The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).



For all mixtures of resins and hardeners, you must comply with the specified proportions.

## 1 EQUIPMENT AND TOOLS REQUIRED

- Gloves, protective mask and goggles
- Brush, abrasive paper and cutter
- Spatula, mastic knife
- Paintbrushes, roller
- Gas burner



## 2 PIPES WITH A CEMENT INTERNAL LINING (DRINKING WATER AND SEWAGE): NATURAL, INTEGRAL, PLUVIAL, CLASSIC (all versions).

**Prepare** the SIKADUR 31DW mixture (ref. 158009) with three parts R (resin) and one part H (hardener). **Mix** to an even consistency.

Preferably **position** the area to be repaired facing downwards.

**Remove** any damaged and loose mortar.

**Clean** until spotless.

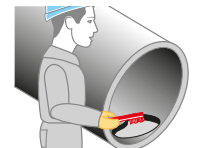
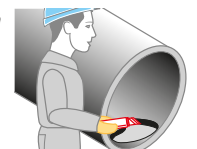
**Apply** the mixture and compact to ensure the correct thickness.

**Smooth** the surface.



For a socket without a cement lining, use:

- **NATURAL and STANDARD TT:** NatZinc ref. 251222 (5 kg dose) and then Aquacoat (0.75 kg dose) ref. 240991
- **CLASSIC :** NatZinc ref. 251222 (5 kg dose) and then black Aquacoat (0.75 kg dose) ref. 265365
- **INTEGRAL and INTEGRAL TT:** NatZinc ref. 251222 (5 kg dose) and then red Aquacoat (0.75 kg dose) ref. 184653
- **PUX and INTEGRAL PUX:** 4820 red brown Eurokote (1 kg dose) ref. 184653.



## 3 PIPES WITH A DUCTAN (DRINK. WATER AND SEWAGE): INTEGRAL DUCTAN, BIOGAN

**Deburr** the edges of the damaged area with a cutter.

**Sand** and **clean** the damaged area.

**Apply** the Eurokote 4820 mixture to the damaged area with a paintbrush.

- ref. 158255 (1 kg dose) or 289842 (five 50 ml syringes)

**Allow to dry.**

# Internal lining repairs

## 4 PIPES WITH A POLYURETHANE INTERNAL LINING (DRIN. WATER AND SEWAGE): NATURAL PUR, INTEGRAL PHI.

**Deburr** the edges of the damaged area with a cutter.

**Brush and clean** to remove any dirt or loose particles.

**Dry** the surfaces to be coated (in case of low temperatures or high humidity, use a gas burner).

**Apply** EUROKOTE 4820 Ivory paint (1 kg dose, ref. **185005** or five 50 ml syringes ref. **291855**) with a paintbrush with vertical and horizontal strokes.

**Cover** with a sheet of PVC to smooth out and protect the product.

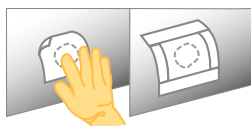
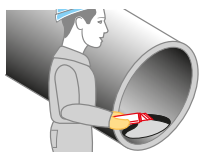
**Close** with adhesive.

**Allow to dry.**



For a socket without a polyurethane lining, use:

- NATURAL PUR: ref. **158255** (1 kg dose) or **289842** (five 50 ml syringes)
- INTEGRAL pH: ref. **184653** (1 kg dose) or **293825** (five 50 ml syringes)



## 5 FITTINGS WITH AN EPOXY COATING (DRINK. WATER AND SEWAGE): NATURAL, INTEGRAL (all versions).

**Deburr** the edges of the damaged area with a cutter.

**Sand and clean** the damaged area.

**Apply** the Eurokote 4820 mixture to the damaged area with a paintbrush.

•NATURAL : ref. **158255** (1 kg dose) or **289842** (ten 50 ml syringes)

•INTEGRAL : ref. **184653** (1 kg dose) or **293825** (ten 50 ml syringes)

•PUX (socket) ref. **185005** (dose 1 kg) or **291855** (ten 50 ml syringes)

**Allow to dry.**



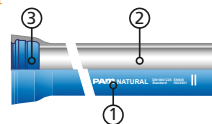
# Repair products

The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal productive equipment).

## 1 DRINKING WATER PIPES AND FITTINGS

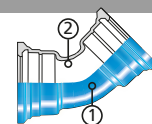
### NATURAL range DN 60 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240991	AQUACOAT blue 4820	dose of 0.75 kg
② interior	158009	SIKADUR 31 DW	dose of 1 kg (R80%+D20%)
③ interior socket and spigot	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240991	AQUACOAT blue 4820	dose of 0.75 kg



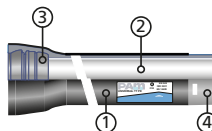
### NATURAL fittings DN 60 to 2000

area	ref.	product	packaging
① exterior and ② interior	158255	EUROKOTE blue 4820	dose of 1 kg (R68%+D32%)



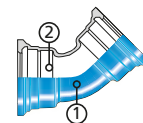
### TT PE range DN 80 to 1000

area	ref.	product	packaging
① exterior (little damages)	175507	PE repair stick	1 item
① exterior (moderate damages)	111216	Heat-shrink patch kit	1 item
	158009	SIKADUR 31 DW	dose of 6 kg (R75%+D25%)
③ interior socket and spigot	251222	NATZINC	dose of 5 kg (R90%+D10%)
	and 240991	AQUACOAT blue 5005	dose of 0.75 kg



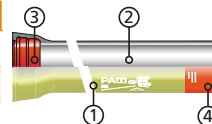
### TT PE fittings DN 80 to 1000

area	ref.	product	packaging
① exterior and ② interior	158255	EUROKOTE blue 4820	dose of 1 kg (R68%+D32%)



### TT PUX Range DN 150 to 2000

area	ref.	product	packaging
① exterior	185005	EUROKOTE ivory 4820	dose of 1 kg (R68%+D32%)
	or 291855	EUROKOTE ivory 4820	kit of five 50 ml syringes
② interior	158009	SIKADUR 31 DW	6 kg kit (R75%+D25%)
③ interior socket	184653	EUROKOTE brown red 4820	dose of 1 kg (R68%+D32%)
④ spigot	184653	EUROKOTE brown red 4820	dose of 1 kg (R68%+D32%)

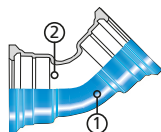


Comply with the recommended applications specified in the safety data sheets available in the Downloads section on [www.pamline.com](http://www.pamline.com).

# Repair products

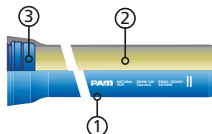
## TT PUX fittings DN 150 to 2000

area	ref.	product	packaging
① exterior and interior	158255	EUROKOTE® blue 4820	dose of 1 kg (R68%+D32%)



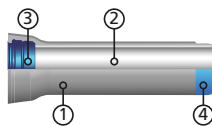
## NATURAL PUR Range DN 150 to 700

area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240991	AQUACOAT Blue 5005	dose of 0.75 kg
② interior	185005	EUROKOTE ivory 4820	dose of 1 kg (R68%+D32%)
	158255	EUROKOTE blue 4820	dose of 1 kg (R68%+D32%)
③ interior socket	or 291855	EUROKOTE ivory 4820	kit of five 50 ml syringes



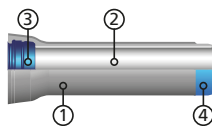
## ZMU Range DN 80 to 600

area	ref.	product	packaging
① exterior	218842	ZMU repair kit	1.2 kg tub
② interior	158009	SIKADUR 31 DW	6 kg kit (R75%+D25%)
③ interior socket and ④ spigot	240991	AQUACOAT blue 5005	dose of 0.75 kg



## ZMU Range DN ≥ 700

zone	ref.	product	packaging
① extérieur	158009	SIKADUR 31 DW	6 kg kit (R75%+D25%)
② intérieur			
③ interior socket and ④ spigot	240991	AQUACOAT® Blue 5005	dose of 0.75 kg

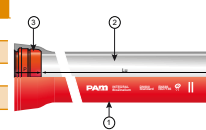


# Repair products

## 2 SEWAGE PIPES AND FITTINGS

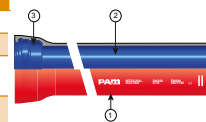
### INTEGRAL Range (BioZinalium) DN 150 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240990	red AQUACOAT	dose of 0.75 kg
② interior	158009	SIKADUR 31 DW	dose of 6 kg (R75%+D25%)
	251222	NATZINC	dose of 5 kg (R90%+D10%)
③ interior socket	240990	red AQUACOAT	dose of 0.75 kg



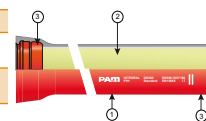
### INTEGRAL DUCTAN Range DN 80 to 125

area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240990	red AQUACOAT	dose of 0.75 kg
② interior	158255	EUROKOTE blue 4820	1 kg dose (R68%+D32%)
③ interior socket	158255	EUROKOTE blue 4820	1 kg dose (R68%+D32%)



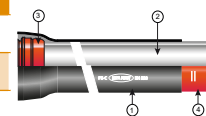
### INTEGRAL pH1 Range DN 150 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240990	red AQUACOAT	dose of 0.75 kg
② interior	185005	EUROKOTE ivory 4820	dose of 1 kg (R68%+D32%)
	ou 291855	EUROKOTE ivory 4820	kit of ten 50 ml syringes
③ interior socket and exterior spigot	184653	EUROKOTE brown red 4820	dose of 1 kg (R68%+D32%)
	293825	EUROKOTE brown red 4820	kit of ten 50 ml syringes



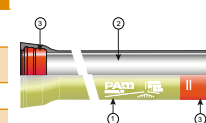
### INTEGRAL TT PE Range DN 150 to 1000

area	ref.	product	packaging
① exterior	175507	PE repair stick	1 item
① exterior	111216	heat-shrink patch kit	1 item
② interior	158009	SIKADUR 31 DW	dose of 6 kg (R75%+D25%)
	251222	NATZINC	dose of 5 kg (R90%+D10%)
③ interior socket	and 240990	red AQUACOAT	dose of 0.75 kg
	293825	EUROKOTE brown red 4820	kit of ten 50 ml syringes



### INTEGRAL TT PUX Range DN 150 to 2000

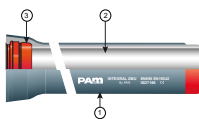
arer	ref.	product	packaging
① exterior	185005	EUROKOTE ivory 4820	dose of 1 kg (R68%+D32%)
	ou 291855	EUROKOTE ivory 4820	kit of ten 50 ml syringes
② interior	158009	SIKADUR 31 DW	dose of 6 kg (R75%+D25%)
	184653	EUROKOTE brown red 4820	dose of 1 kg (R68%+D32%)
③ interior socket and exterior spigot	ou 293825	EUROKOTE brown red 4820	kit of ten 50 ml syringes



# Repair products

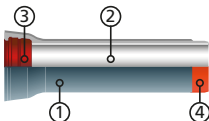
## INTEGRAL ZMU Range DN 150 to 600

area	ref.	product	packaging
① exterior	218842	reparative kit ZMU	tub of 12 kg
② interior	158009	SIKADUR 31 DW	dose of 6 kg (R75%+D25%)
③ interior socket and exterior spigot	251222	NATZINC	dose of 5 kg (R90% + D10%)
	236283	EUROKOTE brown red 448	dose of 1 kg (R80%+D20%)



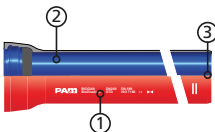
## ZMU Range DN 700 to 1200

area	ref.	product	packaging
① exterior	158009	SIKADUR 31 DW	kit of 6 kg (R75%+D25%)
② interior			
③ interior socket and exterior spigot	251222	NATZINC	dose of 5 kg (R90%+D10%)
	240990	red AQUACOAT	dose of 0.75 kg



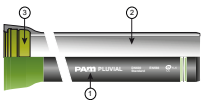
## BIOGAN Range DN 150 to 200

area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+H10%)
	240990	red AQUACOAT	dose of 0.75 kg
② interior and interior socket	158255	EUROKOTE blue 4820	dose 1 kg (R 68% + D 32%)
	289842	EUROKOTE blue 4820	kit of ten 50 ml syringes
③ Cut reparation	283230	Extrem 1 red	tub of 250 ml (0.5 kg)
	283231	Extrem 1 red	tub of 500 ml (1 kg)



## PLUVIAL Range DN 350 to 2000

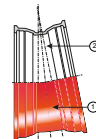
area	ref.	product	packaging
① exterior	251222	NATZINC	dose of 5 kg (R90%+D10%)
	265365	Black AQUACOAT	tub of 0.75 kg
② interior	158009	SIKADUR 31 DW	dose of 6 kg (R75%+D25%)
③ int. and ext. socket	251222	NATZINC	dose of 5 kg (R90%+D10%)
	-	green paint	Consult us



# Repair products

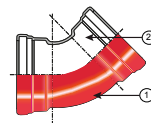
## Sewage fittings DN 75 to 2000

area	ref.	product	packaging
① exterior and interior	184653	EUROKOTE brown red 4820	dose de 1 kg (R68%+D32%)
	or 293825	EUROKOTE brown red 4820	kit of ten 50 ml syringes



## Sewage gravity fittings DN 150 to 300

area	ref.	product	packaging
① exterior and interior	184653	EUROKOTE brown red 4820	dose of 1kg (R68%+D32%)
	or 293825	EUROKOTE brown red 4820	kit of ten 50 ml syringes



Comply with the recommended applications specified in the safety data sheets available in the Downalds section on [www.pamline.com](http://www.pamline.com)

# Polyethylene sleeve

## General instructions

The process of fitting a PE sleeve involves applying a continuous barrel sleeve (outside the trench) and subsequently a joint sleeve (at the bottom of the trench).

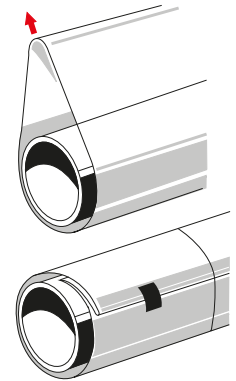
- Pipes must be clean and dry (no soil entrapped between the pipe and sleeve).
- The pipe bed and backfill must not contain any stones or fragmented rock that could damage the sleeve during laying or in service (soil load).

## SPECIAL INSTRUCTIONS

### DETAIL 1

#### Barrel sleeve

Carefully **apply** the PE sleeve so that it is tight against the pipe. Fold the sleeve at the top.



### DETAIL 2

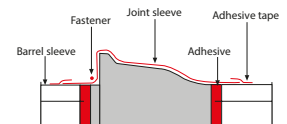
#### Joint sleeve

Carefully **fit** the joint sleeve closely around the junction and overlap the barrel sleeves (upstream and downstream).

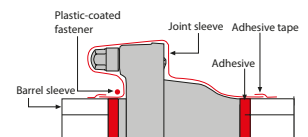
**Secure** with a fastener as close as possible to the gland (EXPRESS joint) or socket face (STANDARD joint).

**Fix the ends** with adhesive tape overlapping the barrel sleeve and joint sleeve.

#### STANDARD joint



#### EXPRESS joint



# Polyethylene sleeve

## Sleeving the barrel



NATURAL, INTEGRAL, ZMU pipes do not require sleeves.

### 1 SLIDE

Before lowering into the trench, **lift** the pipe in the middle (refer to the "Handling" guide) and **slide** the pleated barrel sleeve over the spigot.

### 2 UNFOLD

Since the pipe is supported by two battens, **spread** the barrel sleeve over the full length of the pipe and carefully **wrap** the sleeve tightly around the pipe (the PE sleeve must not billow).

### 3 FASTEN

**Secure** the fold down with adhesive tape.

**Fix** the ends of the sleeve to the pipe barrel with adhesive tape overlapping both the barrel and the sleeve (around the full circumference).

**Add** fasteners (plastic-coated steel wire) every 1.5 m.

**Slip** on the joint sleeve.

### 4 ASSEMBLE

**Lower** the pipe into the trench.

**Join the pipe.** The fold must always be positioned at the top the pipe.

### 5 WRAP

**Bring** the joint sleeve over the socket and spigot.



Make sure that you create a large enough gap under the pipe to easily fit the sleeve (and secure with adhesive tape and fasteners) - see diagrams.

**Fit** the joint sleeve as tightly as possible.

Successive assembly of barrel and joint sleeves must form a continuous protection.

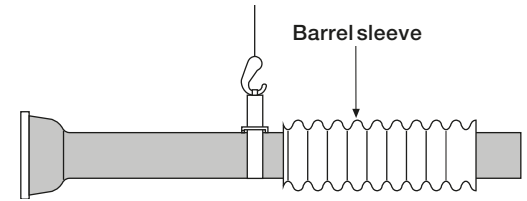
Use the same sleeving to protect fittings.

# Polyethylene sleeve

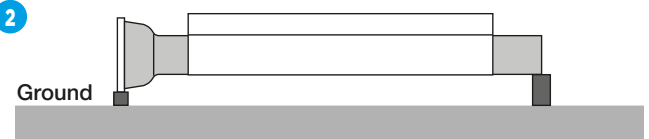
## Sleeving the barrel

The contractor is responsible for analyzing and eliminating any risks when installing the PE sleeve (especially the use of personal protective equipment).

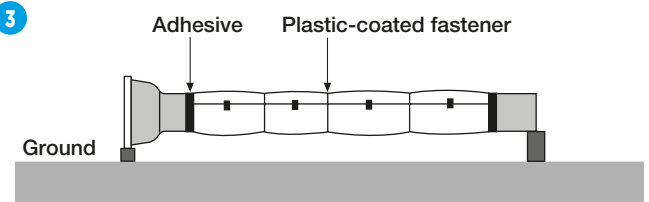
1



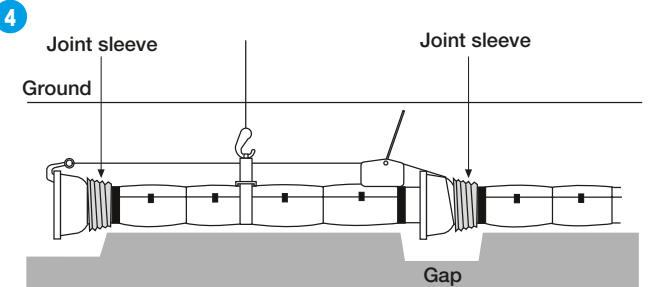
2



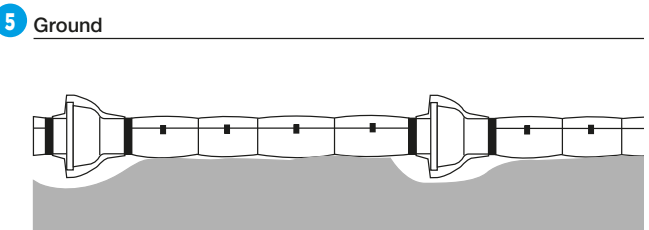
3



4



5



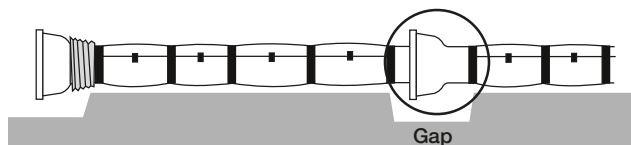
# Polyethylene sleeve

## Sleeving the joint

### 1 PULL

Pull the joint sleeve over the spigot and socket. Make sure that you create a large enough gap under the pipe to easily fit the sleeve (and secure with adhesive tape).

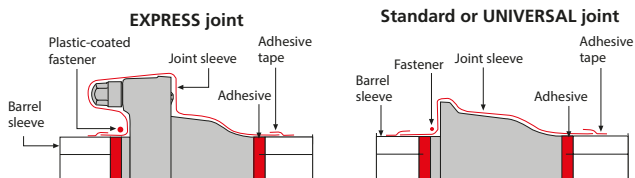
Ground



### 2 FIX

Fold the joint sleeve over and wrap as tightly as possible, overlapping the adjoining barrel sleeves (the fold must always be positioned at the top). Secure with adhesive tape as close as possible to the gland (STANDARD Ve or EXPRESS joint) or socket face (STANDARD or UNIVERSAL joint).

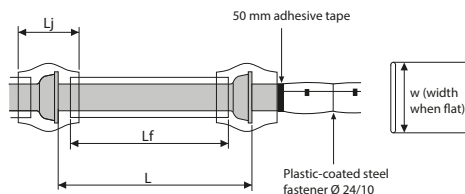
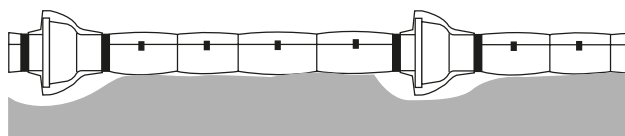
Fix the ends on the adjoining barrel sleeves with adhesive tape wrapped around the whole circumference to make a watertight overlap.



### 3 ASSEMBLE

Successive assembly of barrel and joint sleeves must form a **continuous protection**.

Ground



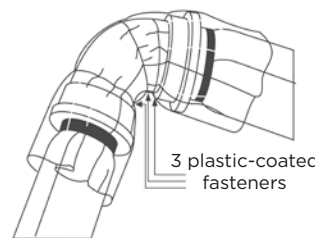
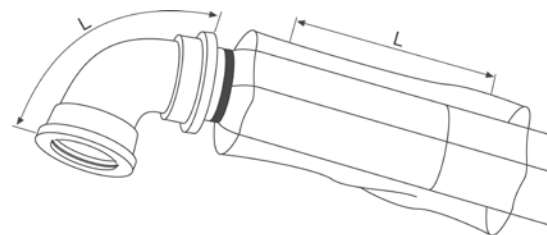
# Polyethylene sleeve

## Sleeving fittings

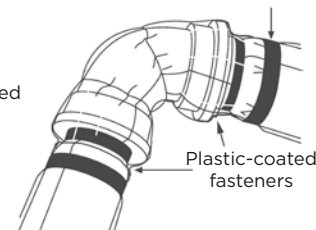
Use the same polyethylene sleeve to protect fittings.

Polyethylene sleeves must be fitted according to the same recommendations (in particular, the polyethylene sleeve must be wrapped around the pipe as tightly as possible).

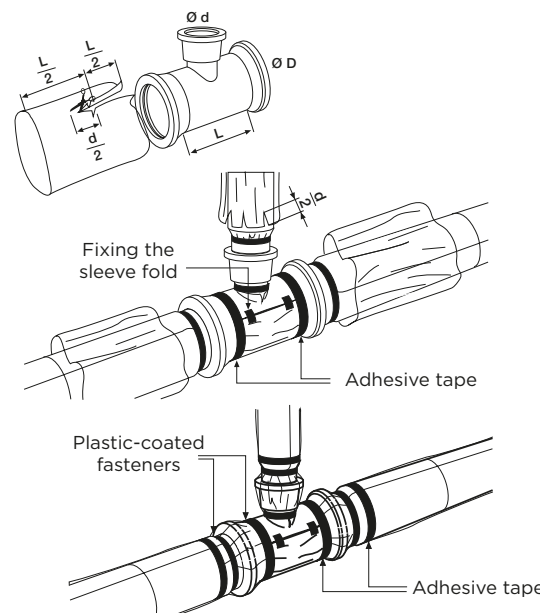
Bend



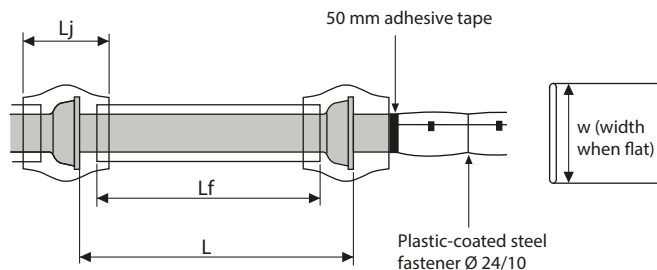
Bend Adhesive tape (over the barrel sleeve)



3-socket tee



# Preparing the barrel and joint sleeves



DN	Barrel			Joint (according to type)			Sleeve thickness μm	Number of fasteners
	L	W	Lf	STD	EXP			
				UNI PK	STD	Ve		
m	m	m	m	m	m	m		
*60	6	0.31	5.8	0.31	0.40	0.60	200	4
*80	6	0.31	5.8	0.31	0.40	0.60	200	4
*100	6	0.31	5.8	0.31	0.56	0.60	200	4
*125	6	0.40	5.8	0.40	0.56	0.60	200	4
*150	6	0.40	5.8	0.41	0.56	0.60	200	4
*200	6	0.56	5.8	0.56	0.71	0.60	200	4
*250	6	0.71	5.8	0.71	0.90	0.60	200	4
*300	6	0.71	5.8	0.71	0.90	0.60	200	4
*350	6	0.90	5.8	0.90	1.12	0.70	200	4
*400	6	0.90	5.8	0.90	1.12	0.70	200	4
*450	6	1.12	5.8	1.12	1.12	0.70	200	4
*500	6	1.12	5.8	1.12	1.25	0.70	200	4
*600	6	1.25	5.8	1.25	1.60	0.70	200	4
700	7	1.60	6.7	1.60	1.60	0.80	200	5
800	7	1.80	6.7	1.80	2.24	0.80	200	5
900	7	2.24	6.7	2.24	2.24	0.80	200	5
1000	7	2.24	6.7	2.24	2.50	0.80	200	5
1100	7	2.50	6.7	2.50	2.50	0.80	200	5
1200	8.26	2.50	7.7	2.50	2.50	0.80	400	6
1400	8.19	2.80	7.7	2.80		0.80	400	6
1500	8.18	3.10	7.7	3.10		0.80	400	6
1600	8.18	3.10	7.7	3.10		0.80	400	6
1800	8.17	3.60	7.7	3.60		0.80	400	6
2000	8.13	4.50	7.7	4.50		0.80	400	6

(\*) For STANDARD pipes (DN 60 to 600), barrel and joint sleeves are supplied pre-cut to size in one package.

# Re-rounding DN 200 to 700

Using a circumferometer, ensure that the outer diameter complies with the following values:

DN	Outside diameter OD (mm)	
	Nominal value	Limit deviations
200	222	+1/-3.0
250	274	+1/-3.1
300	326	+1/-3.3
350	378	+1/-3.4
400	429	+1/-3.5
450	480	+1/-3.6
500	532	+1/-3.8
600	635	+1/-4.0
700	738	+1/-4.3

However, pipes may become oval-shaped due to transportation and handling, meaning that fittings cannot be assembled correctly.

## 1 CHECK THE OVALITY

$$\text{Ovality (\%)} = \frac{DM-dm}{DM+dm} \times 100$$

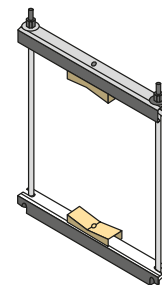
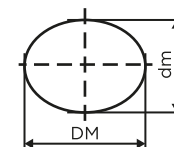
DM: maximum diameter measured

dm: minimum diameter measured

If the ovality exceeds 1%, round up as below.

### TACKLE (ref. 244524)

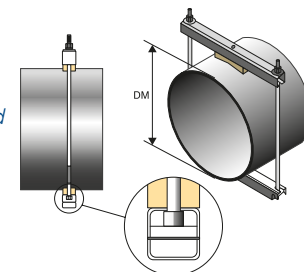
- Two steel bars (top and bottom) fitted with movable pads
- Two threaded rods (right-hand thread)
- Two NYLSTOP nuts + washers



## 2 FIT

Fit the tackle according to the diagram.

The tackle can be set up 50 cm from the end of the pipe so that sleeves can be fitted.



# Re-rounding DN 200 to 700

## 3 TIGHTEN

**Tighten** the nuts by hand so that the tackle is stable.

With a size 30 spanner, **tighten** the nuts on the rods **alternately** and **gradually**.

## 4 CHECK

**Check** that the spigot is perfectly round.

**Ensure** that the procedure has not damaged the cement lining.

## 5 ASSEMBLE

With the device still in position, **assemble** the joint.

The nuts must be kept tight while mounting the joint to compensate for any elastic deformation in the pipe.



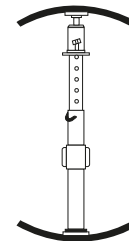
*In case of a small diameter pipe, you can rotate the bars using the adjustable pads.*

# Re-rounding DN ≥ 800

*The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).*

**TACKLE ref. 225018 (DN 800 to 1000) - ref. 158333 (DN 1200 to 2000)**

- Hydraulic jack
- Adjustable support



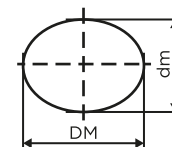
Using a circometer, ensure that the outer diameter complies with the following values:

DN	Outside diameter OD (mm)	
	Nominal value	Limit deviations
800	842	+1/-4.5
900	945	+1/-4.8
1000	1048	+1/-5.0
1100	1152	+1/-6.0
1200	1255	+1/-5.8
1400	1462	+1/-6.6
1500	1565	+1/-7.0
1600	1668	+1/-7.4
1800	1875	+1/-8.2
2000	2082	+1/-9.0

*However, pipes may become oval-shaped due to transportation and handling, meaning that fittings cannot be assembled correctly.*

## 1 CHECK THE OVALITY

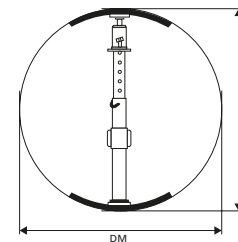
$$\text{Ovality (\%)} = \frac{DM-dm}{DM+dm} \times 100$$



DM: maximum diameter measured  
dm: minimum diameter measured

## 2 POSITION

**Position** the parts according to the diagram while respecting the ovalization position.



# Re-rounding DN ≥ 800

## 3 ADJUST

**Adjust** the support according to the diameter.

## 4 OPERATE

**Operate** the jack and **check** that the spigot is perfectly round.

## 5 CHECK

**Ensure** that the procedure has not damaged the cement lining.

## 6 ASSEMBLE

With the device still in position, **assemble** the joint.

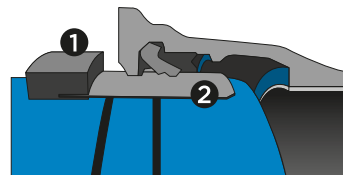
# Disassembly of locked joints

*The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).*

## STANDARD Vi, UNIVERSAL Vi AND BLUTOP Vi

### 1 REQUIRED EQUIPMENT

DN	Ref. anvil 1	Ref. Steel shim 2	Number of shims required
<b>STANDARD Vi and UNIVERSAL Vi</b>			
60			3
80	110680		4
100			5
125	110681		6
150			7
200			9
250		110682	11
300			13
350			15
400	110683		16
450			18
500			19
600			23
700			27
<b>BLUTOP Vi</b>			
75			3
90	110680		4
110		110 682	4
125			5
140	110681		5
160			6



- Gloves, goggles, safety shoes
- Brush, cloth
- Lump hammer
- Lubricant paste
- Textile straps

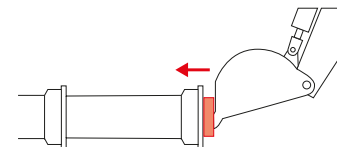
### 2 PREPARATION

**Rinse** with water and brush the joint.

**Clean the annular space as much as possible.**



**Push** the spigot fully into the socket to release the inserts.

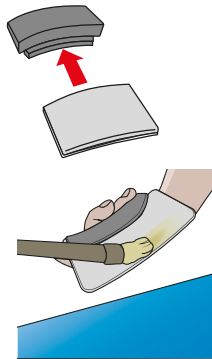


**Prepare** the lubricant paste, the anvil and extractor shims.

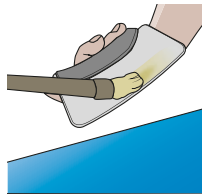
# Disassembly of locked joints

## 3 POSITION THE EXTRACTOR SHIMS

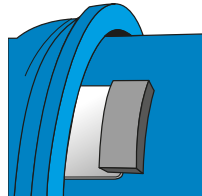
**Slide** the first shim into the slot in the anvil.



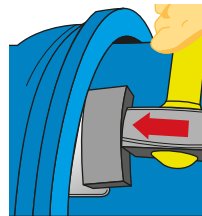
**Coat** the exposed part of the shim with lubricant paste (both sides).



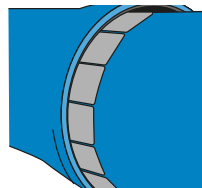
**Place** the shim + anvil in the annular space. The large side of the shim must be in contact with the joint.



Gradually **drive** the shim between the joint and the pipe.



**Keep** the shim flat against the pipe barrel if necessary.



**Repeat** all the way round the joint for the other shims.

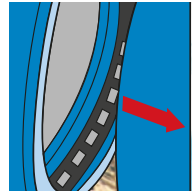


Overlap the shims by approximately 4 to 5 mm. The final shim can be slipped beneath the first shim.

# Disassembly of locked joints

## 4 DISMANTLING THE JUNCTION

**Draw** the spigot out of the socket using textile straps and a digger bucket.



After dismantling the joint, ensure that the surface of the spigot is smooth before reusing. If the spigot is damaged, it must be cut off.



Under no circumstances must the dismantled STANDARD Vi / UNIVERSAL Vi joint be reused.

## UNIVERSAL Ve

### 1 REQUIRED EQUIPMENT

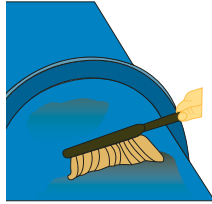
DN	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1500	1600													
Shim																																	
Number	3			4			4			5			14			16			18		20		20		24		24		24				

- Gloves, goggles, safety shoes
- Brush, cloth
- Lump hammer
- Lubricant paste
- Textile straps

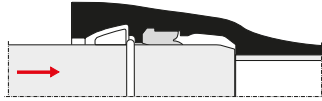
# Disassembly of locked joints

## 2 PREPARATION

**Rinse** with water and brush the joint.  
**Clean** the annular space as much as possible.



**Push** the spigot fully into the socket to release the locking ring.

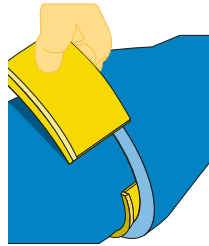


**Prepare** the lubricant paste and the dismantling tools.

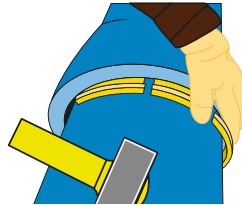
## 3 POSITION THE SHIMS

### DN 100 to DN 300

Gradually **hammer** the wedge between the metal locking ring and the pipe until reaching the weld bead.

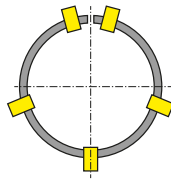


**Repeat** all the way round the joint for the other shims.

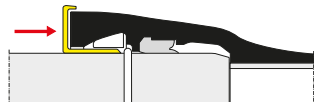


### DN 350 to DN 700

**Insert** shims between the metal locking ring and the pipe, starting at opposite ends of the open ring.



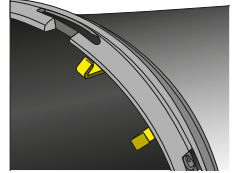
**Insert** the remaining three shims around the rest of the joint.



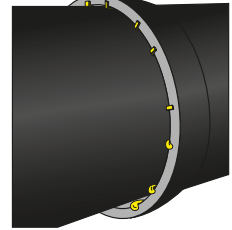
# Dismantling joints

## DN 800 to DN 1600

**Introduce** the extractor shims between the pipe and the metal locking ring (one shim at the end of each segment).

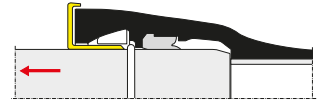


**Proceed** in the same way for all the segments around the circumference.



## 4 DISMANTLING THE JUNCTION

**Draw** the spigot out of the socket using textile straps and a digger bucket.



**Under no circumstances must the dismantled STANDARD joint be reused.**

**Refer to the PamlineTV sheet at the end of the folder.**

# Repairing pipes

The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

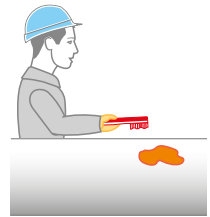
## 1 PIERCED PIPES

### Repair collar

Longitudinal fracture  $\leq 35\%$  of the collar

Circumferential fracture  $\leq 10$  mm

- **Clean** the part of the pipe that needs to be repaired.
- **Fit** the collar around the damaged section.
- **Ensure** that the gasket is not folded and mated firmly against the pipe.



Lubricate the gasket with soapy water or lubricant paste.

- **Position** the opposite end of the collar on top of the gasket.
- **Insert** the bolts and tighten by hand.
- **Turn** the collar in the direction indicated by the arrow on the label.
- **Ensure** that the damaged section is beneath the vulcanized part of the joint.
- Gradually **tighten** the nuts until the jaws close together.



The vulcanized part of the joint must not be deformed, otherwise leaks could occur.

### Different types of repair collars



# Repairing pipes

## 2 BROKEN PIPE (NON-ANCHORED SECTION)

### ULTRALINK, LINK GS, ULTRAQUICK, QUICK GS, EXPRESS COUPLINGS

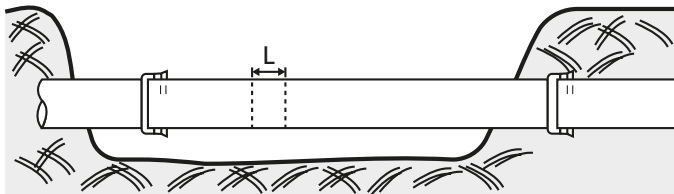
- Carefully **remove** the soil around the existing pipeline.
- **Use** a circometer to check the pipe's diameter.
- **Cut** out the damaged area of the existing pipe (refer to PIPE CUTTING).
- **Remove** the damaged section.
- **Check** the length before creating the replacement section UU while allowing for an admissible gap:  
**Length of replacement section UU = C - 2 x J**
- **Present** replacement section UU with the junction elements in alignment with the two pipes that need to be connected.
- **Position** the fittings while creating an equal gap on each side of the replacement section UU.
- **Bring** each of the components together and insert the bolts. **Check** that all parts are perfectly positioned.



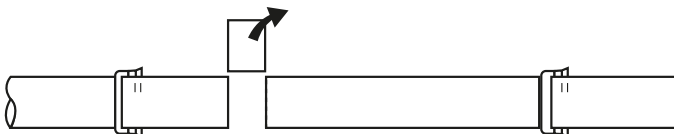
In case of drinking water systems, **all parts must be disinfected before assembly.**

## 3 LEAKING JUNCTION (NON-ANCHORED SECTION)

- Carefully **remove** the soil around the existing pipeline.
- **Use** a circometer to check the pipe's diameter.
- **Draw** the cutting marks (between 150 and 250 mm):

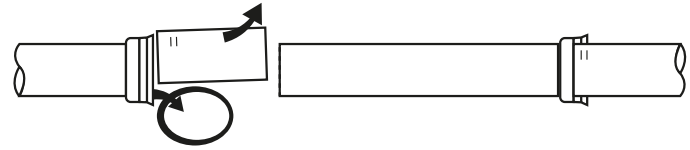


- **Cut and remove** the marked section (refer to the PIPE CUTTING guide)



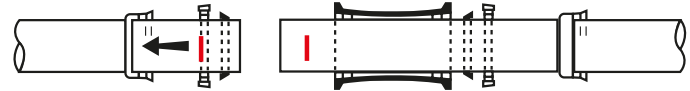
# Repairing pipes

- **Free** the spigot cut-out and remove the joint:

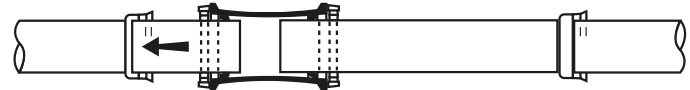


The joint **must** be replaced.

- **Insert** a new STANDARD JOINT (refer to the STANDARD JOINT guide) in the socket.
- **Draw** the marks for the position of the EXPRESS coupling (refer to the EXPRESS JOINT guide). For the section remaining in place: **insert** the gland, gasket and coupling:

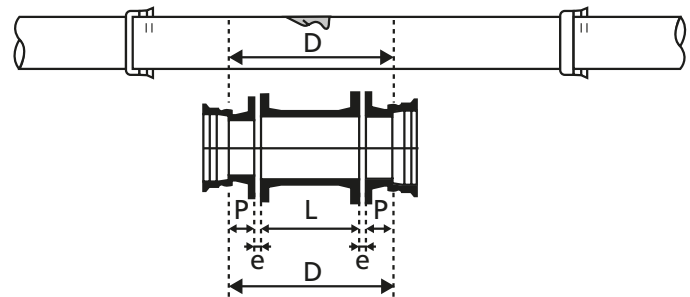


- **Re-assemble** the spigot spigot section after checking for conformity.
- **Place** the EXPRESS collar in the middle of the cut-out section and then assemble the glands with the bolts.



## 4 BROKEN PIPE (ANCHORED SECTION)

- Parts required for the repair:
  - 1 flanged short pipe
  - 2 STANDARD socket flanges
  - 2 flanged joints
  - 2 STANDARD Ve anchoring kits (gland and locking ring)
- **Mark** the cutting lines according to the following formula:

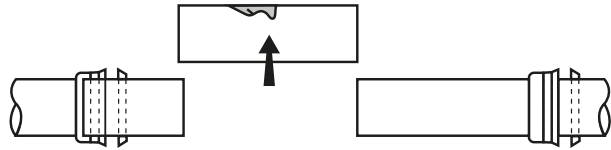


$$D \text{ (cut length)} = L + (2 \times e) + (2 \times P)$$

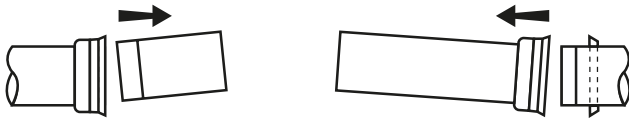
e = 20 mm / L = 250 or 500 mm / P = according to the DN

# Repairing pipes

- **Cut** according to D and then remove the damaged section.

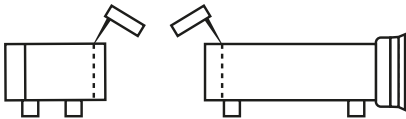


- **Dismantle** the two cut sections.



A special tool may be required depending on the type of anchored joints (refer to the *DISMANTLING ANCHORED JUNCTIONS* guide).

- **Recreate** a locking weld bead on each of the two cut sections.



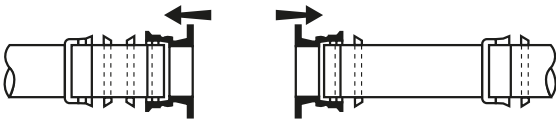
(refer to the *WELD BEAD* guide)

- **Recreate** the chamfers (refer to the *PIPE CUTTING* guide).

On each of the two ends of the pipe, **re-assemble** the cut sections fitted with STANDARD Ve glands.

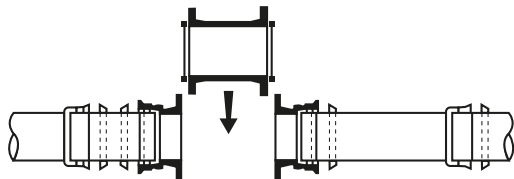


- **Present and assemble** the two flange sockets.



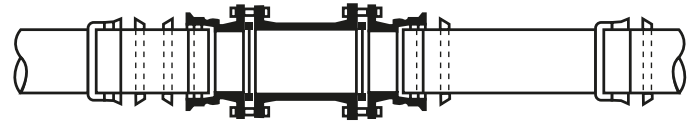
Fully **insert** the two flange sockets.

- **Position** the flanged short pipe and the two flat joints between the flange sockets



# Repairing pipes

- **Install** the bolts in the holes and gently **tighten** (by hand).
- **Position** the four STANDARD glands and bolts. **Tighten** slightly by hand.



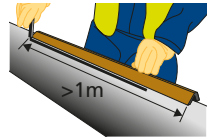
- Finally, **tighten** the flange bolts and then the gland bolts. Refer to the *FLANGE JOINTS* guide

# Branches for sewage pipes - round hole

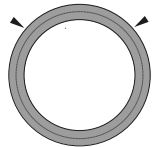
## 90° Saddle branches

### 1 DRAW

**Draw** the centerline at the top of the pipe using an angle bar.



*Position the branch preferably in the 10 o'clock to 2 o'clock.*



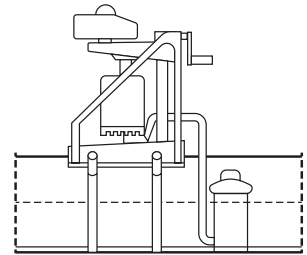
### 2 BORE

**Use** a boring machine with a centerline base.

**Align** the boring machine precisely with the centerline.

**Lubricate** with water.

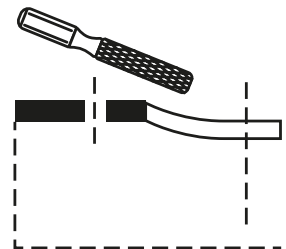
**Bore** with a hole saw specifically for iron (Ø172 mm for 150 branches and Ø232 mm for 200 branches).



### 3 DEBURR

**Deburr** the edges of the defect with a secured cutting tool.

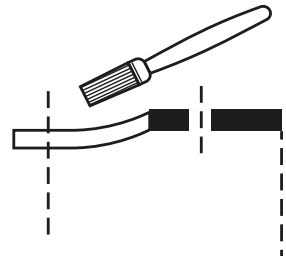
**Break** the angles.



### 4 COAT

**Sand and clean** damaged a loose part of the coating

**Coat** cutting and drillings holes with protective paste (EXTREM 1)



## Branches for sewage pipes - round hole

### 90° Saddle branches

#### 5 POSITION, ALIGN AND DRILL

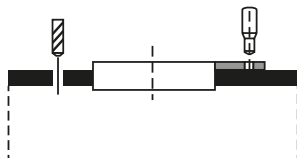
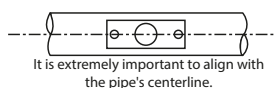
**Use the drilling template.** If it is not provided, the saddle can be used as a template.

**Use of the template:**

**Position** the template while respecting the pipe's centerline.

**Mark** the position of the two holes.

**Remove** the drilling template.



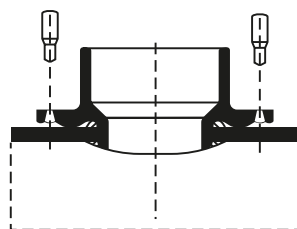
**Use of the saddle as a template:**

**Position** the pitting in the previous cutout in case A (see point 7)

Then **position** the branch by aligning the bolt holes with the previously marked centerline.

**Mark the position** of the two holes to be drilled through the holes of the saddle branch.

**Remove** the tapping saddle and the gasket.



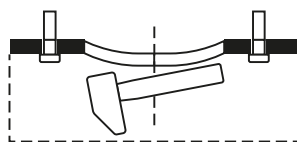
**Drilling:**

**Drill a hole vertically** with a 13 mm diameter.

**Preferably** use a drill bit with a tungsten carbide tip for hardened steel and abrasive materials.

#### 6 MOUNT THE BOLTS

**Mount** the two bolts with their compressed plastic rings in the holes.

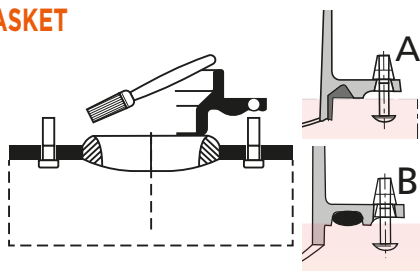


#### 7 POSITION THE GASKET

**Position** the gasket according to the type of joint (see diagrams A and B).

**Check** that the gasket is properly seated.

**Lubricate** the gasket.



## Branches for sewage pipes - round hole

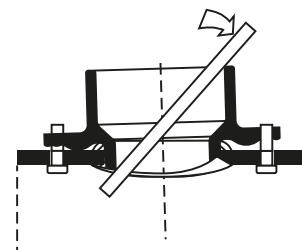
### 90° Saddle branches

#### 8 ASSEMBLE

**Mount** the fully assembled iron part with a single bolt.

**Place** a washer and nut on the bolt, but without tightening.

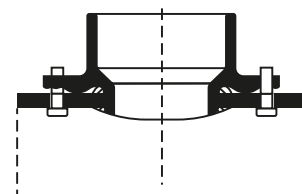
**Finish mounting** the iron part. If necessary, use a wooden lever to avoid damaging the coating. Gradually **apply** increasing pressure and avoid jerky movements.



#### 9 TIGHTEN

**Add** the second bolt + nuts

**Tighten** both nuts



Final tightening : **3 daN.m**



Hole saws that are suitable for iron are marketed by PAM.

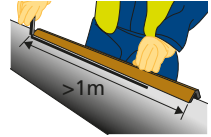
DN	Ø bore(mm)	reference
150	172	111173
200	232	111175

# Branches for sewage pipes - round hole

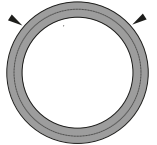
## Swivel saddle branches

### 1 DRAW

**Draw** the centerline at the top of the pipe using an angle bar.



*Position the branch preferably in the 10 o'clock to 2 o'clock.*



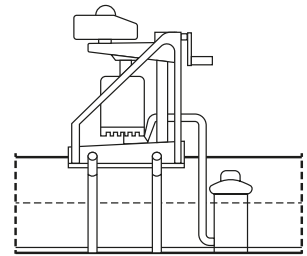
### 2 BORE

**Use** a boring machine with a centerline base.

**Align** the boring machine precisely with the centerline.

**Lubricate** with water.

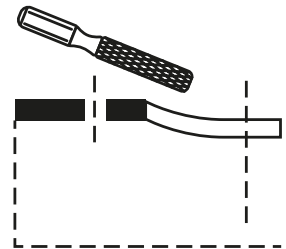
**Bore** with a hole saw specifically for iron (Ø172 mm for 150 branches and Ø232 mm for 200 branches).



### 3 DEBURR

**Deburr** the edges of the defect with a secured cutting tool.

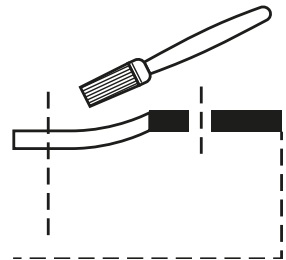
**Break** the angles.



### 4 COAT

**Sand and clean** damaged a loose part of the coating

**Coat** cutting and drillings holes with protective paste (EXTREM 1)



# Branches for sewage pipes - round hole

## Swivel saddle branches

### 5 POSITION, ALIGN AND DRILL

**Dismantle** the branch connection in order to install the saddle part first.

**Use the drilling template.** If it is not provided, the saddle can be used as a template.

#### Use of the template:

**Position** the template while respecting the pipe's centerline.

**Mark** the position of the two holes.

**Remove** the drilling template.

#### Use of the saddle as a template:

**Position** the pitting in the previous cutout in case A (see point 7)

Then **position** the branch by aligning the bolt holes with the previously marked centerline.

**Mark the position** of the two holes to be drilled through the holes of the saddle branch.

**Remove** the tapping saddle and the gasket.

#### Drilling:

**Drill a hole vertically** with a 13 mm diameter.

**Preferably** use a drill bit with a tungsten carbide tip for hardened steel and abrasive materials.

### 6 MOUNT THE BOLTS

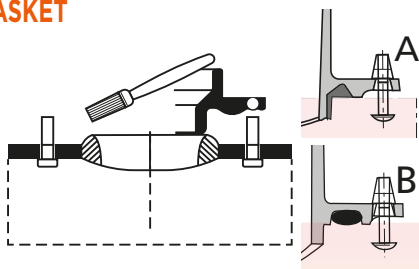
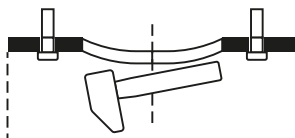
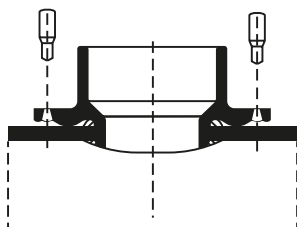
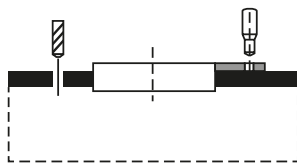
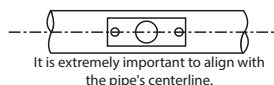
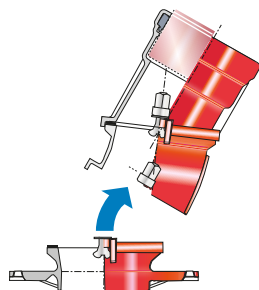
**Mount** the two bolts with their compressed plastic rings in the holes.

### 7 POSITION THE GASKET

**Position** the gasket according to the type of joint (see diagrams A and B).

**Check** that the gasket is properly seated.

**Lubricate** the gasket.



# Branches for sewage pipes - round hole

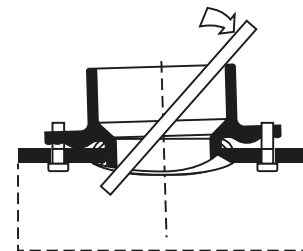
## Swivel saddle branches

### 8 ASSEMBLE

**Mount** the fully assembled iron part with a single bolt.

**Place** a washer and nut on the bolt, but without tightening.

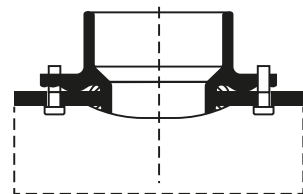
**Finish mounting** the iron part. If necessary, use a wooden lever to avoid damaging the coating. Gradually **apply** increasing pressure and avoid jerky movements.



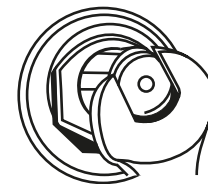
### 9 TIGHTEN

**Fit** the second washer and nut;

**Tighten** both nuts with a size 17 spanner.



**Hold** the bolt by means of the flat sections at the end of the bolt (size 7 spanner).



Final tightening : 3 daN.m

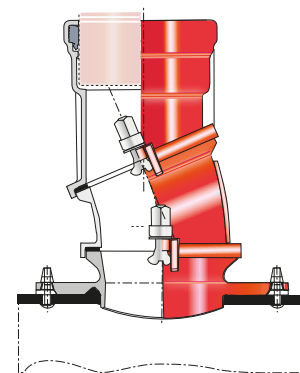
### 10 MOUNT

**Re-mount** the upper elements.

**Turn** the assembly towards its connection position and hold in place.

**Tighten** the four bolts.

Final tightening : 6 daN.m



Hole saws that are suitable for iron are sold by PAM.

DN	Ø bore (mm)	reference
150	172	111173
200	232	111174

# Branches for sewage pipes - rectangular or round hole

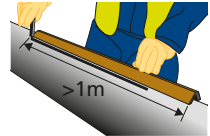
## Swivel saddle branches

The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

### ROUND HOLE

#### 1 DRAW

**Draw** the centerline at the top of the pipe using an angle bar.



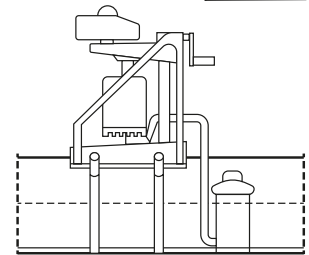
#### 2 BORE

**Use** a boring machine with a centering base.

**Align** the boring machine precisely with the marked pipe generatrix.

**Lubricate** with water.

**Bore** with a hole saw specifically for iron (Ø172 mm for 150 branches and Ø232 mm for 200 branches).



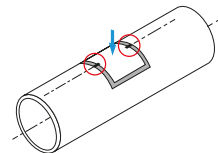
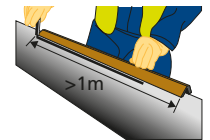
### RECTANGULAR HOLE

#### 1 DRAW

**Draw** the centerline at the top of the pipe using an angle bar.

Using the template provided, **draw** the following on the pipe barrel.

**Position** the template provided on the top centerline using the two markings indicated.

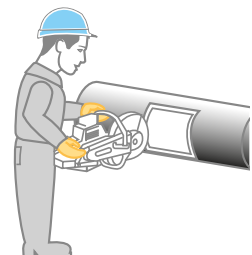


#### 2 CUT AND CLEAN

Using a disc cutter, **cut** the rectangular opening in the pipe barrel on the inside of the line. Comply with the centerline of the pipe shown on the cutting template.

**Use** a multi-material cutting disc.

**Avoid** cutting over the line in the corners.



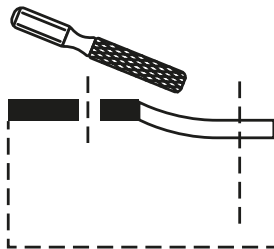
# Branches for sewage pipes - rectangular hole

## Swivel saddle branches

### RECTANGULAR AND ROUND HOLE

#### 3 DEBURR

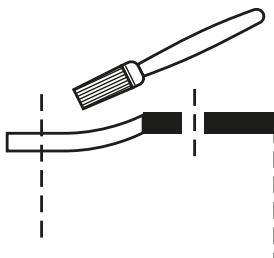
Carefully **debur** using a safe cutting tool to remove any defects and **break** the angles.



#### 4 COAT

**Sand** and **clean** damaged a loose part of the coating

**Coat** cutting and drillings holes with lubricating past (EXTREM 1)



#### 5 ASSEMBLE

**Unmount** the branch so that the plate can first be fitted.

**Fit** the gasket in the housing on the internal face of the plate.

**Lubricate** the joint once seated in its housing.

**Fit** the plate to the pipe barrel.

**Fit** the clamp around the pipe barrel

Gradually **tighten** the bolts, alternating on both sides until the saddle is perfectly in contact with the pipe barrel.

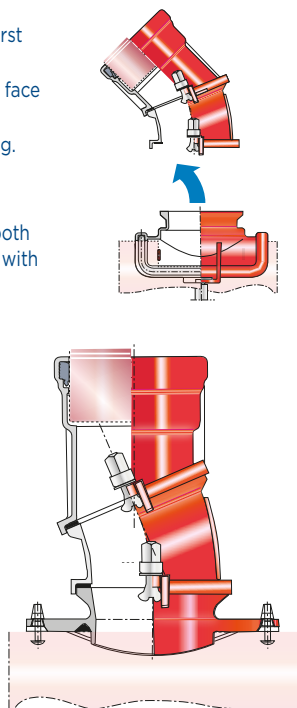
•Final tightening : 10 daN.m

**Re-mount** the upper elements taking care to correctly position the flat gaskets between each element.

**Turn** the assembly towards its connection position and **hold** in place.

**Fit** and **tighten** the stirrups.

•Final tightening : 6 daN.m



## Hydrocleaning

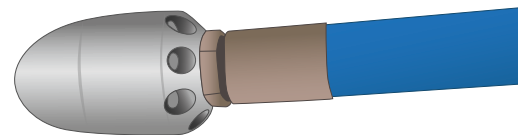
### HYDROCLEANING ON NEW NETWORKS OR ROUTINE AND PREVENTIVE MAINTENANCE OF THE NETWORK

When the operator is working on pipes:

**Check** the condition of the hydrocleaning equipment and in particular the protection of the hose.

**Use** a standard 8-or 10-hole "shell" with nozzles of 2 mm diameter or larger with equal to or larger than 2 mm with 30° orientations.

**Limit** pressure to 120 bar max.



*Note: Under these conditions the resulting flow rate is of the order of 150 l/min which gives a power flux density of 245 w/mm according to EN/TR/14920 and DIN19523.*

**Avoiding** stoppages.

**Avoiding** friction of the hose in the area of the introduction into the pipeline.

### HYDROCLEANING OF CLOGGED PIPES

**Use** a **bi-directional** nozzle with a maximum of 30° orientation at the back and axial at the front

**Gradually increase** the pressure to 120 bar max to remove the plug.

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*link to Natural installation guide playlist*



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*link to Natural assembly tutorial*



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