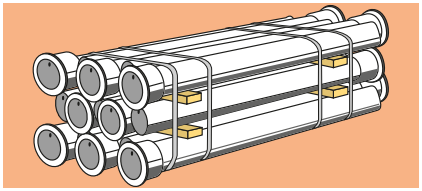
INSTALLATION GUIDE

PIPELINE SOLUTIONS FOR THE FUTURE

PAM SAINT-GOBAIN

CONTENTS

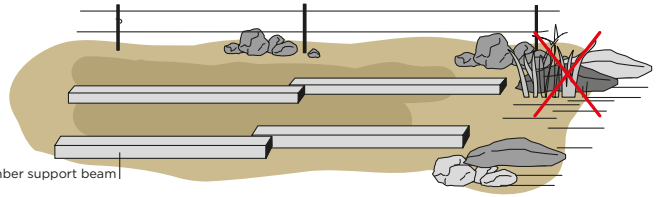
Storage



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**:

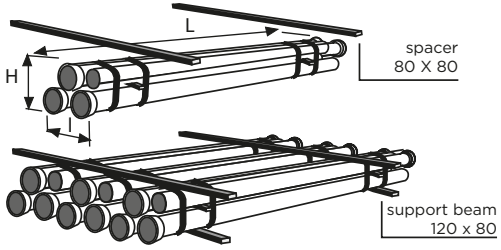
- Removing gaskets from their bags
- Exposing gaskets to sunlight
- High storage temperatures

Restrict storage times.
Storage life: in ten years for EPDM (drinking water systems) and seven years for other gaskets 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).

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

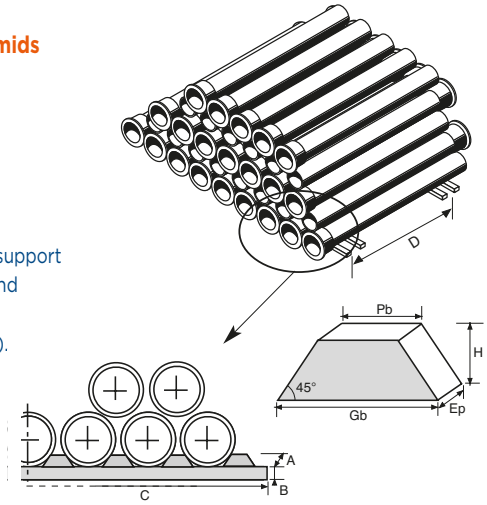
Type of pipe	DN	Number of bundles on the ground	Max. no. stacked bundles	Bundle contents and dimensions			
				L m	W m	H m	Bundle weight (kg)
NATURAL INTEGRAL	60 (24 pipes/bundle)	6	6	6.3	0.54	0.49	1411
	80 (15 pipes/bundle)	5	6	6.3	0.57	0.42	1148
	100 (15 pipes/bundle)	5	6	6.3	0.67	0.50	1398
	125 (12 pipes/bundle)	4	5	6.3	0.65	0.58	1380
	150 (9 pipes/bundle)	3	5	6.3	0.59	0.66	1272
	200 (6 pipes/bundle)	3	5	6.3	0.75	0.56	1190
	250 (4 pipes/bundle)	2	4	6.3	0.63	0.67	1044
	300 (4 pipes/bundle)	2	4	6.3	0.74	0.77	1319
BLUTOP TOPAZ	75 (30 pipes/bundle)	4	6	6.3	0.534	0.564	927
	90 (30 pipes/bundle)	3	5	6.3	0.635	0.605	1095
	110 (20 pipes/bundle)	3	4	6.3	0.608	0.621	904
	125 (20 pipes/bundle)	3	4	6.3	0.668	0.697	1032
	140 (12 pipes/bundle)	3	4	6.3	0.631	0.531	902
	160 (12 pipes/bundle)	3	5	6.3	0.626	0.71	825

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.

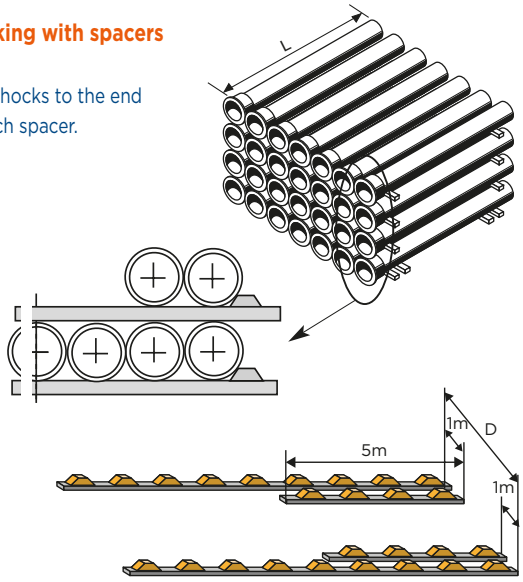
Stacking in pyramids

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.



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

Storage

Bundle stack heights (DN 350 to 2000)

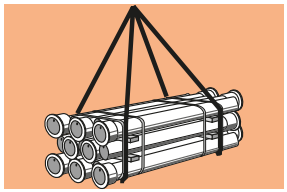
Pyramid – Standard Pipes		
DN	Number of layers	Stack height (m)
350	13	3.90
400	11	3.82
450	10	3.92
500	9	3.92
600	7	3.72
700	6	3.74
800	5	3.61
900	4	3.31
1000	4	3.67
1100	3	3.10
1200	3	3.38
1400	3	3.95
1500	2	2.95
1600	2	3.13
1800	2	3.52
2000	2	3.91

Spacers – Standard Pipes		
DN	Number of layers	Stack height (m)
350	6	2.81
400	6	3.12
450	5	2.87
500	5	3.13
600	4	2.93
700	4	3.36
800	3	2.89
900	3	3.18
1000	3	3.51
1100	2	2.58
1200	2	2.79
1400	2	3.21
1500	2	3.42
1600	2	3.53

Stack chocks (DN 350 to 2000)

DN	Trapezoidal chocks				Support beams			
	Gb mm	Pb mm	Hc mm	Ep 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	Bundle weight NATURAL / BLUTOP	INTEGRAL / TOPAZ bundle weight
		m	m	m	kg	kg
60	4 x 6	6.33	0.54	0.49	1356	
75	5 x 6	6.3	0.51	0.59	921	921
80	3 x 5	6.33	0.56	0.42	1098	1188
90	5 x 6	6.3	0.59	0.63	1122	1122
100	3 x 5	6.33	0.67	0.50	1337	1459
110	4 x 5	6.3	0.63	0.71	962	962
125	3 x 4	6.33	0.65	0.58	1040	1447
125	4 x 5	6.3	0.68	0.65	1034	1034
140	4 x 4	6.3	0.63	0.53	902	902
150	3 x 3	6.3	0.59	0.66	1196	1290
160	3 x 4	6.3	0.63	0.63	901	907
200	2 x 3	6.3	0.75	0.56	1087	1134
250	2 x 2	6.3	0.63	0.67	1013	984
300	2 x 2	6.3	0.74	0.77	1333	1234

NATURAL / INTEGRAL BLUTOP / TOPAZ

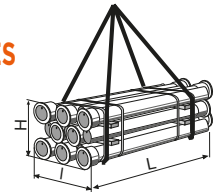
3 PIPE UNIT WEIGHT

DN	pipe length (m)		pipe weight (kg)				
	working	overall	NATURAL CLASSIC	BLUTOP TOPAZ	UNIVERSAL All versions		INTEGRAL PLUVIAL
60	6.00	6.09	56.5				
75	6.00	6.11		30.6			
80	6.00	6.09	73.2		94.8	C100	79.8
90	6.00	6.13		37.2			
100	6.00	6.09	89.10		116.7	C100	97.3
110	6.00	6.15		45.6			
125	6.00	6.10	109.8		144.3	C64	120.0
125	6.00	6.16		53.4			
140	6.00	6.18		60.0			
150	6.00	6.10	132.9		173.8	C64	143.3
160	6.00	6.20		70.8			
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.

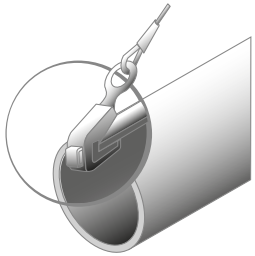


Caution! Never lift a bundle with hooks or vacuum pads. The straps used to secure the bundles are not designed to withstand the load.

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).

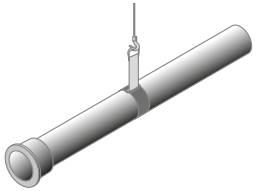
**Hooks available on order.*



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

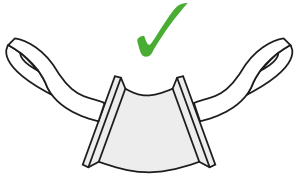
5 DN 350 TO 2000: LIFTING BY THE PIPE BARREL

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

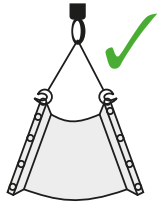


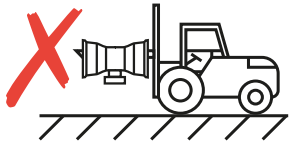
6 HANDLING FITTINGS

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

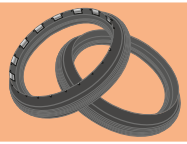
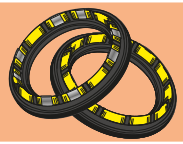


Flanged fittings can be lifted using hooks attached to the holes in the flanges.





Blutop / Blutop Vi / Topaz / Topaz Vi joint

One-piece gaskets	Plastic segment gaskets
	

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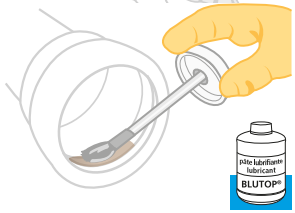
1 CLEAN

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.

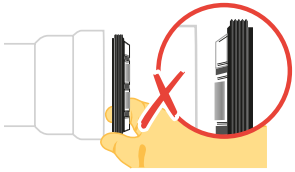


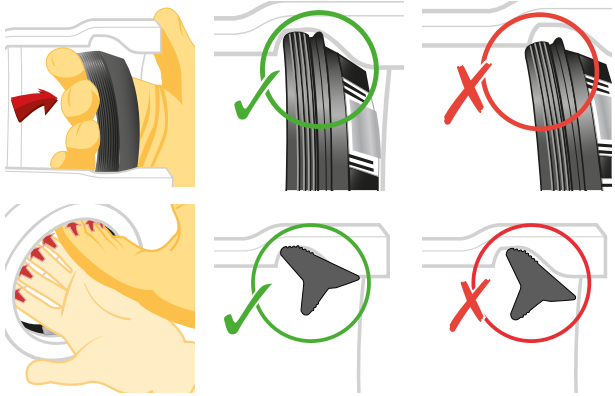
3 INSERT THE GASKET

Ensure that the gasket is properly seated in its housing.

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

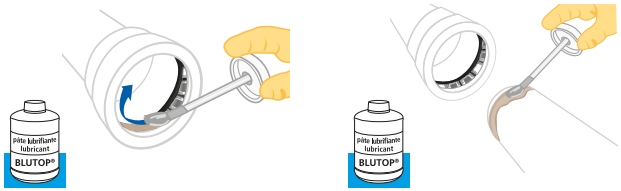
Ensure that the entire surface of the gasket is pressed in all points of the circumference





Blutop / Blutop Vi / Topaz / Topaz Vi joint

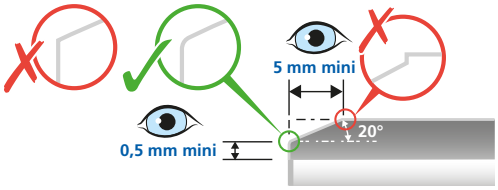
4 LUBRICATE



The inserted gasket and the spigot must be lubricated with Blutop lubricant paste (ref. **214616**).

5 CHECK THE CHAMFER

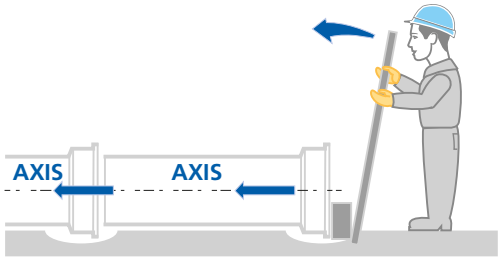
If the pipe needs to be cut, chamfer the edge as shown below. After chamfering the edge, there should not be any sharp edges.



6 ASSEMBLE

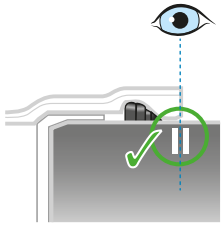
The pipe or fitting must be **perfectly centered and aligned** with the centerline of the installed pipe.

Refer to the "Assembly equipment" guide.



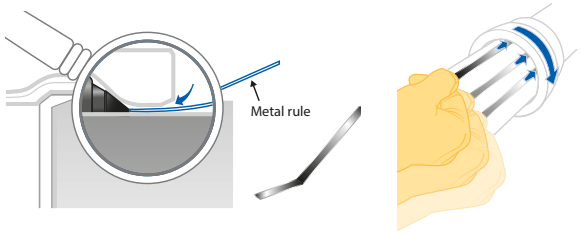
7 CHECK THE DEPTH

After assembly, only a single line should still be visible.



Blutop / Blutop Vi / Topaz / Topaz Vi joint

8 CHECK THE POSITION OF THE GASKET

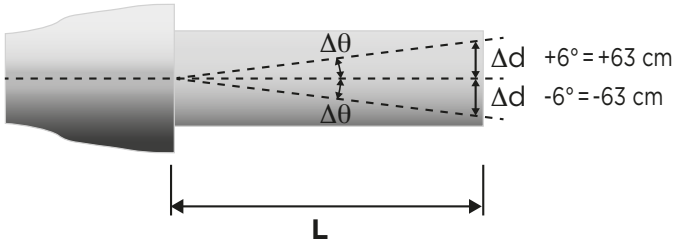


Before deflecting the joint, insert a metal rule into the socket gap and ensure that the depth of penetration is the same around the whole circumference.

PAM metal rule ref: **241031**.

9 INFORMATION

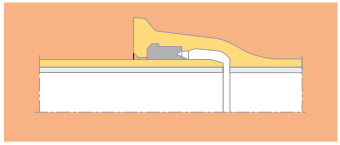
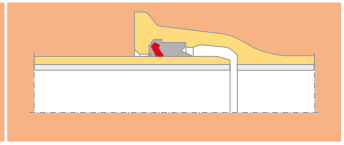
Angular deflection



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

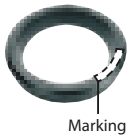
The joint must only be deflected when fully assembled and before pressurizing the system.

Standard joint / Standard Vi / ViLoK joint

Standard gasket	Standard Vi / ViLoK gasket
	

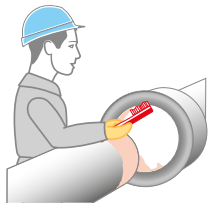
The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

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: ten years for EPDM (drinking water systems) and seven years for other joints subject to optimal storage conditions (contact us for our recommendations).
- Refer to ISO 2230:2002 - Rubber products - Guidelines for storage

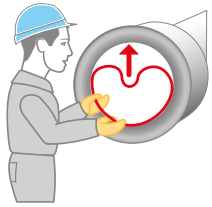
1 CLEAN



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

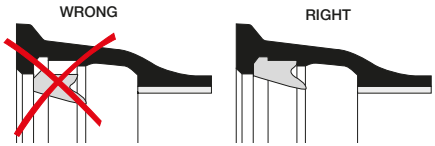
Keep all parts clean until assembly has been completed.

2 INSERT THE GASKET



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

3 CHECK THE GASKET



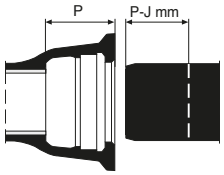
Ensure that the gasket is properly seated in its groove and especially on the inner loop.

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

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 P-J mm.

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

DN (mm)	P (mm)	J (mm)	P-J (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		92.5
350	110.5	20	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	167.0
800	197		172.0
900	200		175.0
1000	203	30	173.0
1100	225		195.0
1200	235		205.0
1400	245	40	205.0
1500	265		225.0
1600	265		225.0
1800	275		235.0
2000	290		250.0

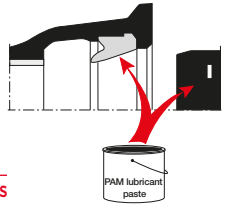
Standard joint / Standard Vi / ViLoK joint

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.

DIFFERENT MARKINGS

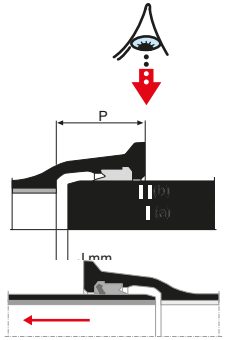
DN 60 to 600 and DN 1400 to 2000	DN 700 to 1200
	

6 ASSEMBLE

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

(a) Up to the marked line corresponding to "P-J mm"

(b) Up to the area between the white lines



DN 700 to 1200: three lines
- 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.

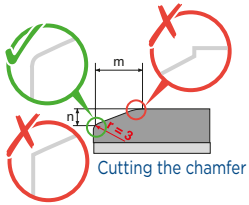
PAM metal rule ref: **241031**

- 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

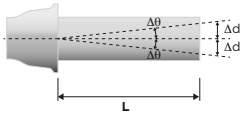
Lubricant paste

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.

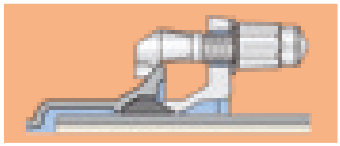
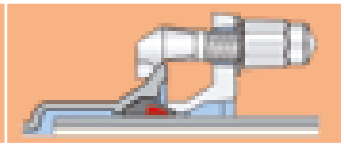
The joint must only be deflected when fully assembled and before pressurizing the system.



Maximum admissible deflection: STD pipes			
DN	Δ θ (°)	L m	Δ 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	Δ θ (°)	L m	Δ 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

Express New joint / Express New Vi joint

Express New joint	Express New Vi joint
	

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

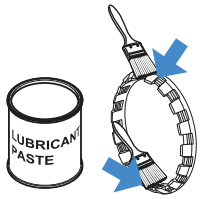
1 CLEAN

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

Keep all parts clean until assembly has been completed.

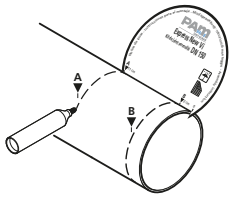
2 LUBRICATE

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



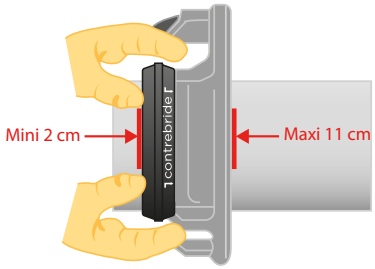
3 MARK THE INSERTION DEPTH

Marking from the spigot A=11cm and B=2cm with a tape measure or with the template provided.



After cutting a pipe, Express New and Express New Vi joints are directly fitted, no need to recreate the chamber on the spigot, a deburring is needed.

4 MOUNT THE ELEMENTS ON THE SPIGOT

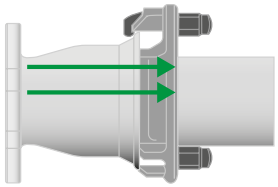


The joint must be properly installed (gland position is specified)

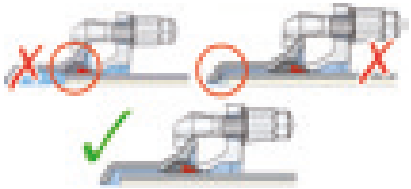
Express New joint / Express New Vi joint

5 ASSEMBLE THE ELEMENTS

Put the fitting on the spigot equipped with the gland and the gasket



ENSURE THE CORRECT DEPTH



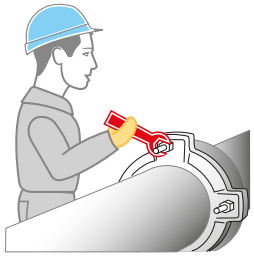
6 TIGHTEN THE BOLTS

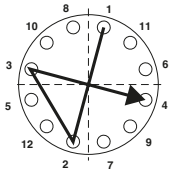
Lubricate the bolt threads with mechanical grease

Tighten the bolts with a torque wrench in successive passes.

Bolt torque values:

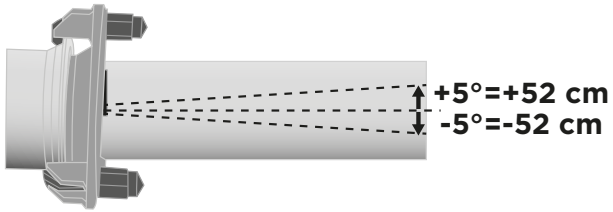
- **Pre-tightening: 2 daN.m**





Express New joint / Express New Vi joint

Angular deflection



Values (for guidance only) for a 6-meter pipe from DN 60 to DN 150.

The pipe must be perfectly aligned with the fitting.
The pipe must be deflected after pre-tightening but before final tightening.

- **Final tightening DN60 to DN150:**
  Express New 14 m.daN
  Express New VI 10 m.DaN

Express New and Express New Vi bolts need to be tightened with a **size 27 ring spanner**.

7 INFORMATION

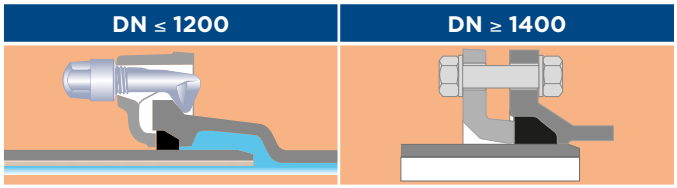
Check that the nuts are tight:

- 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

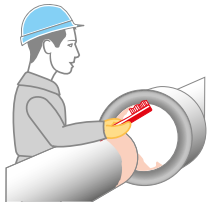


The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

1 CLEAN

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

Keep all parts clean until assembly has been completed.



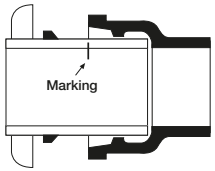
2 LUBRICATE

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

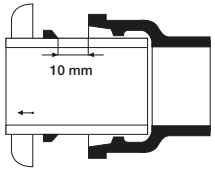
3 MARK THE INSERTION DEPTH

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

Mark a line to represent the insertion depth.



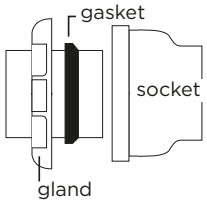
Place the gasket approximately 10 mm from the line. It can be done easily by using light lubrification.



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.

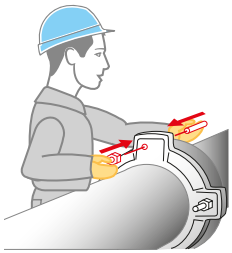


5 ASSEMBLE

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.

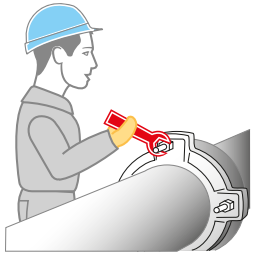
Insert the bolts and **pre-tighten while keeping the joint in alignment.**



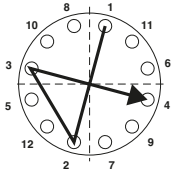
6 TIGHTEN THE BOLTS

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:



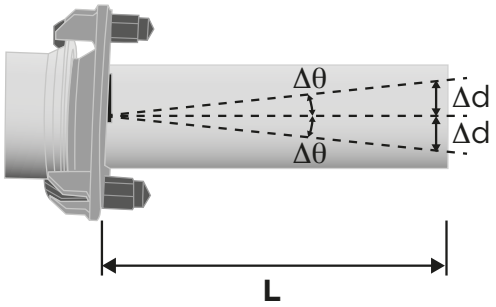
Check that bolts are properly tightened before hydraulic testing. Re-tighten if necessary.

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

Tools required for tightening bolts:
- Ø22: 30 spanner
- Ø27: 35 spanner

7 INFORMATION

Angular deflection



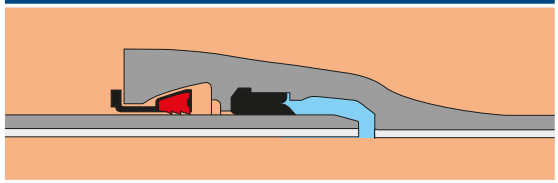
Pipes must be connected together while keeping them perfectly aligned with their centerlines.

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

Maximum admissible deflection:			
DN	Δ θ (°)	**L** m	Δ **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 600 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.

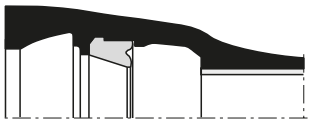
1 CLEAN

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

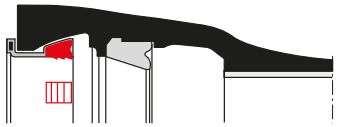
Keep all parts clean until assembly has been completed.

2 POSITION THE RINGS

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



STANDARD gasket

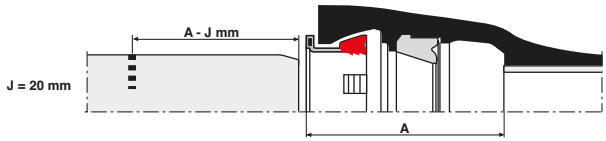


UNIVERSAL Vi locking ring with inserts

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	**150**	155	**300**	187	**450**	198
100	147	**200**	162	**350**	192	**500**	210
125	147	**250**	173	**400**	186	**600**	217

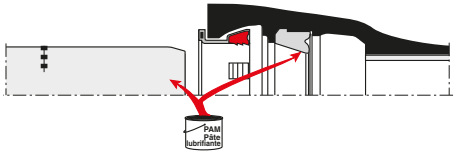


UNIVERSAL Vi joint

4 LUBRICATE

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

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

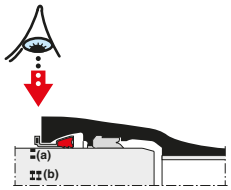


5 ASSEMBLE

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

(a) **Up to the line corresponding to A-20 mm** in case of a cut pipe or standard spigot

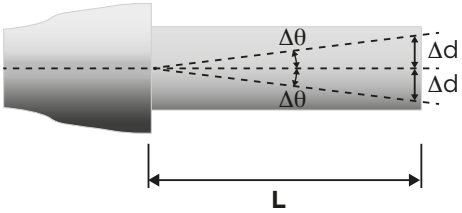
(b) **Between the two lines** if they are original markings on the Universal pipes



6 INFORMATION

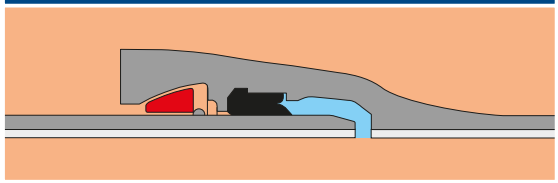
Angular deflection

Maximum admissible deflection:			
DN	Δ θ (°)	**L** m	Δ **d** (cm) for L
80 to 450	3°	5.95	32
500	2°	5.97	21
600	2°	5.97	21



UNIVERSAL Ve joint

Range of DN 100 to 1600 pipes and fittings



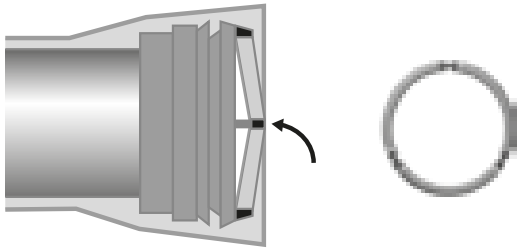
This joint requires the use of UNIVERSAL STANDARD pipes featuring:

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

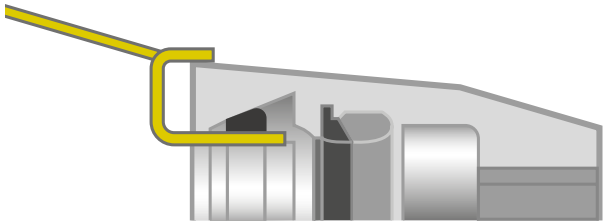
1 POSITION THE LOCKING RING

DN 100 to 200

Fit the locking ring into its groove.



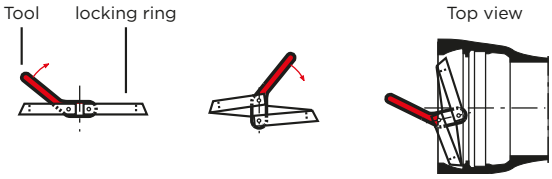
Hold the locking ring in place with the mounting wedges.



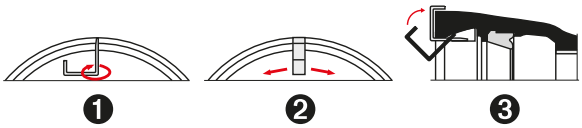
UNIVERSAL Ve joint

DN 250 to 700

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



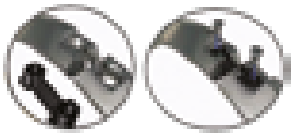
Insert the wedge (sideways) between the end edge of the locking ring.
Twist by 90° to create a gap between the two ends.
Fold down the wedge against the face of the socket.



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

DN 800 to 1600

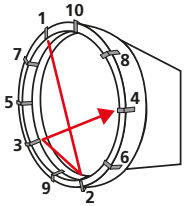
Insert a connector at the end of a first segment on the flat side (internal).



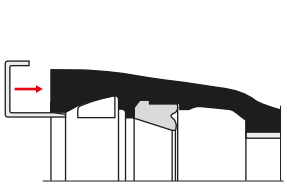
Line up a pin (previously covered in lubricant paste) opposite its groove and **point** its inclined face like that of the connector.

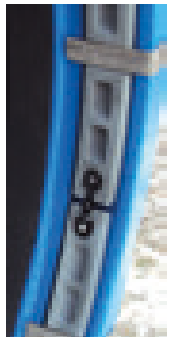
Drive in the pin with a hammer and Ø3.9 mm punch.

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

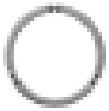
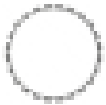
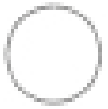


UNIVERSAL Ve joint

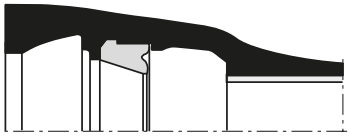




Locking ring accessories according to DN

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

2 INSERT THE GASKET



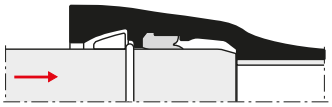
3 LUBRICATE

Using the lubricant paste, **coat** the:
•Exposed side of the gasket
•Chamfer and spigot

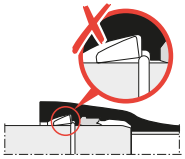
4 ASSEMBLE

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).

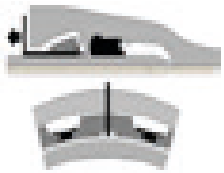


Introduce the spigot fully into the socket. When the locking ring is open, it opens when the weld bead passes through and then clamps to the barrel.

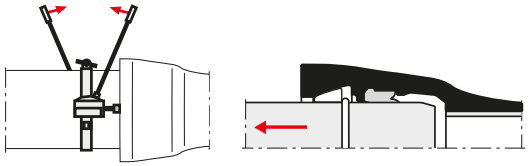


Check that the locking ring is not partially touching the weld bead due to insufficient insertion of the spigot or an excessive angular deflection.

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



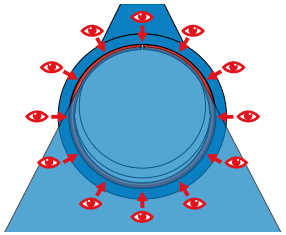
5 EXTEND THE JOINT



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.

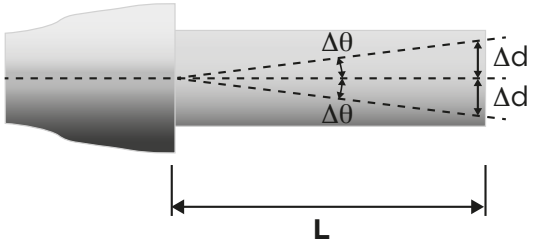
6 CHECK THE POSITION OF THE LOCKING RING

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



7 INFORMATION

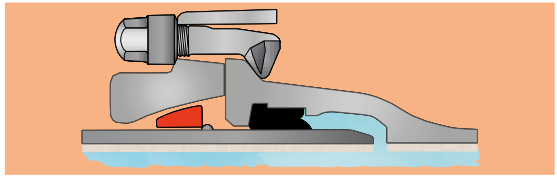
Angular deflection



DN	Angular deflection	Displacement Δ d for L	L
	degree	cm	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	2°	21	
600	2°	21	
700	2°	21	6.89
800	2°	25	
900	1.5°	18	6.87
1000	1.2°	15	6.88
1200	1.1°	15	8.15
1400	0.8°	10	8.08
1600	0.5°	7	

Standard Ve joint

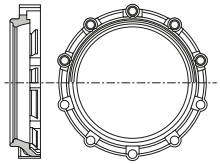
Range of DN 80 to 1200 pipes and fittings



This joint **requires a**:

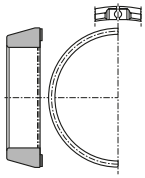
- Standard pipe with a weld bead on the spigot
- Standard VE gland
- Standard VE locking ring
- Standard gasket

Standard gland



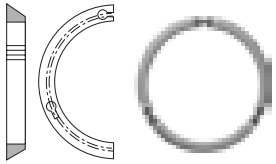
Standard VE locking ring: one-piece or segmented

One-piece: DN 250 to 700



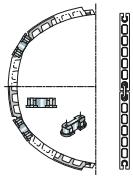
The one-piece locking ring is an open ring

Segment: DN 80 to 200



The locking ring is supplied preassembled

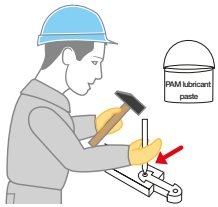
Segment to be assembled: DN 800 to 1200



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

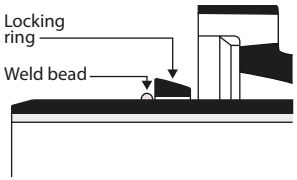
Line up a pin (previously covered in lubricant paste) opposite its groove and point its inclined face like that of the connector.

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

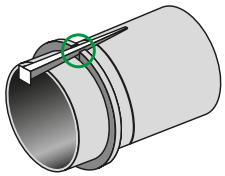


1 POSITION THE GLAND AND LOCKING RING

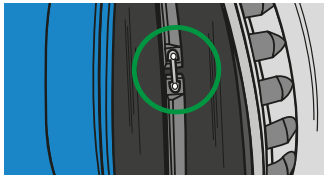
Slide the gland and locking ring over the weld bead.



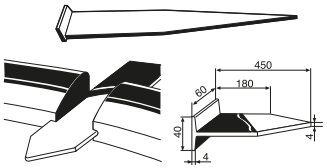
To pass the locking ring over the weld bead.

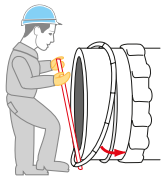


Use a trapezoidal wedge



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

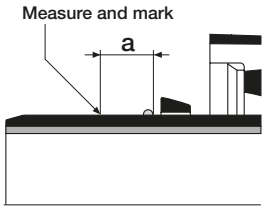




2 MARK THE INSERTION DEPTH

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

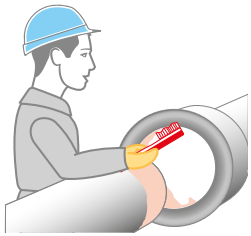
Measure and mark from the weld bead according to dimension "a"



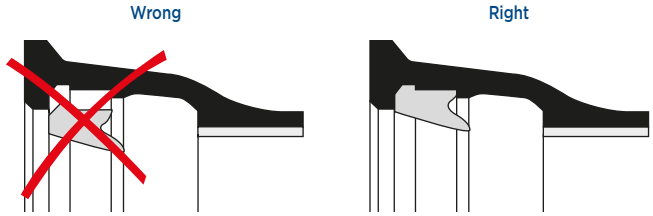
3 CLEAN

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

Keep all parts clean until assembly has been completed.



4 POSITION AND CHECK THE GASKET

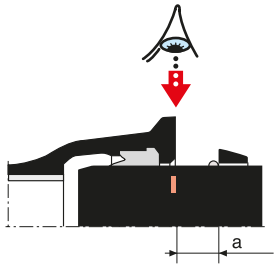


5 LUBRICATE

Using the lubricant paste, **coat** the:
- Exposed side of the gasket
- Chamfer and spigot

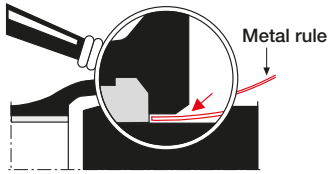
6 ASSEMBLE

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



7 CHECK THE ASSEMBLY

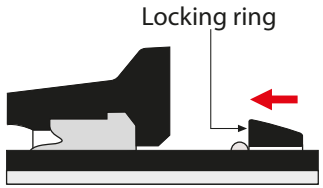
The metal rule must **enter** the same depth all the way around the circumference.



8 POSITION THE LOCKING RING

Move the locking ring forward until it comes into contact with the weld bead.

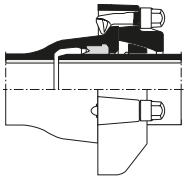
Check that it is touching the weld bead around the entire circumference of the spigot.



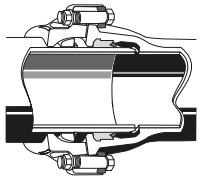
Standard Ve joint

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.

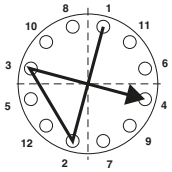


Iron nuts and bolts
DN 80 to 1200



Steel nuts and bolts
DN 800 to 1200 (16 bar < PFA 25 bar)

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

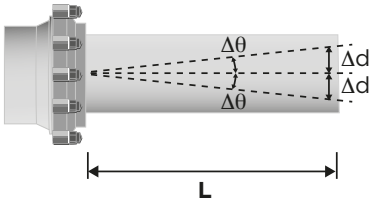


DN	Torque (daN.m)	spanner type and Ø
80 to 200	12	Ø22: 30 spanner
200 to 600	30	Ø27: 36 spanner
700 to 1200		

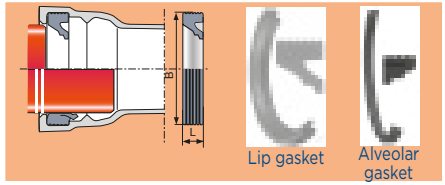
10 INFORMATION

Angular deflection

DN	Δ θ (°)	L m	Δ 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



TAG / IM joint

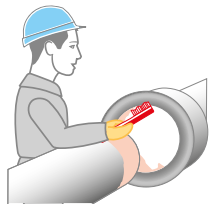


The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

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

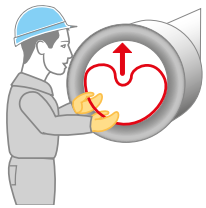
Carefully **clean** the inside of the socket, the spigot and the gasket.
Keep all parts clean until assembly has been completed.



2 INSERT THE IM GASKET

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

Always use the IM gasket, since the STANDARD gasket is incompatible with TAG pipes.



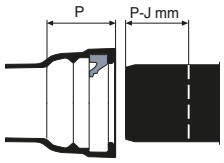
3 CHECK THE JOINT

Ensure that the gasket is properly seated in its groove.

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 P-J mm.

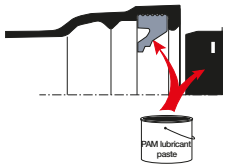


DN (mm)	P (mm)	J (mm)	P-J (mm)
150	98	15	83
200	104	15	89
250	104	15	89
300	105	15	90

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).



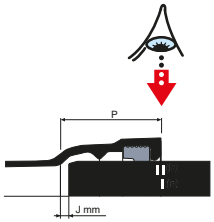
Comply with the recommended applications specified in the safety data sheets available in the Downloads section on www.pamline.com.

6 ASSEMBLE

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

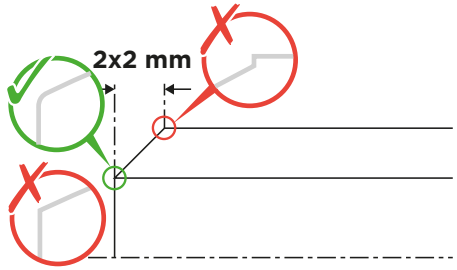
(a) Up to the marked line corresponding to "P-J mm"

(b) Up to the area between the white lines



7 INFORMATION

Cuts and chamfers



Treating a cut pipe

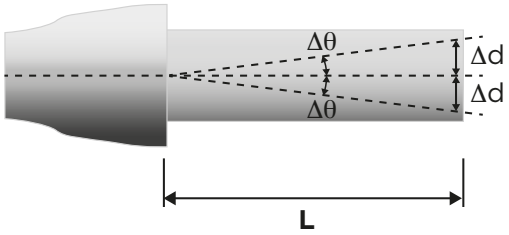
Apply the appropriate paint: ISOLARM 671-50 ref.**179099**.

Refer to the instructions for cutting pipes.

Lubricant paste

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

Angular deflection

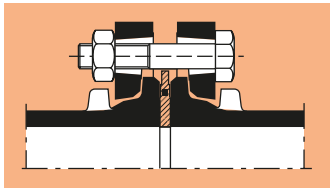


Pipes must be connected together while keeping them perfectly aligned with their axes.

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

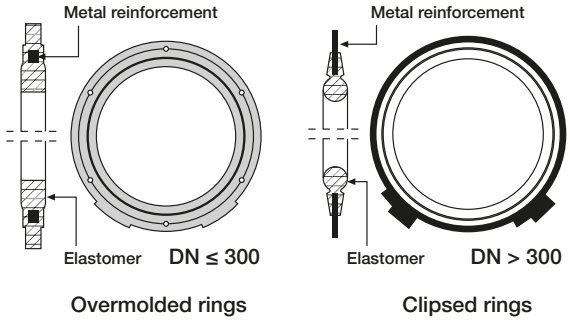
Maximum admissible deflection:			
DN	**Δ θ (°)**	**L m**	**Δ d (cm) for L**
125 to 300	4	6	42

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

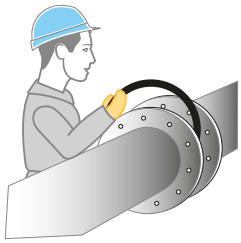


2 CLEAN AND ALIGN THE FLANGES

- **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



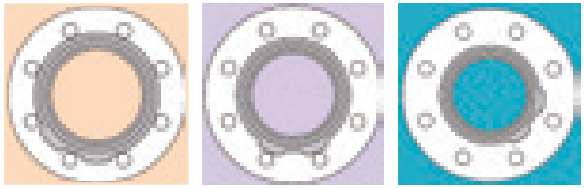
3 POSITION THE REINFORCED GASKET

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

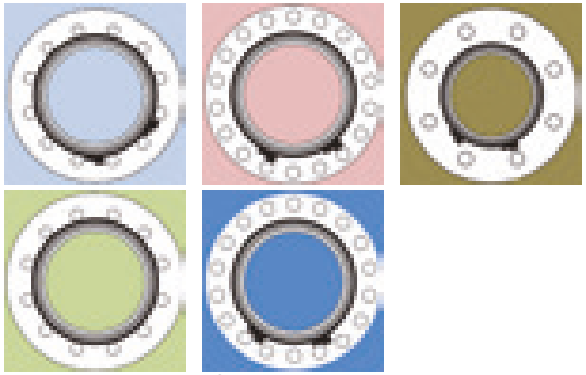
DN	PN 10	PN 16	PN 25	PN 40	PN 63
40					
50					
60					
65					
80					
100					
125					
150					
200					
250					
300					
350					
400					
450					
500					
600					
700					
800					
900					
1000					
1100					
1200					
1400					
1500					
1600					
1800					
2000					

Gasket resting on the bolts	Pins resting on the lower bolts	Visual centering

Overmolded gaskets DN ≤ 300



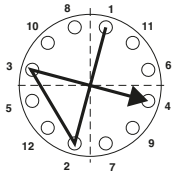
Clipped gaskets DN > 300



4 TIGHTEN 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	PN 16	PN 25	PN 40	PN 63
	daN.m	daN.m	daN.m	daN.m	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

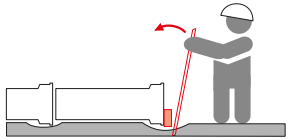
DN	PN 10		PN 16		PN 25	
	Bolt	Socket	Bolt	Socket	Bolt	Socket
40	M16	24	M16	24	M16	24
50	M16	24	M16	24	M16	24
60	M16	24	M16	24	M16	24
65	M16	24	M16	24	M16	24
80	M16	24	M16	24	M16	24
100	M16	24	M16	24	M20	30
125	M16	24	M16	24	M24	36
150	M20	30	M20	30	M24	36
200	M20	30	M20	30	M24	36
250	M20	30	M24	36	M27	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

Assembly equipment

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

1 CROWBAR

Pipes and fittings - DN 125

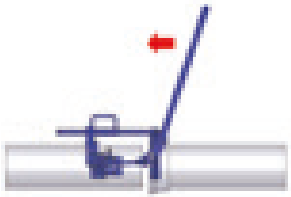


2 MONO DN ASSEMBLY EQUIPMENT

Standard Natural / Integral pipes and fittings DN 100-125, DN 150-200, DN 250-300

1- **Place** the socket frame behind the socket of the installed pipe and **slide** until touching as shown by the arrow.

2- **Put** the lever in the lower position and then **move** the grip section using the handle so that the four grips are correctly positioned against the pipe.

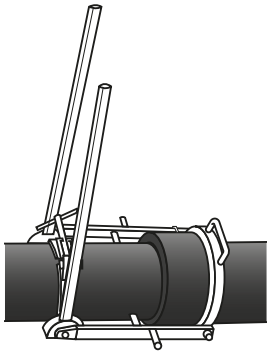


3- **Stand** so that you are facing the socket and firmly **pull** the lever towards you in the direction shown by the arrow until the lever is in the lower position.

4- If necessary, **repeat** the procedure from step three until both pipes are totally interlocking.

Comply with the insertion depth

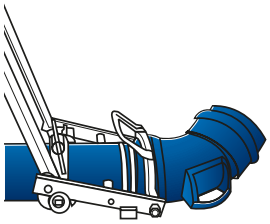
Universal Natural / Integral pipes and fittings DN 100-125, DN 150-200, DN 250-300



Attach the collar to the spigot.
Pre-tighten with a spanner.
Position the cams by turning them towards the spigot.
Attach the collar to the pipe's socket. Run the chain beneath the spigot and socket.
Tighten.
Connect the collar links to the cams on the barrel collar.
Use the levers to **tension** the assembly.
Once the collars are correctly positioned, **tighten** as necessary.
Position the two levers on the cam nuts of the barrel collar as shown. **Pull** both levers together at the same time.
Join the pipes according to the depth lines indicated on the spigot of each pipe.

Comply with the insertion depth

Blutop / Topaz pipes and fittings DN 75, 90, 110, 125, 140, 160



Attach the collar to the spigot.
Pre-tighten with a spanner.
Position the cams by turning them towards the spigot.
Attach the collar to the pipe's socket.
Bring the two half-collars together, so that the junction between both parts is located by the pipe's assembly crown.
Pre-tighten with a size 4 hex key.
Connect the collar links to the cams on the barrel collar.
Use the levers to **tension** the assembly.
Once the collars are correctly positioned, **tighten** as necessary.
Position the two levers on the cam nuts of the barrel collar as shown. **Pull** both levers together at the same time.
Join the pipes according to the depth lines indicated on the spigot of each pipe.

Assembly equipment

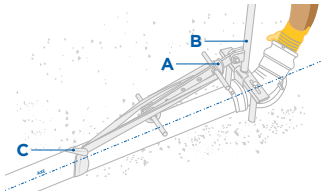
3 MULTI DN ASSEMBLY EQUIPMENT

Blutop / Topaz pipes and fittings DN 75 to 160

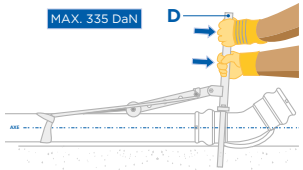
Set the fork gap to the relevant diameter (behind the socket). **Tighten** with a size 24 spanner.

Pass the strap provided around the pipe barrel, but without tightening.

Place the tool with the fork pointing straight up behind the fitting (or pipe) collar.

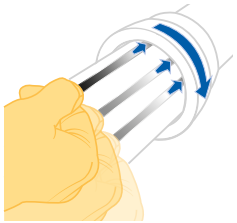


Attach the strap to [A].
Keep the lever [B] upright.
Fasten the strap at [C] so that it is wrapped tightly around the pipe.



Pull the lever as shown in [D] and assemble while ensuring that the fitting (or pipe) is aligned with the centerline.

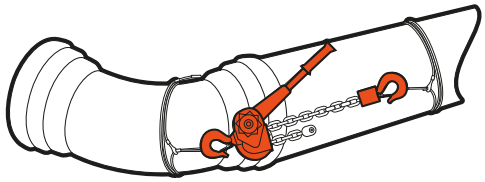
Deflect after assembly if necessary (maximum deflection of 6°).



Check that the gasket is properly positioned using the metal rule supplied in the Blutop or Topaz joint box.

Pipes and fittings with non-restrained joints or anchored joints (Blutop Vi, Standard Vi and Universal Vi)

Pull lift or ratchet chain winch

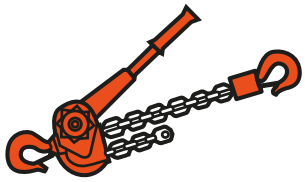


DN Blutop / Topaz	Pipe / Pipe Ratchet chain winch	Number	Pipe / Fitting Ratchet chain winch	Number
WITH FLAT STRAPS 2t Chain length 2m				
125	750 kg	1	750 kg	1
140	--	--	250 kg	2
150	750 kg	1	750 kg	1
160	--	--	250 kg	2
200	1500 kg	1	1500 kg	2
250	1500 kg	1	1500 kg	2
300	1500 kg	2	1500 kg	2
350	1500 kg	2	1500 kg	3
WITH FLAT STRAPS 3t Chain length 3m				
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
WITH FLAT STRAPS 6t Chain length 5m				
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
WITH FLAT STRAPS 8t Chain length 6m				
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

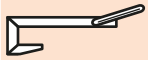
4 ACCESSORIES

Flat textile straps

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

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

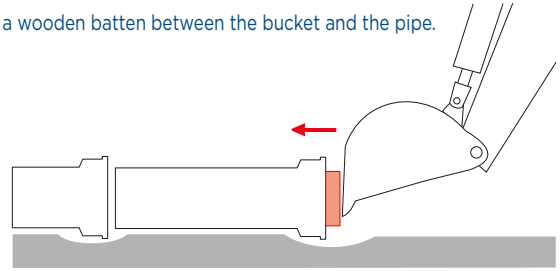
Hooks for connecting pipes

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

Assembly equipment

5 DIGGER BUCKET DN 125 AND OVER

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

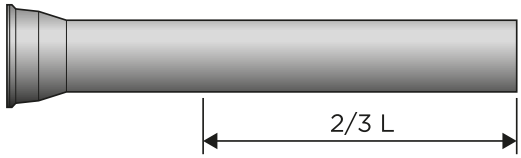
2 CHECK THE EXTERNAL DIAMETER

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

DN	OD mm	DN	OD mm	DN	OD mm	DN	OD mm
60	77	**250**	274	**600**	635	**1200**	1255
80	98	**300**	326	**700**	738	**1400**	1462
100	118	**350**	378	**800**	842	**1500**	1565
125	144	**400**	429	**900**	945	**1600**	1668
150	170	**450**	480	**1000**	1048	**1800**	1857
200	222	**500**	532	**1100**	1151	**2000**	2082

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

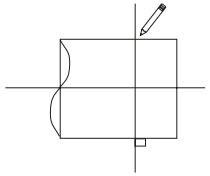
DN ≥ 350 mm: preferably cut pipes that have been calibrated (to be specified when ordering). These pipes are marked with metallic gray paint on the socket face.



For Blutop and Topaz: DN/OD = outer diameter.

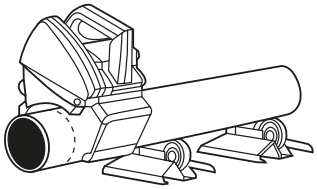
3 DRAW THE CUTTING LINE

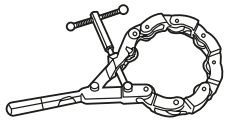
Draw the cutting plane perpendicular to the pipe centerline.



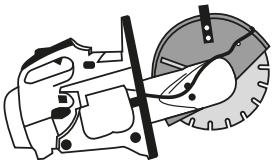
4 CUTTING

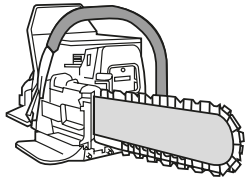
DN 60 to 300: cut the pipe with an electric, heat or manual pipe cutting machine.



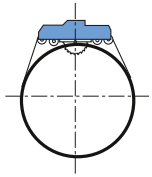


DN 350 to 700: use a cut-off saw or chainsaw.





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.

5 CUTTING SPECIAL COATINGS

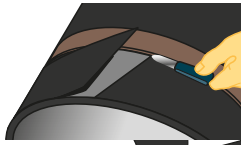
TT PE AND TT PUX PIPES

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

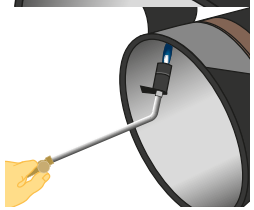
DN	STANDARD TT pipe	UNIVERSAL TT pipe
	mm	mm
60 and 80	95	NK
100	100	NK
125 and 150	105	NK
200 and 250	115	NK
300	120	NK
350 and 400	120	205
450 and 500	125	225
600 and 700	NK	NK

Pipe cutting

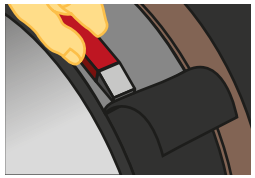
Cut the PE/PUX coating with a cutter through to the iron, but without damaging the iron.
Make a lengthwise cut to strip off the PE.



Preheat the area to be cut from the inside. Max 50°C.

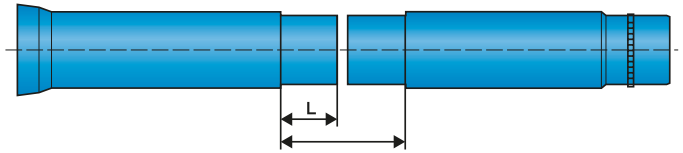


Remove the PE/PUX with a chisel.
By heating the pipe, the adhesive remains on the PE/PUX.



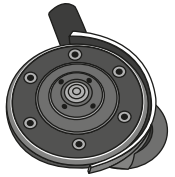
ZMU PIPES

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

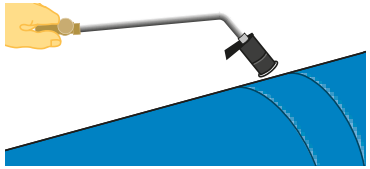


	DN	80	100	125	150	200	250	300	350	400	500	600	700
TYT / STD / TYT-SIT PLUS/ STD VI	L	95	100	105		110	115	120			130	145	225
UNIVERSAL	L	130	155	170	165	170	180	195	225	190	215	230	265

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

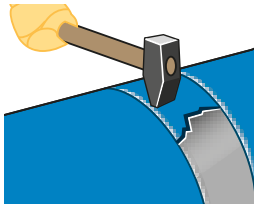


Preheat the area between the cuts in the cement coating. Max 50°C.
Create a lengthwise cut with a chisel.



Pipe cutting

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** (refer to the "Repair products" guide).

ISOPAM PIPES

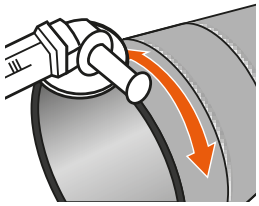
Draw the cutting area according to the following table:

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

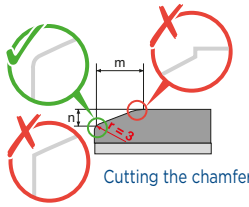
Cut the polyethylene coating and insulation (be careful not to cut into the iron).
Remove the insulation and properly **clean** the spigot.

6 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):

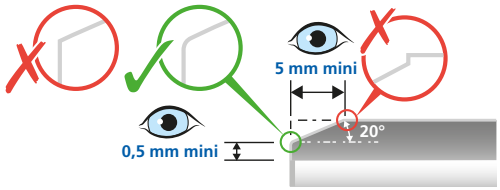


Cutting the chamfer

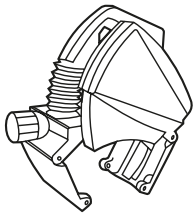
DN	m (mm)	n (mm)
60 to 600	9	3
700 to 1200	15	5
1400 to 1600	20	7
1800 to 2000	23	8

Pipe cutting

For Blutop, Blutop Vi, Topaz and Topaz Vijoints:

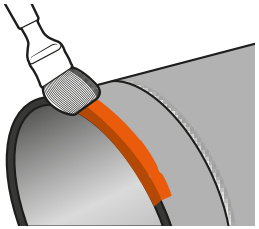


For Blutop and Topaz pipes, remember to use the bluCut machine, which is capable of cutting and chamfering the pipe at the same time.



7 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 / Blutop	AQUACOAT 0.75 kg dose, ref. **240991**
Integral	EUROKOTE 4820 Red Brown 1 kg dose, ref. **184653**
TAG 32	ISOLARM 671-50 ref. **179099**
Classic / Standard TT / Standard TT PUX / Isopam / ZMU	ENDOLAC 245-30 FGC 1 kg dose, ref. **158134**

Also refer to the "Repair products" guide.

PH1 AND TOPAZ PIPES

Ask for Topaz repair kit ref. **250714**.

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 **220817** (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

Check with a circometer (Topaz):

DN	Max. OD after repair	Max. OD before cutting
	mm	mm
75	75.9	75.5
90	90.9	90.5
110	111.0	110.6
125	126.1	125.7
140	141.2	140.8
160	161.3	160.9

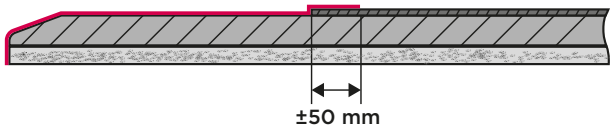
8 REPAIRING SPECIAL COATINGS

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.

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.



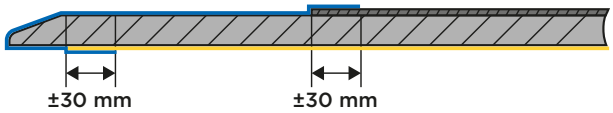
Gently heat the surface for three minutes after application to accelerate the drying time.
As soon as the first coat is tacky to the touch, **apply** the second coat of paint.

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

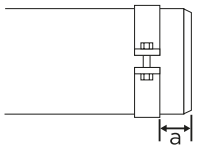
The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

1 REQUIRED EQUIPMENT

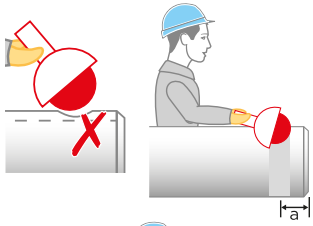
- Electric welding machine with a minimum capacity of 150 amperes.
- Electric or pneumatic grinder.
- Copper guide in accordance with the table on the next page.
- Recommended electrodes: ferro-nickel electrodes - Ø3.2 mm Solid wire: FeNi alloy with 55% Ni according to ISO 1071. Electrode grades are 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.

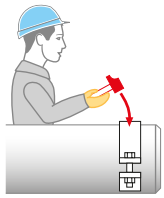


Prepare the surface to be welded by lightly grinding (i.e. grinding all coatings without affecting the thickness of the iron) over a strip of approximately 50 mm.



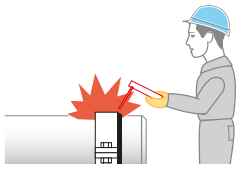
Position the copper guide ahead of the weld while complying with dimension a.

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



3 DEPOSIT THE LOCKING WELD BEAD

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

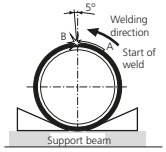


Preferably **work the weld** between marks A and B by turning the pipe.

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).

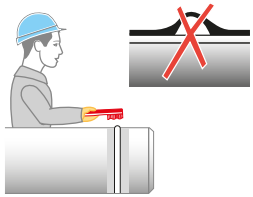


Locking weld bead on site

4 REPAIRING THE EXTERNAL COATING

Brush the welded area.

Apply paint with a paintbrush in moderation to avoid attenuating the vertical face of the weld bead on the pipe.

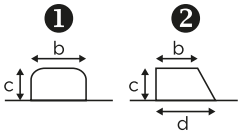


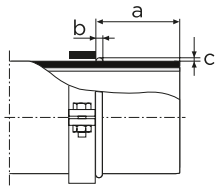
Paint reference:

Each product range has its dedicated line of repair products - refer to the "External coating repairs" guide.

Comply with the recommended applications specified in the safety data sheets available in the Downloads section on www.pamline.com.

Weld bead dimensions and position



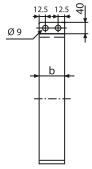


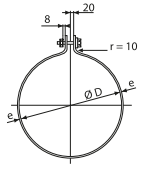
	DN	a +/- 3 mm	b +/- 1.5 mm	d +/- 0.5 mm	c +/- 0.5 mm	No. of passes
STD-VE & UNI VE ❶	80	85	6.5	-	3.5	1
	100	90				
	125	95				
	150	95				
	200	100				
	250	110				
	300	115				
	350	115	7.5	-	4	
	400	113				
	450	120				
	500	125			4.5	
	600	135				
	700	158				
	DN	a +/- 2 mm	b +/- 0.5 mm	d +/- 1 mm	c +0.5/-0.8 mm	
STD-VE & UNI VE ❷	800	150	9	5	5	1
	900	155				
	1000	165				
	1100	165				
	1200	170				
	DN	a +/- 2 mm	b +/- 1 mm	d +/- 1 mm	c +0.5/-0.8	
UNI VE ❷	1400	190	8	14	6	1
	1500	192				
	1600	195				
	DN	a +3/-2 mm	b +/- 1 mm	d +/- 2 mm	c +3/-1 mm	
PAMLOCK ❷	1400	170	8	17	8	1
	1500	180				
	1600	195				
	DN	a +3/-2 mm	b +/- 1 mm	d +/- 2 mm	c +/- 1 mm	
	1800	222	16	25	11	1
	2000	243				

Locking weld bead on site

Copper guide details

Once created, the weld bead must be inspected using the appropriate means.





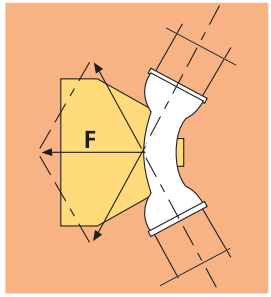
DN	D	e	b	WEIGHT
80	96	5	25	0.72
100	116			0.75
125	142			0.84
150	168			0.94
200	220			1.12
250	271		35	1.81
300	323			2.06
350	375			2.32
400	427			2.58
450	477			2.82
500	528			3.07
600	631		50	5.1
700	734			5.82
800	837			5.62
900	940			7.27
1000	1043			7.99
1100	1140			8.67
1200	1249			9.44
1400	1455	10	80	34.3
1500	1558			36.6
1600	1661			39
1800	1868			43.6
2000	2073			48.2

Estimated time for producing a locking weld bead

DN	No. electrodes	Grinding time	Welding time	Total time
80	3 to 4	4 min	9 min	20 min
100	4 to 5	5 min	11 min	25 min
125	5 to 6	5 min	13 min	30 min
150	6 to 7	6 min	16 min	35 min
200	8 to 9	6 min	20 min	40 min
250	10 to 11	6 min	25 min	50 min
300	12 to 14	7 min	30 min	1 hr
350	14 to 16	8 min	35 min	1 hr 5 min
400	16 to 18	9 min	40 min	1 hr 15 min
450	18 to 20	10 min	45 min	1 hr 30 min
500	20 to 22	11 min	50 min	1 hr 35 min
600	23 to 27	13 min	1 hr	1 hr 50 min
700	27 to 31	15 min	1 hr 10 min	2 hr 10 min
800	31 to 36	18 min	1 hr 20 min	2 hr 25 min
900	35 to 40	20 min	1 hr 30 min	2 hr 40 min
1000	39 to 45	22 min	1 hr 40 min	2 hr 55 min
1100	43 to 49	24 min	1 hr 50 min	3 hr 10 min
1200	47 to 54	26 min	2 hr	3 hr 30 min
1400	55 to 62	31 min	2 hr 20 min	4 hr
1500	59 to 67	33 min	2 hr 30 min	4 hr 20 min
1600	62 to 71	35 min	2 hr 40 min	4 hr 40 min
1800	70 to 80	40 min	3 hr	5 hr 10 min
2000	78 to 89	44 min	3 hr 10 min	5 hr 50 min

Grinding and welding times are given for guidance only. Times may vary according to worksite conditions.

Anchor blocks



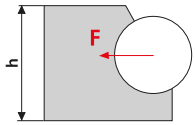
The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).
All the values contained in this document are provided by SAINT-GOBAIN PAM for guidance only. They are no substitute for carrying out prior studies or enlisting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

1 CONSTRUCTION RECOMMENDATIONS

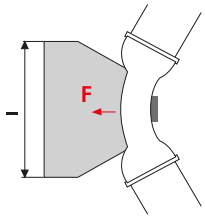
The concrete anchor blocks presented hereinafter have been designed for the most frequently encountered types of soil and laying conditions.

If the laying conditions are not covered by the following tables, contact SAINT-GOBAIN PAM.

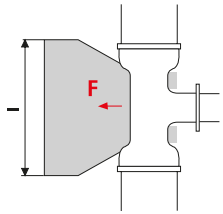
It is important to cast the concrete **directly against the surrounding soil** and use a concrete mix offering adequate strength.



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.



2 ANCHOR BLOCK DIMENSIONS

Soil with HIGH mechanical strength

- Internal friction: $\phi = 40°$
- Soil strength: $\sigma = 0.6$ daN/cm²
- Mass density: $\gamma = 2$ t/m³
- Height of cover: **H = 1 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 /m³	m x m /m³	m x m /m³	m x m /m³	m x m /m³
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	0.44x0.33/0.09	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: $\phi = 30°$
- Soil strength: $\sigma = 0.6$ daN/cm²
- Mass density: $\gamma = 2$ t/m³
- Height of cover: **H = 1 m**
- No groundwater

Soil with medium 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 /m³	m x m /m³	m x m /m³	m x m /m³	m x m /m³
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

Anchor blocks

3 HYDRAULIC THRUST

Thrust F = test P x 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	15	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

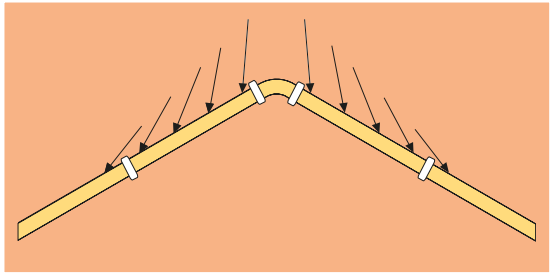
4 SOIL CHARACTERISTICS

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	
	ϕ	γ	ϕ	γ
	degrees	t/m³	degrees	t/m³
Fragmented rock	40	2	35	1.1
Gravel, sands	35	1.9	30	1.1
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	

ϕ: soil internal friction angle
γ: soil density
(standard geotechnical data)

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 SAINT-GOBAIN 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 SAINT-GOBAIN PAM.

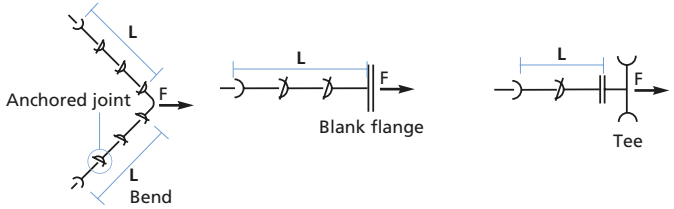
Anchoring is recommended in case of space constraints (urban areas) or non-cohesive soils.

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**:

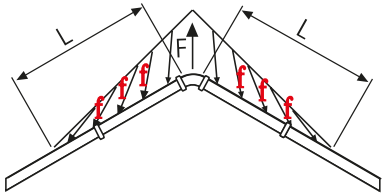
- Usual coatings: BioZinalium, Zinalium or Zinc
- Special coatings: Standard TT, PUX, ZMU or PE sleeve

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	
	ϕ	γ	ϕ	γ
	degrees	t/m³	degrees	t/m³
Fragmented rock	40	2	35	1.1
Gravel, sands	35	1.9	30	1.1
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	

ϕ: soil internal friction angle
γ: soil density
(standard geotechnical data)

4 ANCHORING LENGTHS

Assumptions for the calculation:

- Internal friction: **ϕ = 30°**
- Soil strength: **σ = 0.6 daN/cm²**
- Mass density: **γ = 2t / m³**
- No groundwater

Usual coatings:

- BioZinalium, Zinalium or Zinc

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:

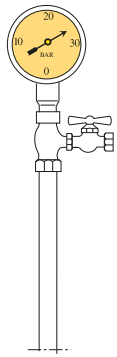
Apply a multiplier of 1.9 to the length to be anchored.

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.

Hydraulic testing



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

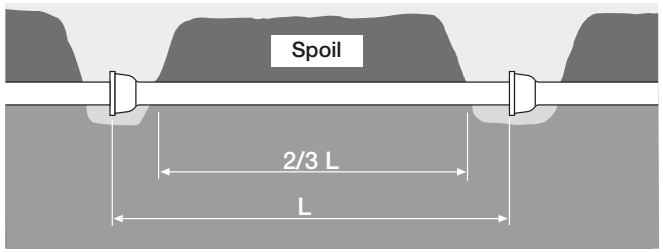
1 PREPARATION FOR THE TEST

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.

Thrust F = test P x f (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

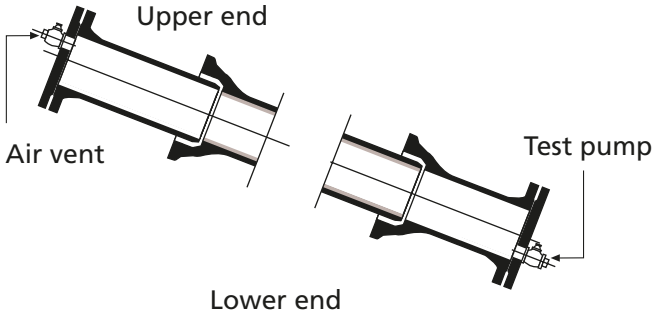
Calculation for the volume of water in m^3

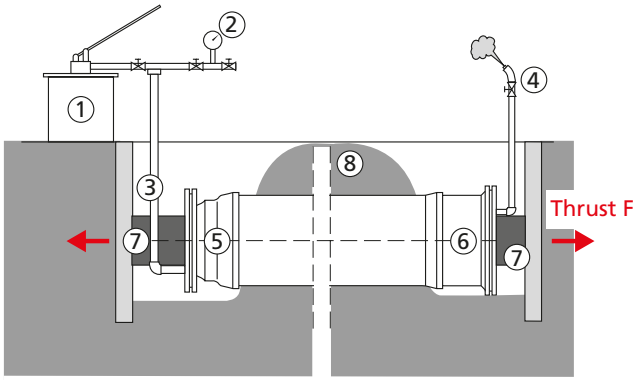
π x $(DN/2000)^2$ x pipeline length

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

3.1415 x $(800/2000)^2$ x 1850 = 929.78 m^3

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

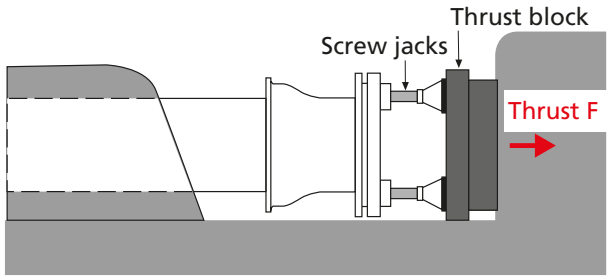




1 - Test pump
2 - Manometer
3 - Pump connection
4 - Air vent
5 - Lower end part
6 - Upper end part
7 - Anchor system
8 - Spoil

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.

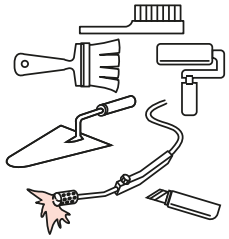
Flush out the main thoroughly to remove any foreign bodies trapped during laying.

Disinfect before commissioning.

External coating repairs

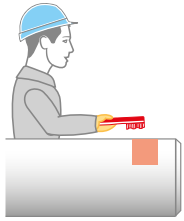
The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

1 EQUIPMENT AND TOOLS REQUIR



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

2 PIPES WITH A BIOZINALIUM AND ZINALIUM EXTERNAL COATING: Natural, Integral, Blutop, Topaz, Tag 32

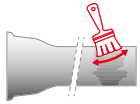


Brush to remove any dirt or loose particles.

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/BLUTOP Blue ref. **240991** – INTEGRAL/TAG32/TOPAZ Red ref. **240990**) with vertical and horizontal strokes.

3 FITTINGS WITH AN EPOXY EXTERNAL COATING: Natural, Blutop, Integral, Topaz (all versions).

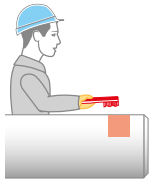
Brush and clean the area to be touched up and then **dry**.

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

- **Natural / Blutop**: EUROKOTE 4820 Blue (1 kg dose: ref. **158255**)
- **Integral / Tag32 / Topaz**: EUROKOTE 4820 Red Brown (1 kg dose: 184653 or kit of five 50 ml syringes: ref. **220817**)
- **Standard TT PUX and Integral TT PUX:** Eurokote 4820 Ivory (ref. **220818**)

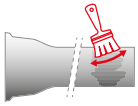
4 PIPES WITH A ZINC AND SYNTHETIC PAINT EXTERNAL COATING

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 ENDOLAC 245-30 FGC paint (ref. **158134**) with a paintbrush with vertical and horizontal strokes.

5 PIPES WITH A POLYETHYLENE EXTERNAL COATING

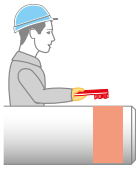
5.1 Significant damage

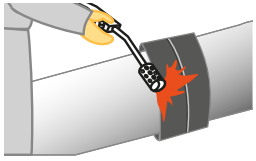
Roughen the area to be repaired with abrasive paper.

Clean and dry the area.

Preheat to approximately 60°C.

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

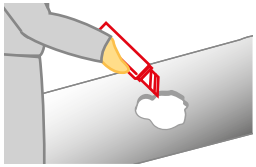




Wrap the sleeve all around the pipe's circumference using a gas burner and then fit the closing strip.

5.2 Moderate damage

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



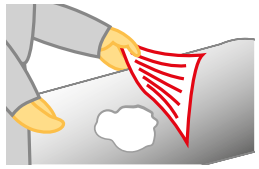
Clean and **dry** the exposed area.

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

Preheat to approximately 60°C.

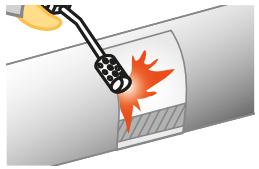
Apply the mastic and smooth with a knife.

Place the repair strip with a 50 mm 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.



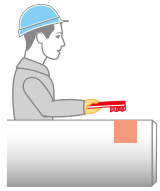
5.3 Minor damage

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.

6 PIPES WITH A POLYURETHANE EXTERNAL COATING

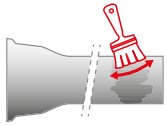
Brush to remove any dirt or loose particles and then **sand** to clean and roughen the surface.

Remove any dust from the surface to be coated.



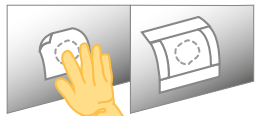
Heat with a gas burner to remove any traces of humidity.

Apply the product to the surface with a syringe (kit of five syringes - Eurokote 4820 Ivory – ref. **220818**).



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

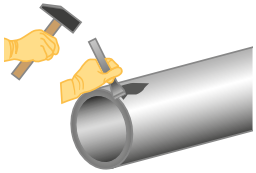
Close with adhesive.



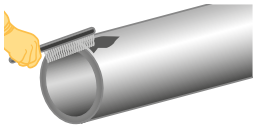
In case of major damage to the PUX coating, follow procedure 5.1 in the previous chapter.

External coating repairs

7 PIPES WITH A CEMENT EXTERNAL COATING



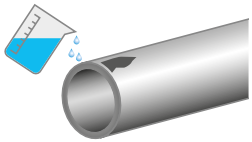
Prepare the affected surface by removing the damaged and loose mortar.



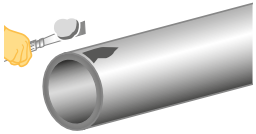
Brush to remove any dirt or loose particles and then **clean** the surface.

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.

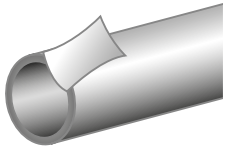
Remove any damaged and loose mortar.

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.

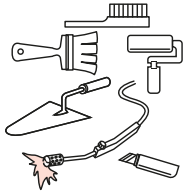
Optimal drying time: 2 hr 30 min.

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, 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.

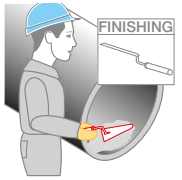
Remove any damaged and loose mortar.

Clean until spotless.

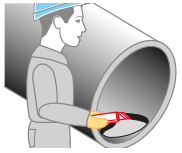
Apply the mixture and compact to ensure the correct thickness.

Smooth the surface.

For a socket without a cement lining, use:
- *NATURAL: NatZinc ref. 251222 (5 kg dose) and then Aquacoat (0.75 kg dose) ref. 240991*
- *CLASSIC and STANDARD TT: NatZinc ref. 251222 (5 kg dose) and then Endolac (1 kg dose) ref. 158134*
- *INTEGRAL and INTEGRAL TT or PUX: NatZinc ref. 251222 (5 kg dose) and then Eurokote (1 kg dose) ref. 236283*

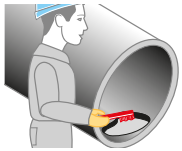


3 PIPES WITH A DUCTAN AND EPOXY INTERNAL LINING (DRINK. WATER AND SEWAGE): Blutop, Topaz, Tag32.



Deburr the edges of the damaged area with a cutter.

Sand and **clean** the damaged area.



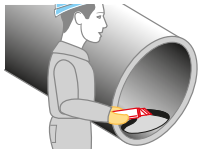
Apply the Eurokote 4820 mixture to the damaged area with a paintbrush.

- Blutop: ref. **158255** (1 kg dose) or **220815** (five 50 ml syringes)
- Topaz: ref. **184653** (1 kg dose) or **220817** (five 50 ml syringes)
- Tag32: ref. **184653** (1 kg dose) or **220817** (five 50 ml syringes)

Allow to dry.

Internal lining repairs

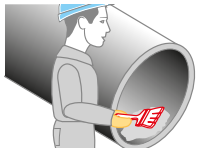
4 PIPES WITH A POLYURETHANE INTERNAL LINING (DRIN. WATER AND SEWAGE): Natural PUR, Integral pH1.



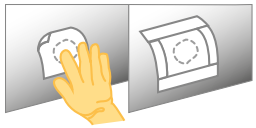
Deburr the edges of the damaged area with a cutter.

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. **220818**) 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 **220815** (five 50 ml syringes)*
*- INTEGRAL pH1: ref. **184653** (1 kg dose) or **220817** (five 50 ml syringes)*

5 FITTINGS WITH AN EPOXY COATING (DRINK. WATER AND SEWAGE): Natural, Integral, Classic (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/Blutop/Topaz: ref. **158255** (1 kg dose) or **220815** (five 50 ml syringes)
- Integral/Tag32/PUX: ref. **184653** (1 kg dose) or **220817** (five 50 ml syringes)

Allow to dry.

Comply with the recommended applications specified in the safety data sheets available in the Downloads section on www.pamline.com.

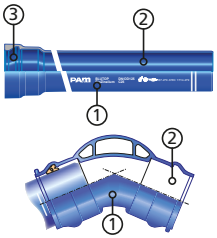
Repair products

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

1 DRINKING WATER AND SEWAGE PIPES & FITTINGS

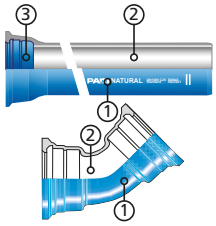
BLUTOP range - DN/OD 75 to 160

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
③ interior socket	240991	AQUACOAT Blue 5005	0.75 kg dose
② interior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)
① exterior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)
② interior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)



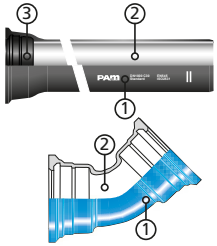
NATURAL range - DN 80 to 1000

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
③ interior socket	240991	AQUACOAT Blue 5005	0.75 kg dose
② interior	158009	SIKADUR 31 DW	6 kg kit (R75% + H25%)
① exterior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)
② interior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)



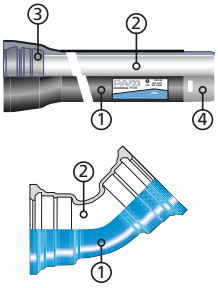
CLASSIC range - DN 700 to 1200

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
③ interior socket	265365	AQUACOAT CLASSIC PLUVIAL	0.75 kg dose
② interior	158009	SIKADUR 31 DW	6 kg kit (R75% + H25%)
① exterior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)
② interior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)



TT PE range - DN 80 to 700

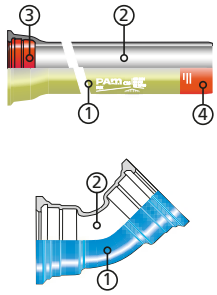
area	ref.	product	packaging
① exterior (minor damage)	175507	PE repair stick	1 item
① exterior (moderate damage)	111216	heat-shrink patch kit	1 item
② interior	158009	SIKADUR 31 DW	6 kg kit (R75% + H25%)
③ interior socket	251222	AQUACOAT Black	0.75 kg dose
④ spigot	158134	ENDOLAC 245-30 FGC	1 kg box
① exterior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)
② interior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)



Repair products

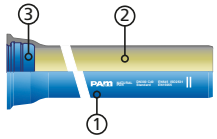
TT PUX range - DN 800 to 2000

area	ref.	product	packaging
① exterior	185005	EUROKOTE 4820 Ivory	1 kg dose (R80%+H20%)
① exterior	220818	EUROKOTE 4820 Ivory	Kit of five 50 ml syringes
② interior	158009	SIKADUR 31 DW	6 kg kit (R75% + H25%)
③ interior socket	184653	EUROKOTE 4820 brown red	1 kg dose (R80%+H20%)
④ spigot	251222	NATZINC	5 kg dose (R90%+H10%)
	184653	EUROKOTE 4820 brown red	1 kg dose (R80%+H20%)
① exterior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)
② interior	158255	EUROKOTE 4820 Blue	1 kg dose (R80%+H20%)



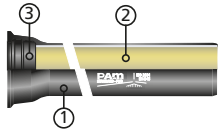
NATURAL PUR range - DN 150 to 700

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
③ interior socket	240991	AQUACOAT Blue 5005	0.75 kg dose
② interior	185005	EUROKOTE 4820 Ivory	1 kg dose (R80%+H20%)
	220818	EUROKOTE 4820 Ivory	Kit of five 50 ml syringes



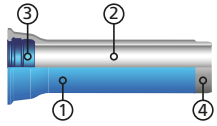
CLASSIC PUR range - DN 800 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
③ interior socket	265365	AQUACOAT CLASSIC PLUVIAL	0.75 kg box
② interior	185005	EUROKOTE 4820 Ivory	1 kg dose (R80%+H20%)
	220818	EUROKOTE 4820 Ivory	Kit of five 50 ml syringes



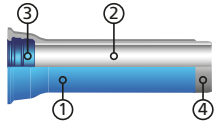
ZMU range - DN 80 to 600

area	ref.	product	packaging
① exterior	218842	ZMU repair kit	1.2 kg tub
② interior	158009	SIKADUR 31 DW	6 kg kit (R75% + H25%)
③ interior socket	240991	AQUACOAT Blue 5005	0.75 kg dose
④ spigot	158134	ENDOLAC 245-30 FGC	1 kg box



ZMU range - DN ≥ 700

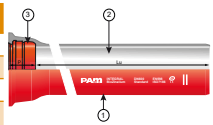
area	ref.	product	packaging
① exterior	158009	SIKADUR 31 DW	6 kg kit (R75% + H25%)
② interior			
③ interior socket	240991	AQUACOAT Blue 5005	0.75 kg dose
④ spigot	158134	ENDOLAC 245-30 FGC	1 kg box



2 SEWAGE PIPES AND FITTINGS

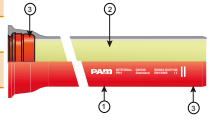
INTEGRAL range (BioZinalium, Zinalium,Aquacoat) DN 80 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
	240990	AQUACOAT	0.75 kg dose
② interior	158009	SIKADUR 31 DW	6 kg dose (R75% + H25%)
③ int. and ext. spigot	251222	NATZINC	5 kg dose (R90%+H10%)
	240990	AQUACOAT	0.75 kg dose



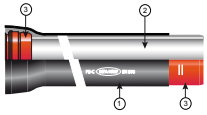
INTEGRAL pH1 range - DN 150 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
	236283	EUROKOTE 448 Red Brown	1 kg dose (R80%+H20%)
② interior	185005	EUROKOTE 4820 Ivory	1 kg dose (R80%+H20%)
	220818	EUROKOTE 4820 Ivory	Kit of five 50 ml syringes
③ int. and ext. spigot	184653	EUROKOTE 4820 Red Brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red Brown	Kit of five 50 ml syringes



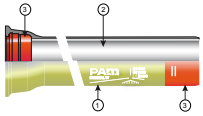
INTEGRAL TT PE range - DN 80 to 700

area	ref.	product	packaging
① exterior	175507	PE repair stick	1 PCE
② interior	158009	SIKADUR 31 DW	6 kg dose (R75% + H25%)
③ int. and ext. spigot	251222	NATZINC	5 kg dose (R90%+H10%)
	236283	EUROKOTE 448 Red Brown	1 kg dose (R80%+H20%)



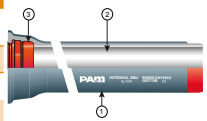
INTEGRAL TT PUX range - DN 150 to 2000

area	ref.	product	packaging
① exterior	185005	EUROKOTE 4820 Ivory	1 kg dose (R80%+H20%)
	220818	EUROKOTE 4820 Ivory	Kit of five 50 ml syringes
② interior	158009	SIKADUR 31 DW	6 kg dose (R75% + H25%)
③ int. and ext. spigot	184653	EUROKOTE 4820 Red Brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red Brown	Kit of five 50 ml syringes



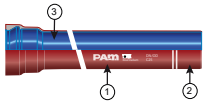
INTEGRAL ZMU range - DN 80 to 700

area	ref.	product	packaging
① exterior	218842	ZMU repair kit	12 kg tub
② interior	158009	SIKADUR 31 DW	6 kg dose (R75%+H25%)
③ interior socket	251222	NATZINC	5 kg dose (R90%+H10%)
	236283	EUROKOTE 448 Red Brown	1 kg dose (R80%+H20%)



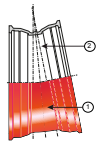
TOPAZ range - DN 75 to 160

area	ref.	product	packaging
① exterior	240990	AQUACOAT	dose de 0.75 kg
② cut	184653	EUROKOTE 4820 red brown	dose de 1kg (R80%+H20%)
	220817	EUROKOTE 4820 red brown	Kit of five 50 ml syringes
	250714	reparative kit cut TOPAZ	
③ interior	158255	Eurokote 4820 blue	1kg dose (R80%+H20%)



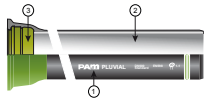
INTEGRAL and TOPAZ fittings (all versions) - DN 75 to 2000

area	ref.	product	packaging
① exterior	184653	EUROKOTE 4820 red brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 448 Red Brown	Kit of five 50 ml syringes
② interior	184653	EUROKOTE 4820 Red brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red brown	Kit of five 50 ml syringes



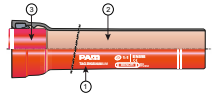
PLUVIAL range - DN 350 to 2000

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
	265365	AQUACOAT CLASSIC PLUVIAL	0.75 kg box
② interior	158009	SIKADUR 31 DW	6 kg dose (R75% + H25%)
③ int. and ext. spigot	251222	NATZINC	5 kg dose (R90%+H10%)
	-	Green paint	Contact us



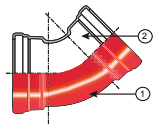
TAG 32 BioZinalium range - DN 150 to 300

area	ref.	product	packaging
① exterior	251222	NATZINC	5 kg dose (R90%+H10%)
	240990	AQUACOAT Red	0.75 kg dose
② interior	184653	EUROKOTE 4820 Red Brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red Brown	Kit of five 50 ml syringes
③ interior socket	184653	EUROKOTE 4820 Red Brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red Brown	Kit of five 50 ml syringes
cut	179099	ISOLARM 671-50 protective paste for repairing cuts	200 g tube



TAG 32 fittings DN 150 to 300

area	ref.	product	packaging
① exterior	184653	EUROKOTE 4820 Red Brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red Brown	Kit of five 50 ml syringes
② interior	184653	EUROKOTE 4820 Red Brown	1 kg dose (R80%+H20%)
	220817	EUROKOTE 4820 Red Brown	Kit of five 50 ml syringes



Comply with the recommended applications specified in the safety data sheets available in the Downloads section on 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).

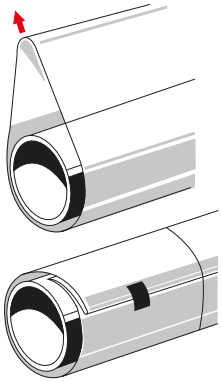
- Pipes must be clean and dry (no soil entrapped between the pipe and sleeve).
- The pipe bed and backfill must not contain any stones or fragmented rock that could damage the sleeve during laying or in service (soil load).

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

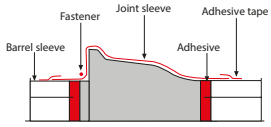
Joint sleeve

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

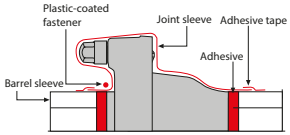
Secure with a fastener as close as possible to the gland (EXPRESS joint) or socket face (STANDARD joint).

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

STANDARD joint



EXPRESS joint



Polyethylene sleeve Sleeving the barrel

NATURAL, INTEGRAL (ZINALIUM + BIOZINALIUM), ZMU, STANDARD TT and INTEGRAL TT 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 thightly as possible.

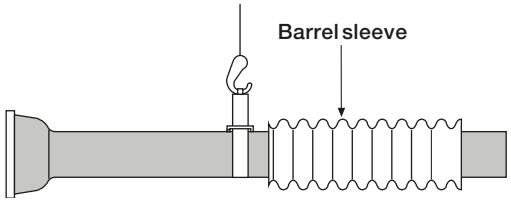
Successive assembly of barrel and joint sleeves must form a continuous protection.

Use the same sleeving to protect fittings.

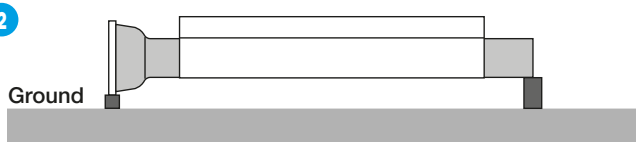
Polyethylene sleeve
Sleeving the barrel

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

1



2



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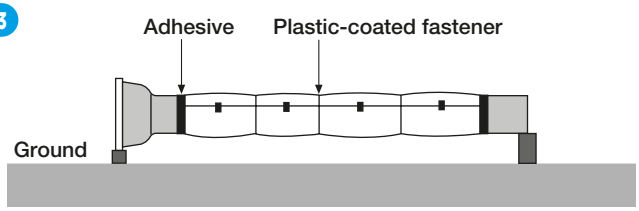
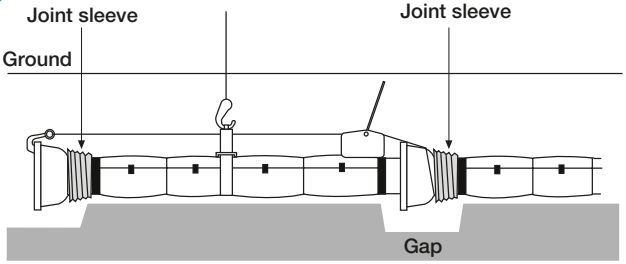


4



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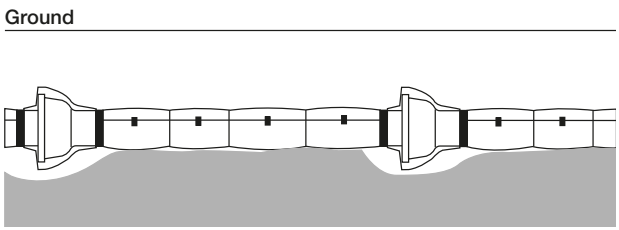
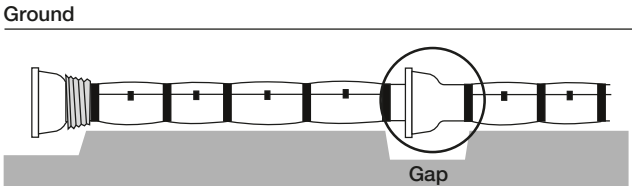


Polyethylene sleeve
Sleeving the joint

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).



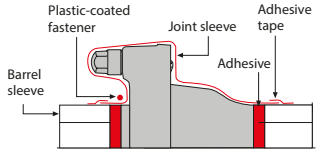
2 FIX

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).

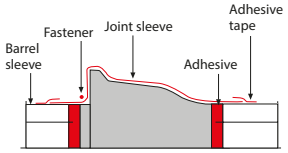
Secure with adhesive tape as close as possible to the gland (STANDARD Ve or EXPRESS joint) or socket face (STANDARD or UNIVERSAL joint).

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

Standard Ve or EXPRESS joint

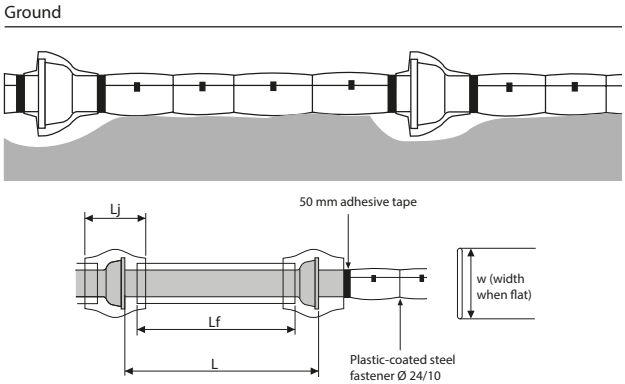


Standard or UNIVERSAL joint



3 ASSEMBLE

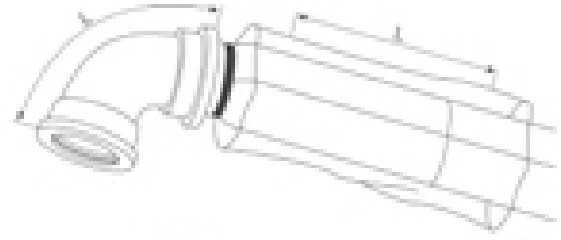
Successive assembly of barrel and joint sleeves must form a **continuous protection**.

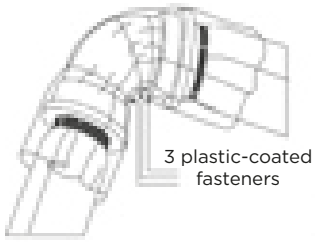


Polyethylene sleeve Sleeving fittings

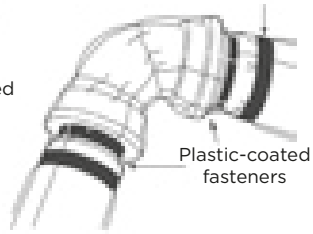
Use the same polyethylene sleeve to protect fittings.
Polyethylene sleeves must be fitted according to the same recommendations (in particular, the polyethylene sleeve must be wrapped around the pipe as tightly as possible).

Bend

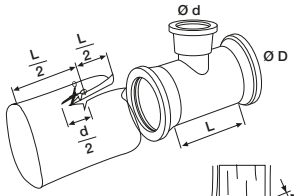


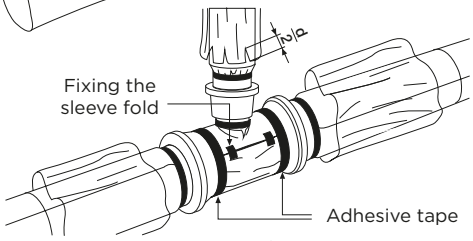


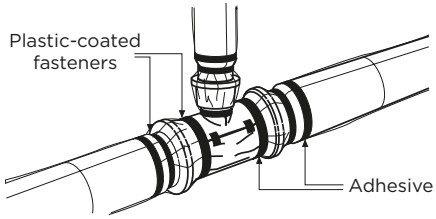
Bend Adhesive tape (over the barrel sleeve)



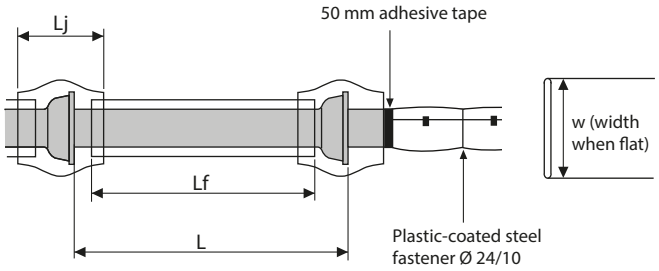
3-socket tee







Preparing the barrel and joint sleeves



DN		Barrel		Joint (according to type)			Sleeve thickness	Number of fasteners
				STD UNI PK	EXP STD Ve			
	L	W	Lf	W	W	Lj		
	m	m	m	m	m	m	µm	
*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.

Ovality correction DN 200 to 700

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

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

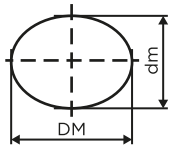
DN	Outside diameter OD (mm)	
	Nominal value	Limit deviations
200	222	+ 1/-3.0
250	274	+ 1/-3.1
300	326	+ 1/-3.3
350	378	+ 1/-3.4
400	429	+ 1/-3.5
450	480	+ 1/-3.6
500	532	+ 1/-3.8
600	635	+ 1/-4.0
700	738	+ 1/-4.3

Excerpt from EN 545 - Table 15

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

1 CHECK THE OVALITY

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

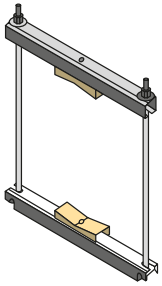


DM: maximum diameter measured

dm: minimum diameter measured

TACKLE (ref. 244524)

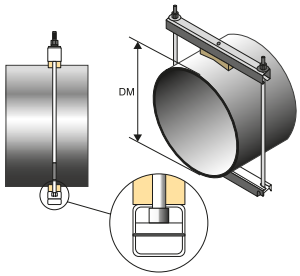
- Two steel **bars** (top and bottom) fitted with movable pads
- Two **threaded rods** (right-hand thread)
- Two **Nylstop nuts** + **washers**



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.



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**.

Ovality correction DN 200 to 700

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.

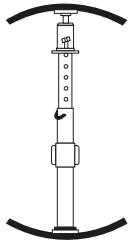
In case of a small diameter pipe, you can rotate the bars using the adjustable pads.

Ovality correction 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:

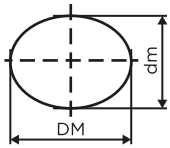
DN	Outside diameter OD (mm)	
	Nominal value	Limit deviations
800	842	+ 1/-4.5
900	945	+ 1/-4.8
1000	1048	+ 1/-5.0
1100	1152	+ 1/-6.0
1200	1255	+ 1/-5.8
1400	1462	+ 1/-6.6
1500	1565	+ 1/-7.0
1600	1668	+ 1/-7.4
1800	1875	+ 1/-8.2
2000	2082	+ 1/-9.0

Excerpt from EN 545 - Table 15

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

1 CHECK THE OVALITY

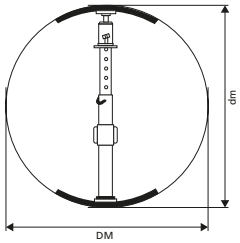
$$\text{Ovality (\%)} = \frac{DM-dm}{DM+dm} \times 100$$



DM: maximum diameter measured
dm: minimum diameter measured

2 POSITION

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



Ovality correction 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.

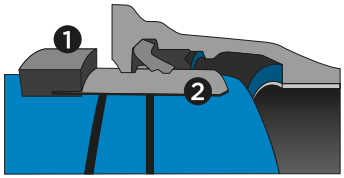
Dismantling joints

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
Standard Vi and UNIVERSAL Vi			
60	110680	110682	3
80			4
100			5
125	110681		6
150			7
200	110683		9
250			11
300			13
350			15
400			16
450			18
500			19
600			23
700			27
Blutop Vi			
75	110680	110 682	3
90			4
110			4
125	110681		5
140			5
160			6



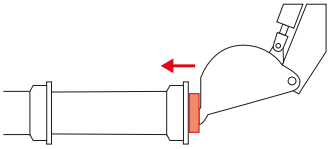
- Gloves, goggles, safety shoes
- Brush, cloth
- Lump hammer
- Lubricant paste
- Textile straps

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.

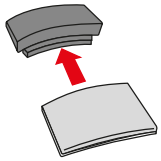


Prepare the lubricant paste, the anvil and extractor shims.

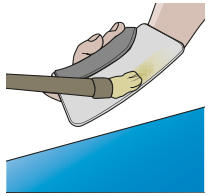
Dismantling joints

3 POSITION THE EXTRACTOR SHIMS

Slide the first shim into the slot in the anvil.

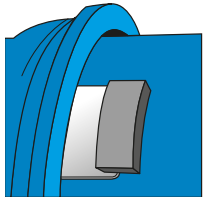


Coat the exposed part of the shim with lubricant paste (both sides).



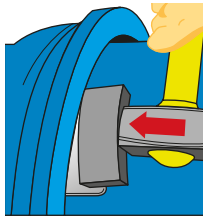
Place the shim + anvil in the annular space.

The large side of the shim must be in contact with the joint.

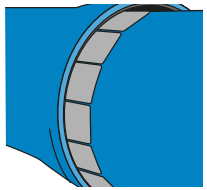


Gradually **drive** the shim between the joint and the pipe.

Keep the shim flat against the pipe barrel if necessary.



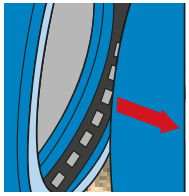
Repeat all the way round the joint for the other shims.



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

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 / Blutop Vi joint be reused.

UNIVERSAL Ve

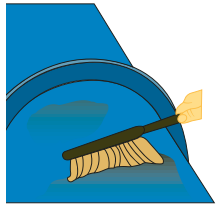
1 REQUIRED EQUIPMENT

DN	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

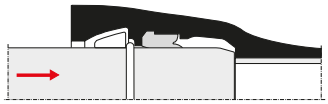
- Gloves, goggles, safety shoes
- Brush, cloth
- Lump hammer
- Lubricant paste
- Textile straps

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 locking ring.

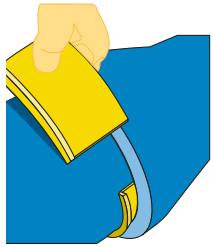


Prepare the lubricant paste and the dismantling tools.

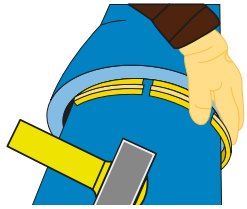
3 POSITION THE SHIMS

DN 100 to DN 300

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

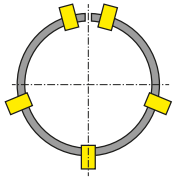


Repeat all the way round the joint for the other shims.

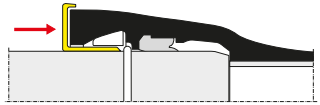


DN 350 to DN 700

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



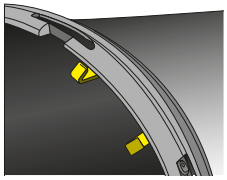
Insert the remaining three shims around the rest of the joint.



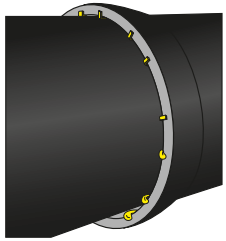
Dismantling joints

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).

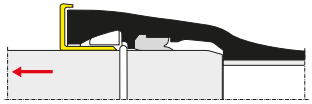


Proceed in the same way for all the segments around the circumference.



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.

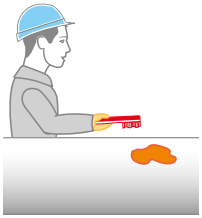
The contractor is responsible for analyzing and eliminating any risks during installation (especially the use of personal protective equipment).

1 PIERCED PIPES

Repair collar

Longitudinal fracture ≤ 35% of the collar

Circumferential fracture ≤ 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

2 BROKEN PIPE (NON-ANCHORED SECTION)

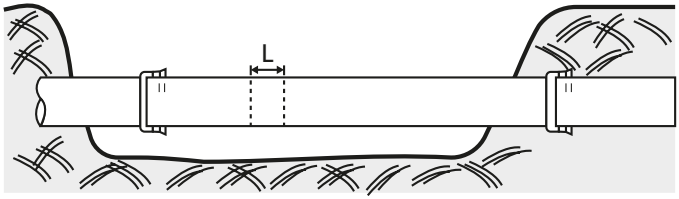
ULTRALINK, LINK GS, ULTRAQUICK, QUICK GS, EXPRESS COUPLINGS

- 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.

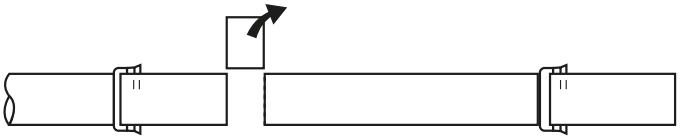
In case of drinking water systems, **all parts must be disinfected before assembly.**

3 LEAKING JUNCTION (NON-ANCHORED SECTION)

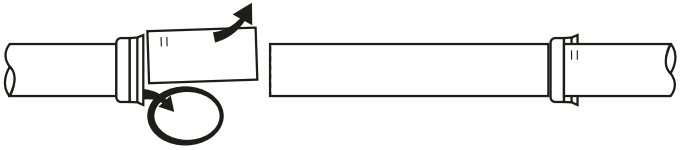
- Carefully **remove** the soil around the existing pipeline.
- **Use** a circometer to check the pipe's diameter.
- **Draw** the cutting marks (between 150 and 250 mm):



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



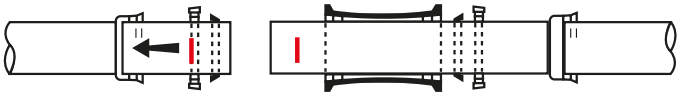
•**Free** the spigot cut-out and remove the joint:



The joint **must** be replaced.

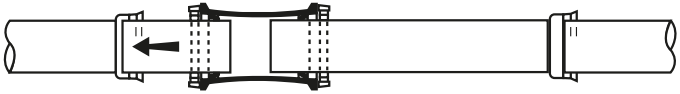
•**Insert** a new STANDARD JOINT (refer to the STANDARD JOINT guide) in the socket.

•**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.

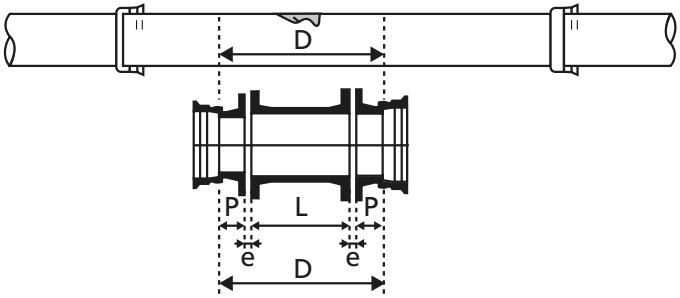
•**Place** the EXPRESS collar in the middle of the cut-out section and then assemble the glands with the bolts.



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)

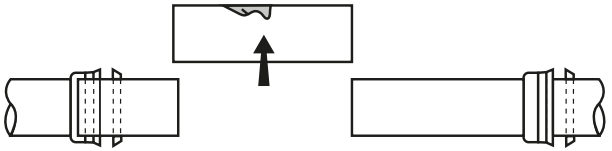
•**Mark** the cutting lines according to the following formula:



D (cut length) = **L + (2 x e) + (2 x P)**

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

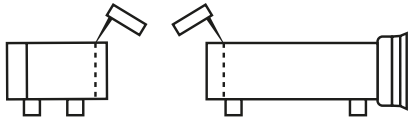
•**Cut** according to D and then remove the damaged section.



•**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.

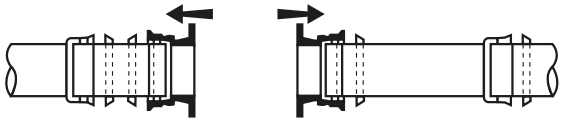


(refer to the WELD BEAD guide)

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

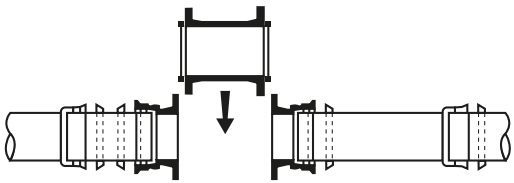
On each of the two ends of the pipe, **re-assemble** the cut sections fitted with Standard Ve glands.

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



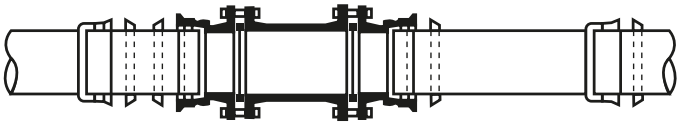
Fully **insert** the two flange sockets.

•**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.



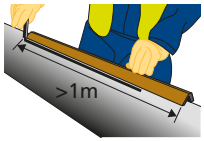
- Finally, **tighten** the flange bolts and then the gland bolts.

Refer to the FLANGE JOINTS guide
Refer to the STANDARD Ve JOINTS guide

Branches for sewage pipes - rectangular hole

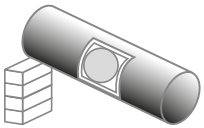
Saddle branches

1 DRAW



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

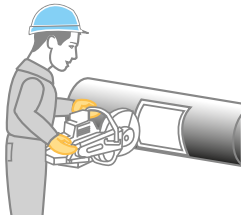
- The external rectangular outline of the plate.
- The internal outline of the pipe neck from the saddle branch.
- A rectangle corresponding to the dimensions specified in the following table and positioned around the circle drawn during the previous step.



DN	Opening dimensions	
	Length (mm)	Width* (mm)
200	190	190
250	190	250
300	240	250
400	300	300
500	300	300
600	300	300

* Cut on the line. Measure on the circumference (circle arc).

2 CUT AND CLEAN



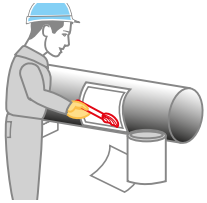
Using a disc cutter, **cut** the rectangular opening in the pipe barrel on the inside of the line. Comply with the centerline of the pipe shown on the cutting template.

Use a multi-material cutting disc.

Avoid cutting over the line in the corners.

Using a cloth, **clean** the part of the pipe barrel to which the plate will be mounted, as well as the inside of the pipe and the face to be re-coated.

3 REPAIR

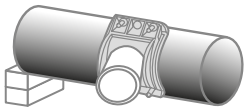


Repair the coating on the exposed part of the pipe after cutting by applying fast-drying epoxy paint with a paintbrush.

If necessary, **repair** the lining.

Product used: ISOLARM protective paste (ref. **179099**)

4 ASSEMBLE



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

Lubricate the gasket once seated in its housing.

Start assembly in the middle of each straight section and progressively fit by hand. Use a mallet if necessary.

Fit the plate to the pipe barrel.

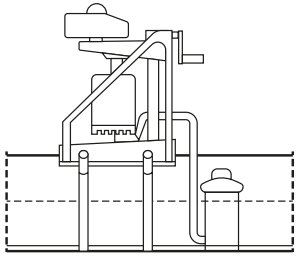
Gradually **tighten** the bolts, alternating on both sides until the plate is perfectly in contact with the pipe barrel.

Fit and **tighten** the stirrups (until the part is in contact with the pipe).

Branches for sewage pipes - round hole

90° saddle branches

1 BORE

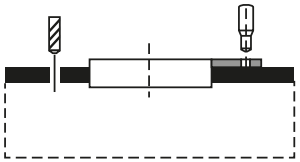


Use a boring machine with a centering base.

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

Lubricate with water.

2 PUNCH AND DRILL

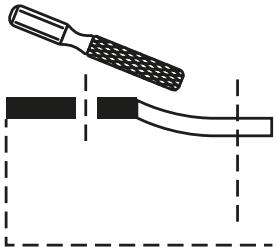


Mark the position of the two holes with a center punch.

Drill a hole with a 13 mm diameter.

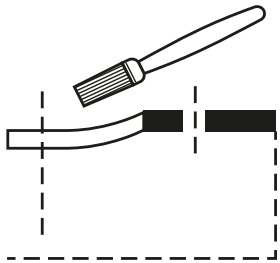
Preferably **use** a drill bit with a tungsten carbide tip for hardened steel and abrasive materials.

3 Deburr



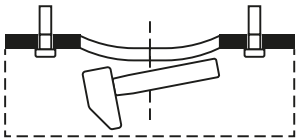
Carefully **deburr** and **break** the angles.

4 COAT



Coat the exposed parts with ISOLARM paste (INTEGRAL, TAG 32) or EUROKOTE (INTEGRAL PUX, INTEGRAL pH1).

5 MOUNT THE BOLTS



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

Branches for sewage pipes - round hole

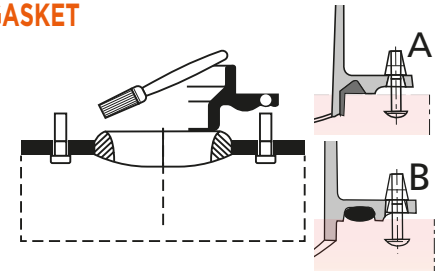
Saddle branches

6 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.

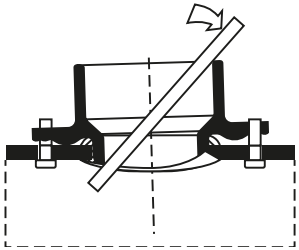


7 ASSEMBLE

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.



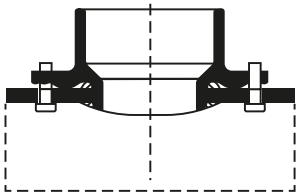
8 TIGHTEN

Add the second bolt.

Tighten both nuts.

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

Torque: **30 N.m**



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

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

Branches for sewage pipes - round hole

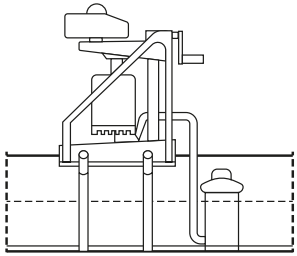
Swivel saddle branches

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

1 BORE

Use a boring machine with a centering base and a hole saw specifically for iron (Ø172 mm for 150 branches and Ø232 mm for 200 branches).

Lubricate with water.



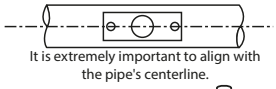
2 PUNCH AND DRILL

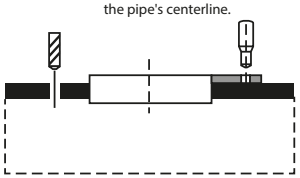
Position the template while respecting the pipe's centerline.

Mark the position of the two holes with a center punch.

Drill a hole with a 13 mm diameter.

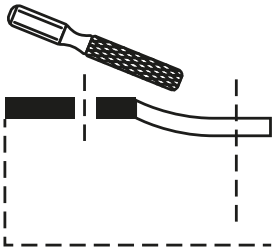
Preferably **use** a drill bit with a tungsten carbide tip for hardened steel and abrasive materials (high performance).





3 Deburr

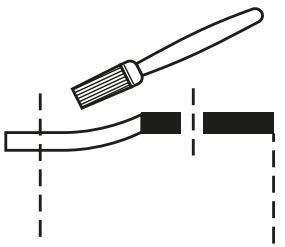
Carefully **deburr** and **break** the angles.



4 COAT

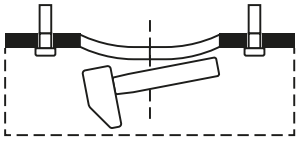
Coat the exposed parts with:

- ISOLARM paste ref. 179099 for INTEGRAL or TAG32 pipes
- IVORY paint ref. 220818 for INTEGRAL TT or INTEGRAL pH1 pipes



5 MOUNT THE BOLTS

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



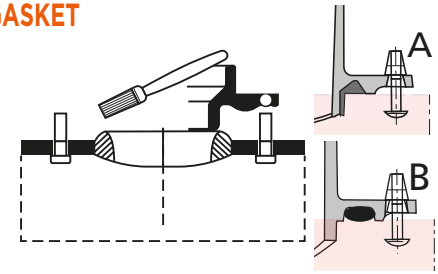
Branches for sewage pipes - round hole
Swivel saddle branches

6 POSITION THE GASKET

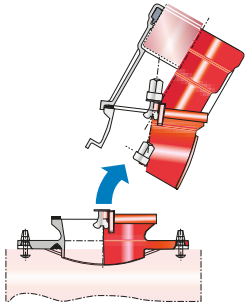
Position the gasket according to the type of joint (see diagrams A and B).

Check that the gasket is properly seated.

Lubricate the gasket.



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

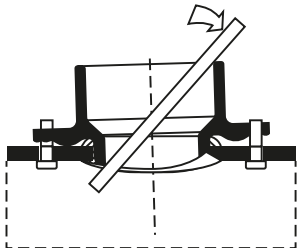


7 ASSEMBLE

Mount the fully assembled iron part with a single bolt.

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

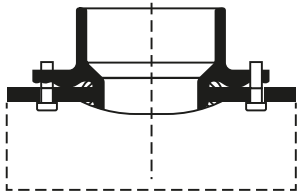
Finish mounting the iron part. If necessary, use a wooden lever to avoid damaging the coating. Gradually **apply** increasing pressure and avoid jerky movements.



8 TIGHTEN

Add the second bolt.

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).

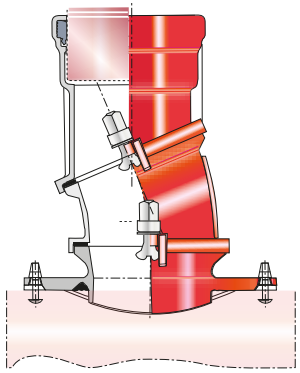
Branches for sewage pipes - round hole
Swivel saddle branches

9 ASSEMBLE

Re-mount the upper elements.

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

Fit and **tighten** the stirrups.



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

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

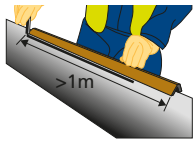
Branches for sewage pipes - rectangular hole

Swivel saddle branches

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

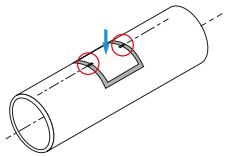
1 DRAW

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



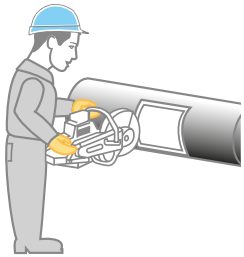
Using the template provided, **draw** the following on the pipe barrel.

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.



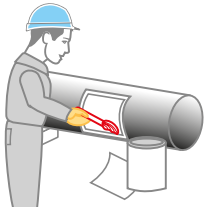
Use a multi-material cutting disc.

Avoid cutting over the line in the corners.

Using a cloth, **clean** the part of the pipe barrel to which the plate will be mounted, as well as the inside of the pipe and the face to be re-coated.

3 REPAIR

Repair the coating on the exposed part of the pipe after cutting by applying fast-drying epoxy paint with a paintbrush.



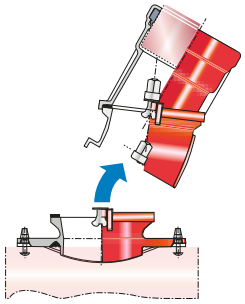
If necessary, **repair** the lining.

Product used: ISOLARM protective paste (ref. **179099**)

4 ASSEMBLE

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

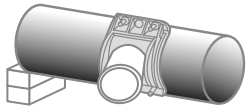
Fit the gasket in the housing on the internal face of the plate.



Branches for sewage pipes - rectangular hole

Swivel saddle branches

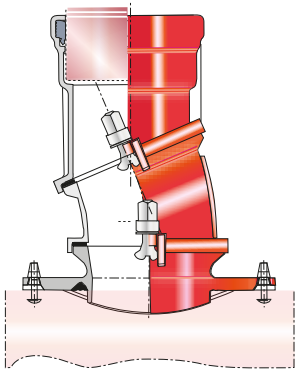
Lubricate the joint once seated in its housing.



Fit the plate to the pipe barrel.

Start assembly in the middle of each straight section and progressively **fit** by hand. Use a mallet if necessary.

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



Re-mount the upper elements.

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

Fit and **tighten** the stirrups.

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