



Table of contents

0.0	Table of contents	0.525	Building connection – press fitting, fixed-point forces
		0.530	Building connection installation
0.1	System description	0.535	Installation tool, general and for screw connection
0.100	System description (general)	0.540	Installation tool, for connection to sliding sleeves
0.105	System description (data)		
0.106	System description (data)		
0.110	Long-term behaviour/service life calculation		
0.115	FLEXSTAR UNO range, heating, 6 bar		
0.116	FLEXSTAR DUO range, heating, 6 bar		
0.2	Planning, project development		
0.200	FLEXSTAR pressure loss diagram, heating, 6 bar		
0.210	FLEXSTAR heat loss, heating, 6 bar		
0.3	Components		
0.315	L-shell		
0.316	Big L-shell		
0.325	I-shell		
0.326	Big I-shell		
0.330	T-shell		
0.335	Big T-shell		
0.365	Insulating material, PE foam		
	PUR foam container		
0.370	Screw connections, external thread, weld end		
0.375	Screw connection, elbow 90°		
0.380	Press fittings, thread, weld end with sliding sleeve		
0.385	Press fittings, coupling, elbow 90° with sliding sleeve		
0.390	Press T-piece, with sliding sleeve, heating, 6 bar		
0.405	End cap, standard, shrinkable		
0.410	Wall sealing ring, for wall openings		
0.415	Building entry, wall opening		
0.420	Labyrinth wall sealing ring, core drillings/cement casing pipe		
0.425	Building entry, core drillings/cement casing pipe		
0.5	Civil engineering, installation		
0.500	Route		
0.505	Trench dimensions		
0.510	Pipe warning tape, laying aids		
0.515	Connection (rigid/flexible), FLEXSTAR plastic sheath pipe		
0.520	Building connection – screw connection, shaft entry		

17.03.2022

Subject to technical changes.

BRUGG
Pipes

System description

1. General

FLEXSTAR is the protected name for a flexible pipe system from BRUGG Pipes, designed especially for the low-temperature range and heat-pump range and produced according to the current standard (EN 15632-1/-2).

FLEXSTAR, the flexible heat-pump pipe, has been designed for use in small and medium-sized heat-pump networks, as well as for small local heating networks and heating-pipe reconstructions.

The FLEXSTAR systems consist of a carrier pipe made of cross-linked polyethylene PEX and are equipped with an organic oxygen diffusion barrier (EVOH).

The carrier pipe was selected or integrated into the standards because it has excellent thermal and mechanical properties. The corrosion-resistant, chemically resistant material is very robust and can very easily be processed by hand.

The thermal insulation of FLEXSTAR consists of a patented flexible polyurethane foam with good thermal insulation properties.

During the formation of the foam, the carrier pipes are wetted very effectively by it, resulting in a firm adhesion and a force-locking bond. The physical properties of the PEX pipe combined with the insulation bond allow installation without having to take thermal expansion into account.

The FLEXSTAR systems boast outstanding bending characteristics, which allows them to be adapted to all building and heat-pump entries. Thanks to this flexibility, obstacles can be bypassed with ease, without additional costs.

The FLEXSTAR systems are available as a set or are delivered to the construction site in the desired length, in endless rings, or on a drum. Longer delivery lengths enable pipes to be laid in the ground largely without joints. This means that the pipe trench can be considerably narrower. This allows considerable savings to be made in civil engineering work.

This applies in particular to DUO lines.

If you also consider the very short installation time, the FLEXSTAR systems are not only a technically perfect solution, but also the key to the time and cost-saving creation of heat-pump connections due to the reduced amount of coordination work required on site and the quick and easy installation.

Assembling the connection pieces could hardly be easier. With conventional screw connections or press fittings, the connections are quickly and safely installed. The wide range of accessories ensures that solutions can be chosen for every possible situation.

2. Application area

Heating, pipe series 5 (SDR 11):

Max. continuous operating temp. T_{Bmax} : 80 °C

Max. operating temp. T_{max} : 95 °C (fluctuating)

Max. operating pressure p : Max. 6 bar

See sheet FXS 1.110

System description

1. Composite system

Requirements:

Factory-insulated, flexible pipe systems according to EN 15632-1/-2

Fire behaviour:

Building material class B2 (normal flammability) according to DIN 4102

2. Carrier pipe

Materials

Base material: High-density polyethylene (HDPE), peroxide-crosslinked (PEXa), cross-linked with an electron accelerator (PEXc), colour: black

Bonding agent

Modified PE, heat-stabilised, colour: black

Oxygen barrier layer

Ethylene vinyl alcohol (EVOH), heat-stabilised, colour: black

Requirements

According to DIN 16892 / DIN 16893

Oxygen tightness

According to DIN 4726, at 40 °C, oxygen tightness related to the internal pipe volume of $\leq 0.10 \text{ g}/(\text{m}^3 \times \text{d})$ according to DIN 4726

DIN 16893 pipe rows

Series 5 (SDR 11): for FLEXSTAR (with EVOH barrier)

Long-term behaviour

See catalogue sheet FXS 0.110

Properties

Unaffected by aggressive water, low pressure losses, very good chemical and mechanical resistance

PEXa carrier pipe	Reference temp. °C	Value	Test standard
Density	–	938 kg/m ³	DIN 53479
Thermal conductivity	20 °C	0.38 W/mK	DIN 52612
Oxygen permeability	-	< 0.1 g/(m ³ *d)	DIN 4726, ISO 17455
Elongation	-	> 400%	DIN 53455
Linear thermal expansion coefficient	20	$1.4 \cdot 10^{-4} \text{ 1/K}$	DIN 52328
Linear thermal expansion coefficient	100	$2.0 \cdot 10^{-4} \text{ 1/K}$	–

PEXc carrier pipe	Reference temp. °C	Value	Test standard
Density	–	945 kg/m ³	DIN 53479
Thermal conductivity	20 °C	0.38 W/mK	DIN 52612
Oxygen permeability	-	< 0.1 g/(m ³ *d)	DIN 4726, ISO 17455
Elongation	-	> 400%	DIN 53455
Linear thermal expansion coefficient	20	$1.4 \cdot 10^{-4} \text{ 1/K}$	DIN 52328
Linear thermal expansion coefficient	100	$2.0 \cdot 10^{-4} \text{ 1/K}$	–

System description

3. Insulation

Materials:

FLEXSTAR (heating, 6 bar)

CFC-free, cyclopentane-blown polyurethane foam (PUR)

PUR insulation	Reference temp. °C	FLEXSTAR	Test standard
Density	–	> 50 kg/m ³	EN 253
Axial shear strength		≥ 90 kPa	EN 15632-2
Thermal conductivity, flexible systems	50	≤ 0.025 W/mK	EN 253 and ISO 8497
Closed-cell structure	-	≥ 88 %	EN 253
Water absorption	100	≤ 10 %	EN 15632-1

4. Protective casing

Materials:

Linear low-density polyethylene (LLDPE), seamlessly extruded, UV-protected

Task:

To protect against mechanical influences and moisture

LLDPE protective casing	Reference temp. °C	Value	Test standard
Density	–	918–922 kg/m ³	ASTM D792
Thermal conductivity	–	0.33 W/mK	DIN 52612

Long-term behaviour

Service life calculation

Operating temperature °C	FLEXSTAR (pipe series 5 / SDR 11)				
	Operating pressure (bar)				
	1 year	5 years	10 years	25 years	50 years
10	17.9	17.5	17.4	17.2	17.1
20	15.8	15.5	15.4	15.2	15.1
30	14.0	13.8	13.7	13.5	13.4
40	12.5	12.2	12.1	12.0	11.9
50	11.1	10.9	10.8	10.7	10.6
60	9.9	9.7	9.7	9.5	9.5
70	8.9	8.7	8.6	8.5	8.5
80	8.0	7.8	7.7	7.6	–
90	7.2	7.0	6.9	–	–
95	6.8	6.6	6.6	–	–

1 MPa = 10 bar

Long-term behaviour (table)

The permissible operating pressures according to DIN 16892/93 are based on water as a flow medium and have been designed with a safety factor (SF) of 1.25 (according to DIN EN ISO 12162). The values are monitored by the plastic pipe producer through long-term studies and are confirmed and tested by independent test institutes in different countries. The max. operating temperature is specified as 95 °C; however, a short-term overtemperature (fault temperature) of 110 °C is observed. In general, when the temperature fluctuates as expected in the flow in a district heating system, this results in an average temperature/year of approx. 66 °C.

Service life calculation with Miner's rule

Service life calculation (Miner's rule)

When a PEX pipe system is used with fluctuating operating temperatures, the operating duration can be calculated using Miner's rule (EN ISO 13760).

Usage examples

The basis for this is a collective temperature over a year with fluctuating operation (according to EN 15632-2)

1 year = 365 days = 8760 hours.

Operating temperature °C	Example 1 Annual operating duration h	Example 2 Annual operating duration h	Example 3 Annual operating duration h
95	3.3	0	0
90	292	50	50
85	0	100	1000
80	8468	200	3450
75	0	2000	1000
70	0	2410	0
65	0	4000	0
60	0	0	0
Total	8763.3	8760	5500

The three examples have been calculated using Miner's rule.

Example 1: Service life of 30 years

Example 2: Service life of 50 years

Example 3: Service life of 40 years

FLEXSTAR range

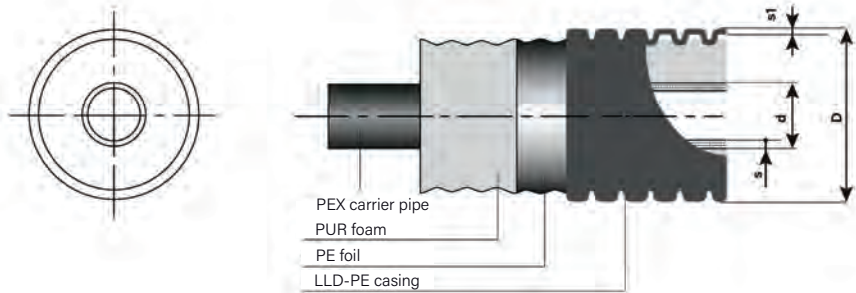
FLEXSTAR UNO (heating, 6 bar)

FLEXSTAR

In rings:

Dimensions:

FXS Ø 70–105 mm



FLEXSTAR heating, 6 bar, UNO

Type	PEX inner pipe d x s mm	Nominal diameter		Outer casing D x s1 mm	Minimum winding radius m	Volume of inner pipe l/m	Weight kg/m	Maximum delivery length m
		DN	Inches "					
25/70*	25 x 2.3	20	¾	71 x 1.5	0.30	0.32	0.73	200
32/70	32 x 2.9	25	1	71 x 1.5	0.30	0.53	0.84	200
40/90	40 x 3.7	32	1¼	90 x 1.6	0.30	0.83	1.25	200
50/90	50 x 4.6	40	1½	90 x 1.6	0.30	1.30	1.44	200
63/105	63 x 5.8	50	2	106 x 1.7	0.30	2.07	2.07	200

* carrier pipe PEXc

Longer or shorter delivery lengths can be supplied on drums on request.

When ordering at the construction site, please observe the total weight of the ring (unwinding equipment)

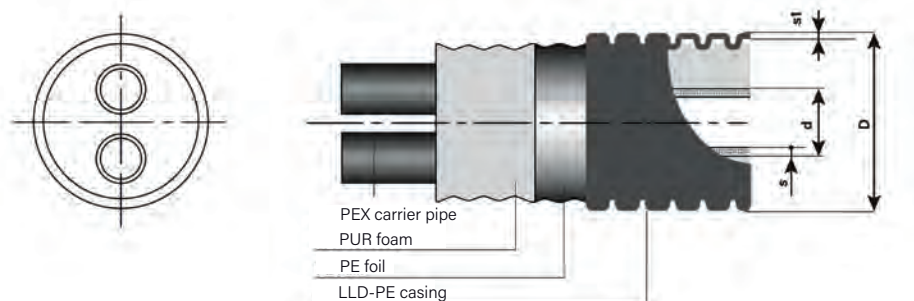
FLEXSTAR range

FLEXSTAR DUO (heating, 6 bar)

FLEXSTAR in rings:

Dimensions:

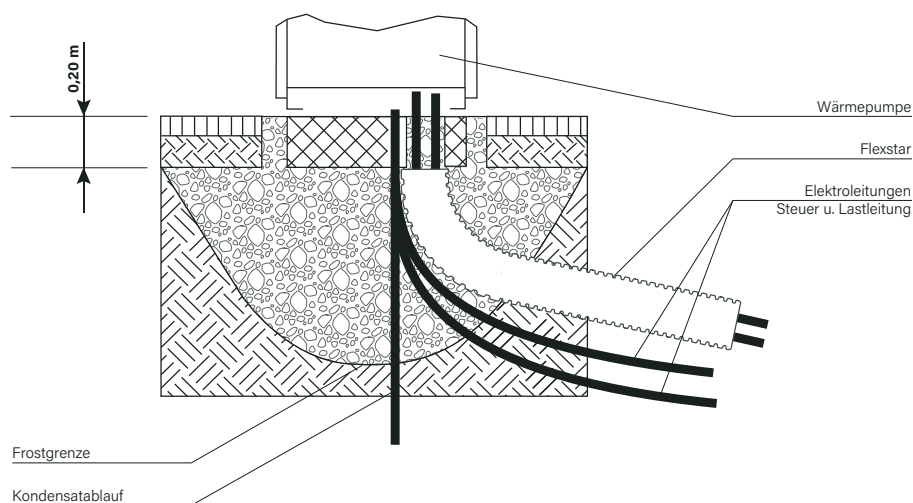
FXS Ø 90–150 mm



FLEXSTAR heating, 6 bar, DUO

Type	PEX inner pipe d x s mm	Nominal diameter DN	Inches	Outer casing D x s1 mm	Minimum winding radius m	Volume of inner pipe l/m	Weight kg/m	Maximum delivery length m
25 + 25/ 90*	2 x 25 x 2.3	20 + 20	2 x ¾	90 x 1.6	0.30	2 x 0.32	1.16	200
32 + 32/105	2 x 32 x 2.9	25 + 25	2 x 1	106 x 1.7	0.30	2 x 0.53	1.66	200
40 + 40/125	2 x 40 x 3.7	32 + 32	2 x 1¼	126 x 1.8	0.35	2 x 0.83	2.28	100
50 + 50/150	2 x 50 x 4.6	40 + 40	2 x 1½	151 x 1.9	0.40	2 x 1.30	3.05	100

* carrier pipe PEXc



When ordering at the construction site, please observe the total weight of the ring (unwinding equipment)

Pressure loss diagram

FLEXSTAR (heating, 6 bar)

Water temperature 80 °C

Surface roughness $\varepsilon = 0.007$ mm (PEX)

(1 mmWS = 9.81 Pa)

$$\dot{m} \approx \frac{Q \cdot 860}{\Delta T}$$

$\dot{m}$ =

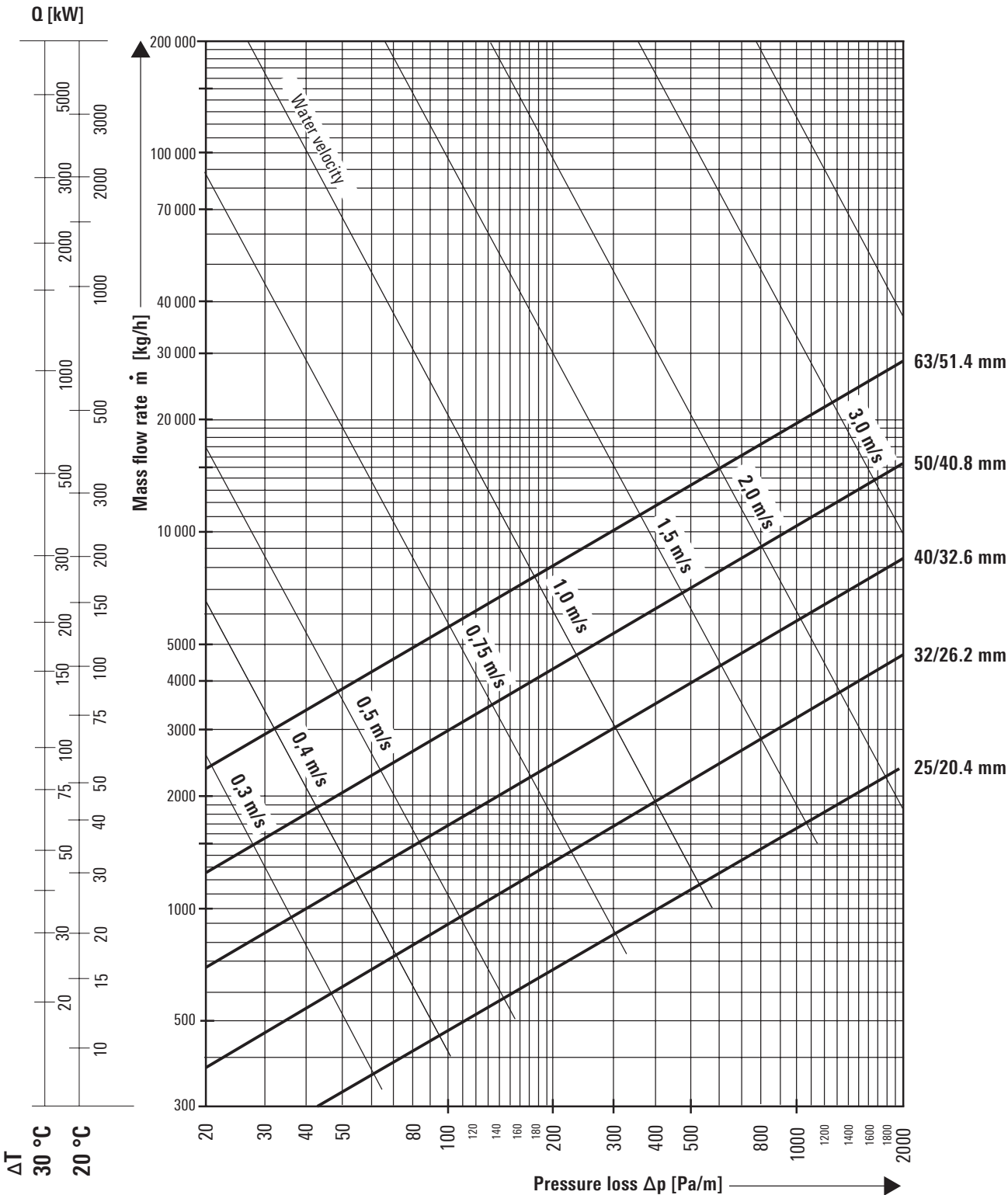
flow in kg/h

Q =

power requirement in kW

ΔT =

temperature difference
Flow/return in °C



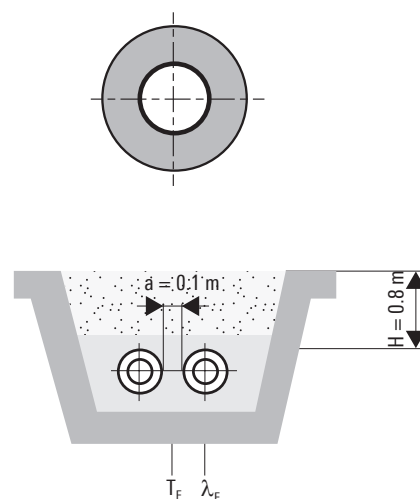
Heat loss

FLEXSTAR (heating, 6 bar)

FLEXSTAR UNO

Heat losses q [W/m] for an UNO pipe

Type	U value [W/mK]	Average operating temperature T_B [°C]					
		40°	50°	60°	70°	80°	90°
25/70	0.1530	4.59	6.12	7.65	9.18	10.71	12.24
32/70	0.2010	6.03	8.04	10.05	12.06	14.07	16.08
40/90	0.1940	5.82	7.76	9.70	11.64	13.58	15.52
50/90	0.2680	8.04	10.72	13.40	16.08	18.76	21.44
63/105	0.2980	8.94	11.92	14.90	17.88	20.86	23.84

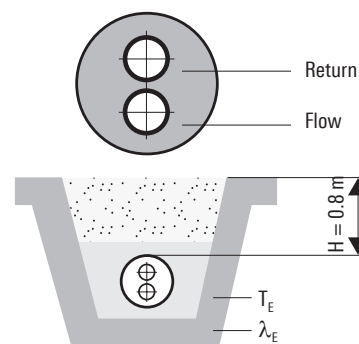


FLEXSTAR DUO

(flow and return in one pipe)

Heat losses q [W/m] for a DUO pipe

Type	U value [W/mK]	Average operating temperature T_B [°C]					
		40°	50°	60°	70°	80°	90°
25 + 25/ 90	0.2360	7.08	9.44	11.80	14.16	16.52	18.88
32 + 32/105	0.2600	7.80	10.40	13.00	15.60	18.20	20.80
40 + 40/125	0.2660	7.98	10.64	13.30	15.96	18.62	21.28
50 + 50/150	0.2970	8.91	11.88	14.85	17.82	20.79	23.76



FXS UNO laying type:

FXS DUO laying type:

Pipe spacing:

Cover height:

Ground temperature:

Conductivity of the ground:

Conductivity of the PUR foam:

* Conductivity of the PEX pipe:

Conductivity of the PE casing:

Measurement temperature for λ :

2 pipes laid underground

1 pipe laid underground

$a = 0.10$ m

$H = 0.80$ m

$T_E = 10$ °C

$\lambda_E = 1.0$ W/mK

$\lambda_{PU} = 0.025$ W/mK

$\lambda_{PEX} = 0.38$ W/mK

$\lambda_{PE} = 0.33$ W/mK

$T_\lambda = 50$ °C

Heat loss during operation:

$q = U (T_B - T_E)$ [W/m]

U = thermal transmittance coefficient [W/mK]

T_B = average operating temperature [°C]

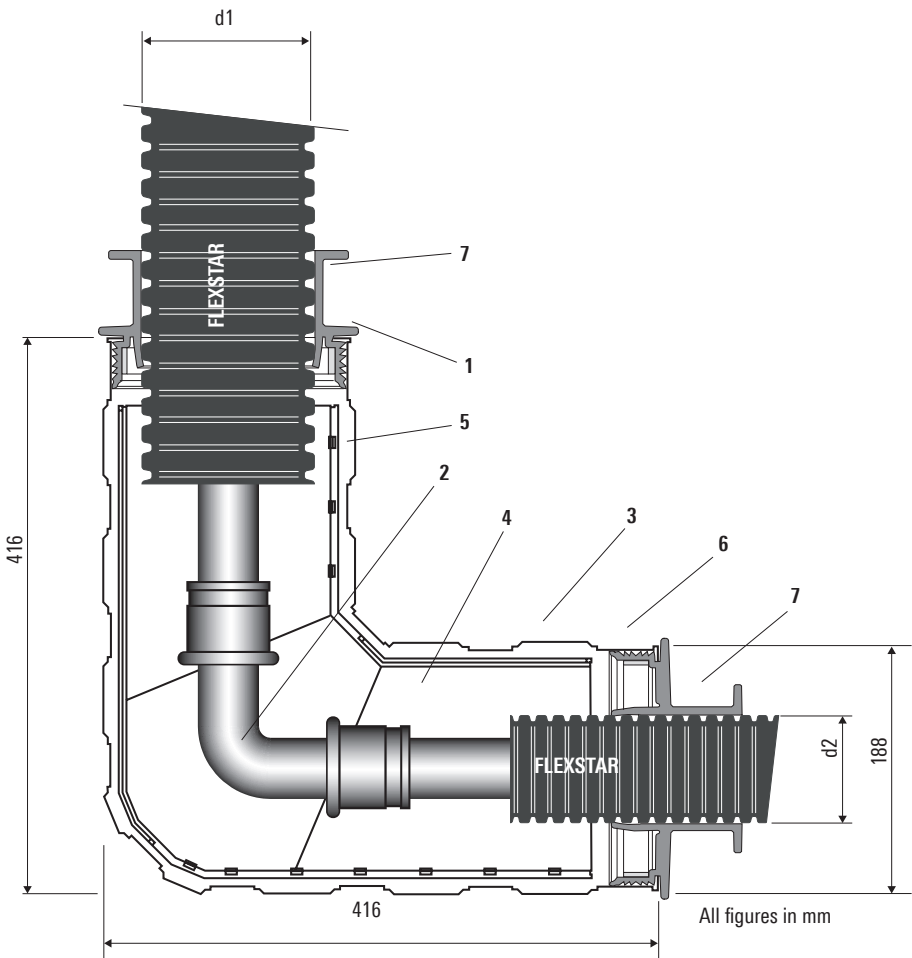
T_E = average ground temperature [°C]

F = flow

R = return

L-shell

Dimensions: Ø 70–125 mm



CALPEX L-shell, UNO/DUO

Outer casing Ø d1	Ø d2			
	70	90	105	125
70	F			
90		C		
105			F	
125				C

F = FXS sealing ring
C = CPX sealing ring

Structure of the half-shells

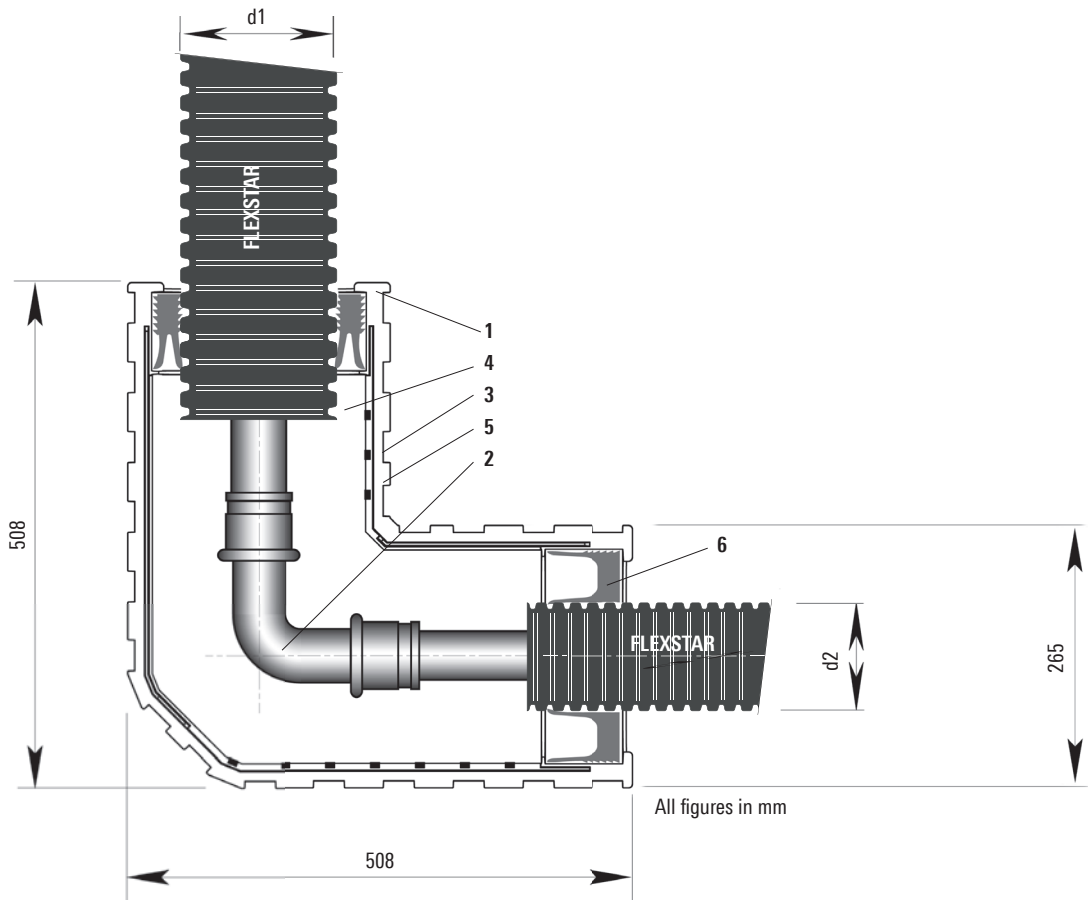
- 1 ABS half-shells
- 2 PEX angled coupling; see FXS 0.390
- 3 Locking clips (15 pcs.)
- 4 Insulating material; see FXS 0.365
- 5 Adhesive surfaces
- 6 Reducer ring or sealing ring
- 7 Hose clips

CALPEX shells must be installed so that they are protected from solar radiation if possible.

Can be combined with CALPEX L-shell sealing rings

Big L-shell

Dimensions: Ø 70–150 mm



CALPEX Big L-shell, UNO/DUO

Outer casing Ø d1	Ø d2				
	70	90	105	125	150
70	F				
90		F			
105			F		
125				F	
150					F

F = FXS sealing ring

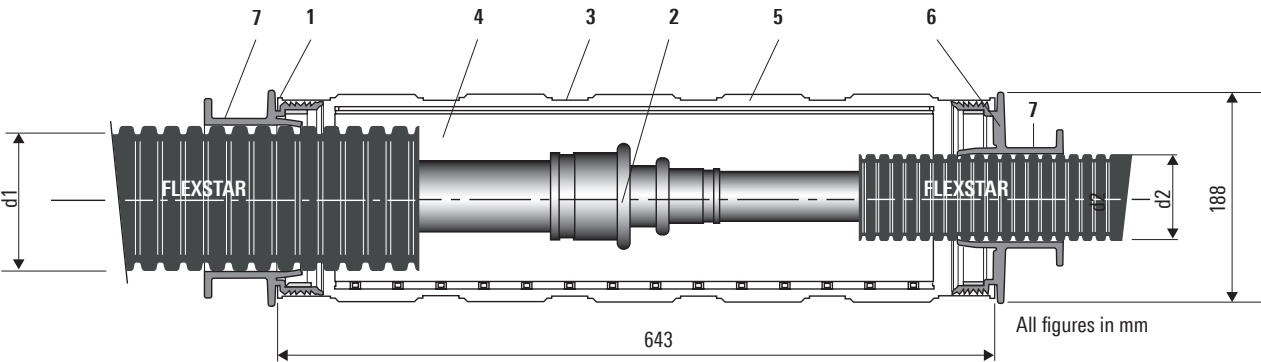
Structure of the half-shells

- 1 ABS half-shells
- 2 PEX angled coupling; see FXS 0.390
- 3 Locking clips (22 pcs.)
- 4 Insulating material; see FXS 0.365
- 5 Adhesive surfaces
- 6 Reducer ring or sealing ring

CALPEX shells must be installed so that they are protected from solar radiation if possible.

I-shell

Dimensions: Ø 70–125 mm



CALPEX I-shell, UNO/DUO

Outer casing Ø d1	Ø d2			
	70	90	105	125
70	F			
90		C		
105			F	
125				C

F = FXS sealing ring

C = CPX sealing ring

Structure of the half-shells

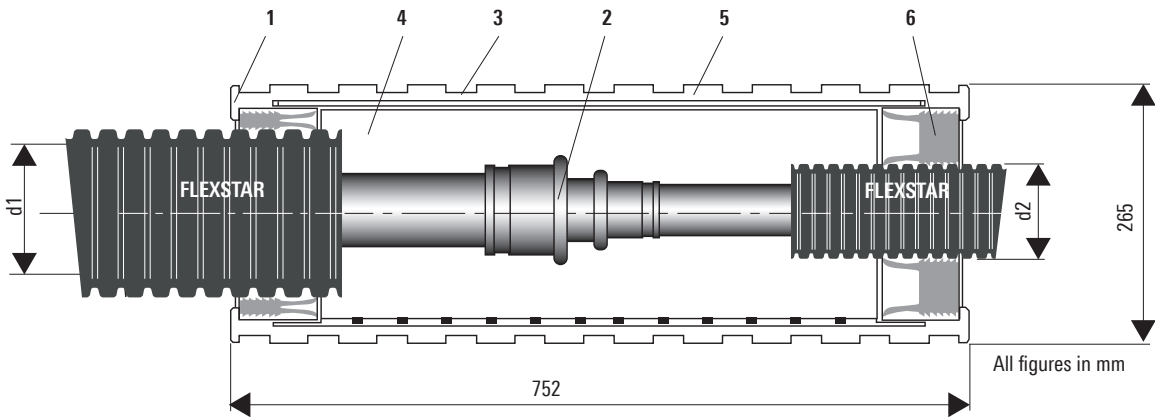
- 1 ABS half-shells
- 2 PEX angled coupling; see FXS 0.390
- 3 Locking clips (14 pcs.)
- 4 Insulating material; see FXS 0.365
- 5 Adhesive surfaces
- 6 Reducer ring or sealing ring
- 7 Hose clips

CALPEX shells must be installed so that they are protected from solar radiation if possible.

Can be combined with CALPEX I-shell sealing rings

Big I-shell

Dimensions: Ø 70–150 mm



CALPEX Big I-shell, UNO/DUO/QUADRIGA

Outer casing Ø d1	Ø d2				
	70	90	105	125	150
70	F				
90	F	F			
105	F	F	F		
125	F	F	F	F	
150	F	F	F	F	F

F = FXS sealing ring

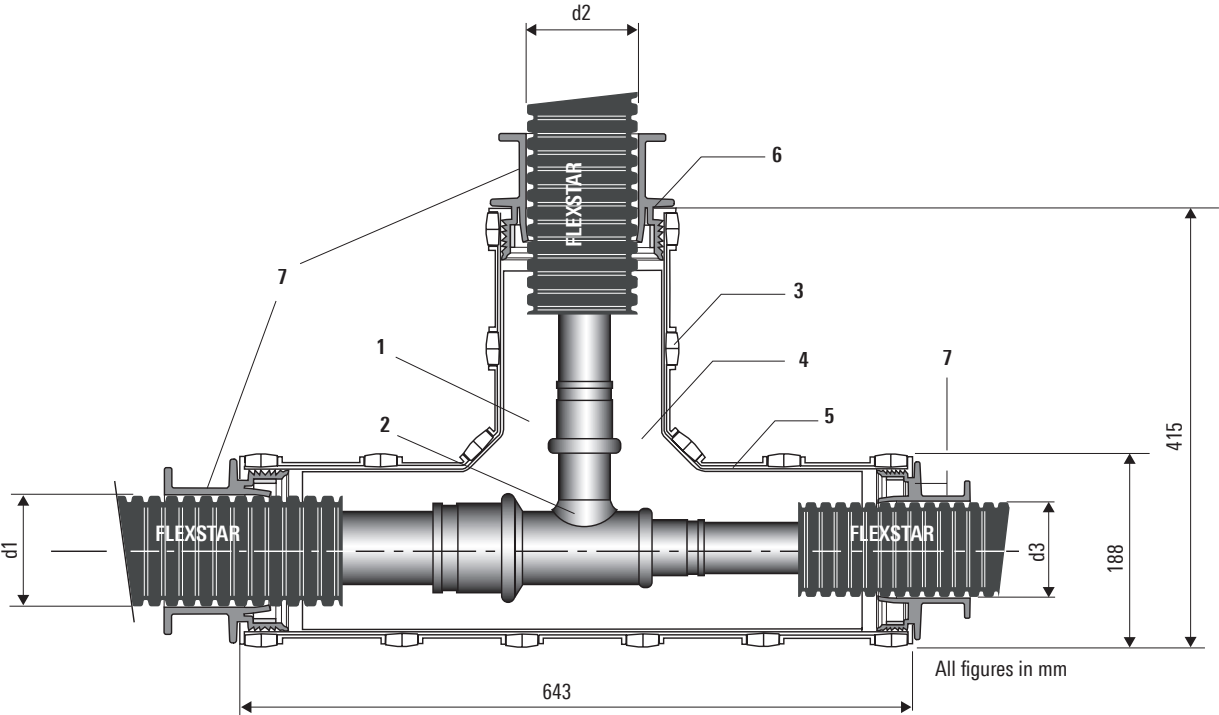
Structure of the half-shells

- 1 ABS half-shells
- 2 PEX angled coupling; see FXS 0.390
- 3 Locking clips (22 pcs.)
- 4 Insulating material; see FXS 0.365
- 5 Adhesive surfaces
- 6 Reducer ring or sealing ring

CALPEX shells must be installed so that they are protected from solar radiation if possible.

T-shell

Dimensions: Ø 70–125 mm



CALPEX T-shell, UNO/DUO

Outer casing Ø d1–Ø d3	Branch, Ø d2			
	70	90	105	125
70	F			
90		C		
105			F	
125				C

F = FXS sealing ring

C = CPX sealing ring

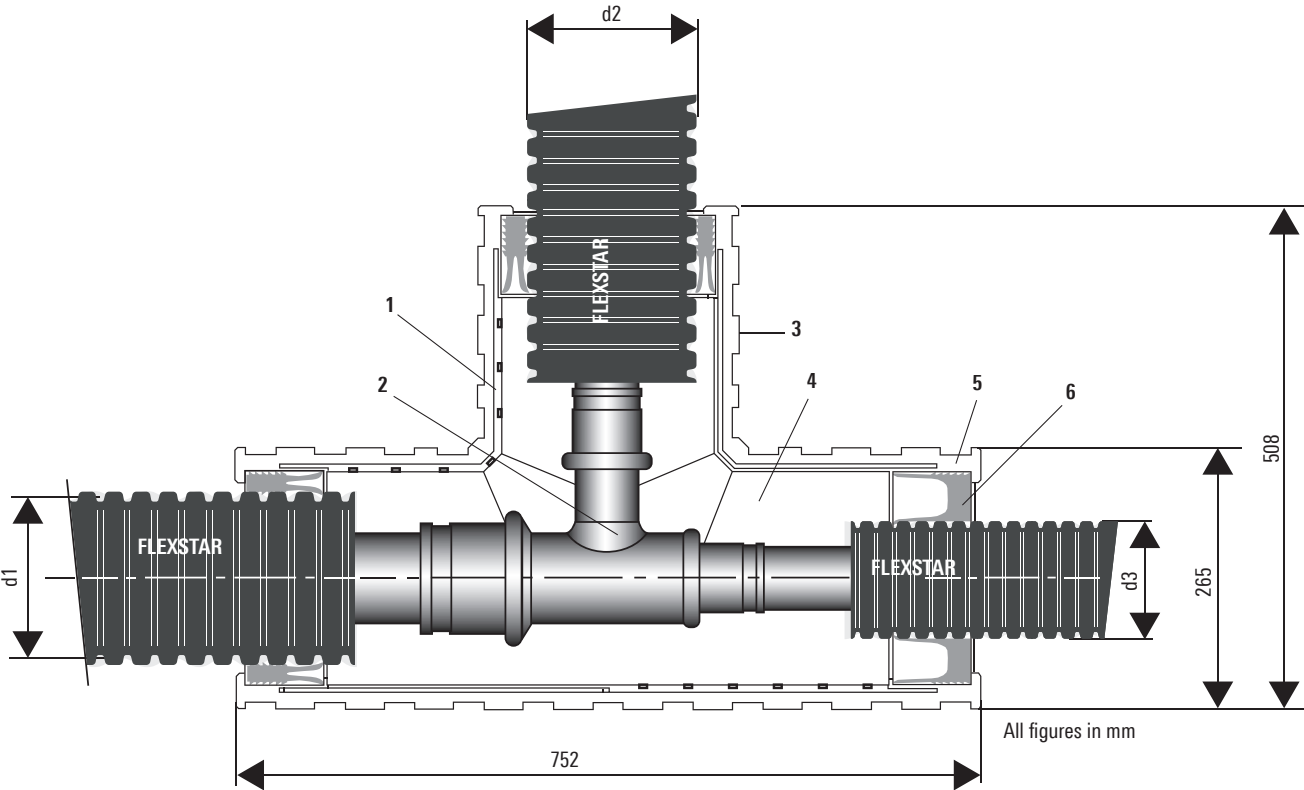
Structure of the half-shells

- 1 ABS half-shells
- 2 PEX T-piece; see FXS 0.395
- 3 Locking clips (20 pcs.)
- 4 Insulating material; see FXS 0.365
- 5 Adhesive surfaces
- 6 Reducer ring or sealing ring
- 7 Hose clips

CALPEX shells must be installed so that they are protected from solar radiation if possible.

Big T-shell

Dimensions: Ø 70–150 mm



CALPEX Big T-shell, UNO/DUO

Outer casing Ø d1	Ø d2				
	70	90	105	125	150
70	x				
90	x	x			
105	x	x	x		
125	x	x	x	x	
150	x	x	x	x	x

F = FXS sealing ring

Structure of the half-shells

- 1 ABS half-shells
- 2 PEX T-piece; see FXS 0.395
- 3 Locking clips (27 pcs.)
- 4 Insulating material; see FXS 0.365
- 5 Adhesive surfaces
- 6 Reducer ring or sealing ring

CALPEX shells must be installed so that they are protected from solar radiation if possible.

Insulating material

PUR foam container (CPX 25/70–50 + 50/150)

Insulating material for shrink-on sleeves and the FLEXSTAR shells

PUR foam container (FXS 25/70–50 + 50/150)

CFC-free, CO₂-blown PUR foam in plastic bottles

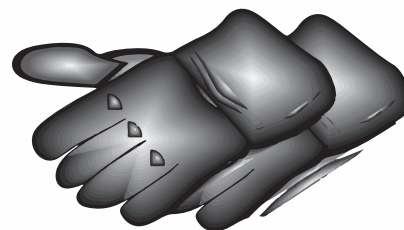
The required amount of PUR foam (CFC-free) is supplied in the appropriate container sizes for the various sleeves and T-pieces. The components are supplied in two separate bottles and are only mixed when used. Please note the safety regulations in the installation instructions provided.



Safety regulations

For foaming, eye protection and gloves must be used.

Plastic gloves



Eye protection



Screw connections

External thread, weld end

Connection with external thread



FLEXSTAR (heating, 6 bar)

Material: Brass

PEX pipe mm	Screw connection mm	L/L1 mm
25 x 2.3	25 x 2.3-3/4"	61/26
32 x 2.9	32 x 2.9-1"	68/29
40 x 3.7	40 x 3.7-1 1/4"	77/36
50 x 4.6	50 x 4.6-1 1/2"	79/36
63 x 5.7	63 x 5.7-2"	97/46

Connection with weld end



FLEXSTAR (heating, 6 bar)

Material: Steel

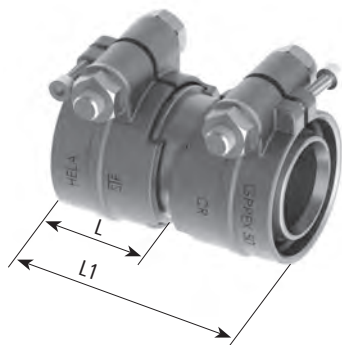
PEX pipe mm	Weld end mm	L/L1 mm
25 x 2.3	26.9 x 2.3	61/26
32 x 2.9	33.7 x 2.6	63/29
40 x 3.7	42.4 x 2.6	75/36
50 x 4.6	48.3 x 2.6	84/36
63 x 5.7	60.3 x 2.9	88/46

Connections with weld ends must be welded first and then crimped.

Screw connection

Coupling, any, elbow 90°

Coupling, any



FLEXSTAR (heating, 6 bar)

Material: Brass

PEX pipe mm	Coupling mm	L/L1 mm
25 x 2.3	25 x 2.3	68/26
32 x 2.9	32 x 2.9	75/29
40 x 3.7	40 x 3.7	90/36
50 x 4.6	50 x 4.6	90/36
63 x 5.7	63 x 5.7	110/46

Reduced couplings (soldered) can be supplied on request

Elbow 90°



FLEXSTAR (heating, 6 bar)

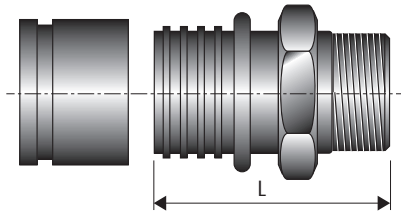
Material: Brass, soldered

PEX pipe mm	On PEX pipe mm
25 x 2.3	25 x 2.3
32 x 2.9	32 x 2.9
40 x 3.7	40 x 3.7
50 x 4.6	50 x 4.6
63 x 5.7	63 x 5.7

Press fittings

External thread, weld end

Connection with external thread

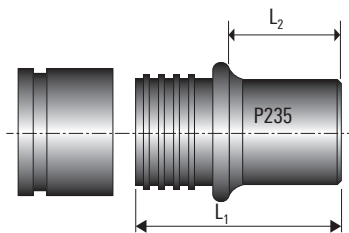


FLEXSTAR (heating, 6 bar)

Material: Brass

PEX pipe mm	Screw connection mm	L mm
25 x 2.3	25 x 2.3-3/4"	62
32 x 2.9	32 x 2.9-1"	72
40 x 3.7	40 x 3.7-1 1/4"	82
50 x 4.6	50 x 4.6-1 1/2"	89
63 x 5.8	63 x 5.7-2"	109

Connection with weld end



FLEXSTAR (heating, 6 bar)

Material: Steel (P235)

PEX pipe mm	Weld end mm	L1 mm	L2 mm
25 x 2.3	26.9 x 2.65	50	20
32 x 2.9	33.7 x 2.3	60	24
40 x 3.7	42.4 x 2.6	70	29
50 x 4.6	48.3 x 2.6	85	37
63 x 5.8	60.3 x 2.9	90	32

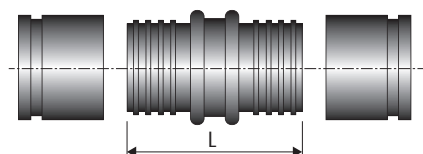
Connections with weld ends must be welded first and then crimped.

For pressing tools, see FXS 0.540

Press fittings

Coupling, any, reduced coupling, elbow 90°

Coupling

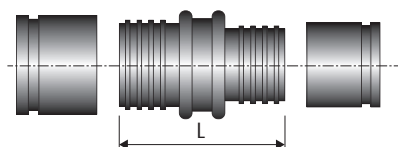


FLEXSTAR (heating, 6 bar)

Material: Brass

PEX pipe mm	Coupling mm	L mm
25 x 2.3	25 x 2.3	67.0
32 x 2.9	32 x 2.9	88.0
40 x 3.7	40 x 3.7	100.0
50 x 4.6	50 x 4.6	114.0
63 x 5.8	63 x 5.7	141.0

Coupling, reduced

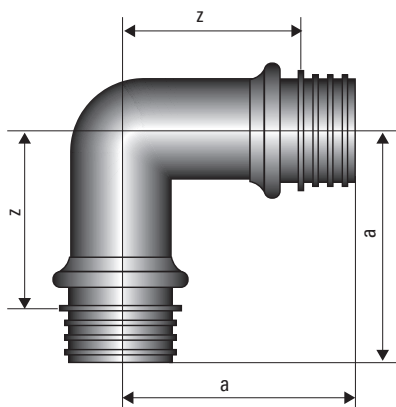


FLEXSTAR (heating, 6 bar)

Material: Brass/steel* (P235)

PEX pipe mm	Coupling mm	L mm
32 x 2.9	25 x 2.3	80.0
40 x 3.7	32 x 2.9	100.0
50 x 4.6	40 x 3.7	108.0
63 x 5.8	50 x 4.6	129.0

Elbow 90°



FLEXSTAR (heating, 6 bar)

Material: Brass/steel* (P235)

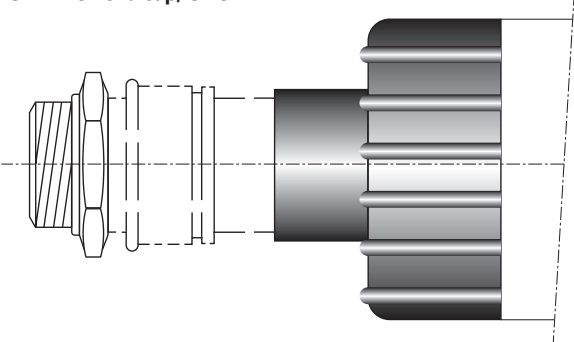
PEX pipe mm	PEX pipe mm	a mm	z mm
25 x 2.3	25 x 2.3	54	32
32 x 2.9	32 x 2.9	64	37
40 x 3.7	40 x 3.7	74	42
50 x 4.6	50 x 4.6	87	48
63 x 5.8	63 x 5.8	106	60

For pressing tools, see FXS 0.540

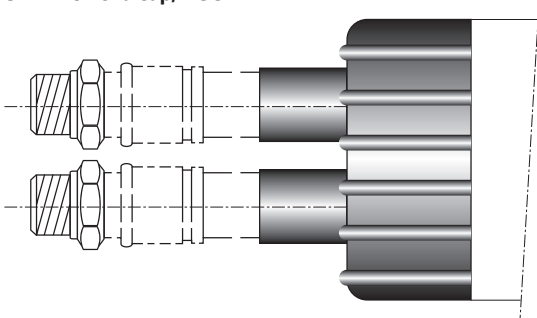
End cap

Standard, shrinkable

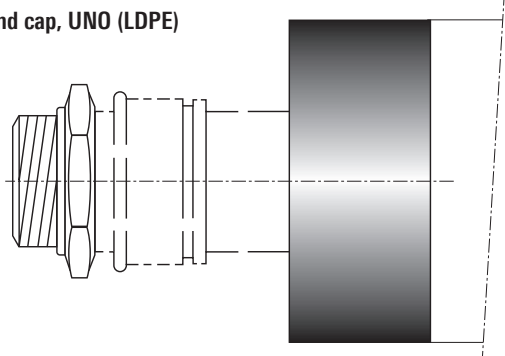
Shrink-on end cap, UNO



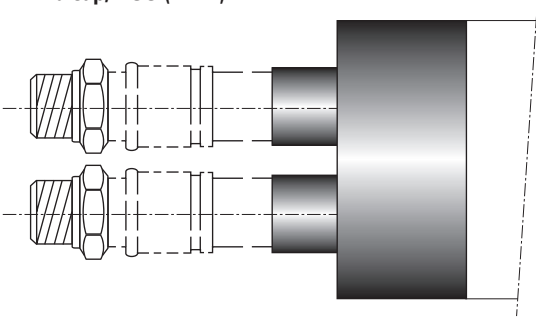
Shrink-on end cap, DUO



End cap, UNO (LDPE)



End cap, DUO (LDPE)



FLEXSTAR UNO

Type
25/70
32/70
40/90
50/90
63/105

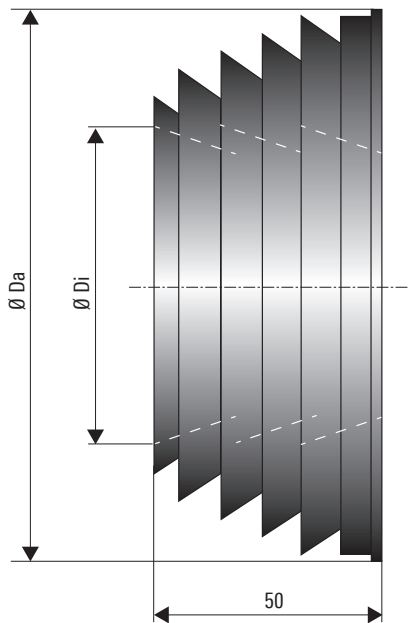
FLEXSTAR DUO

Type
25 + 25/90
32 + 32/105
40 + 40/125
50 + 50/150

LDPE end caps are used;
suitable for dry rooms

Wall sealing insert

for wall openings



All figures in mm

FLEXSTAR UNO, DUO

Outer casing diameter	Labyrinth wall sealing ring	
mm	$\varnothing Di$, inner mm	$\varnothing Da$, outer mm
70	74	118
90	88	133
105	107	153
125	122	168
150	137	183

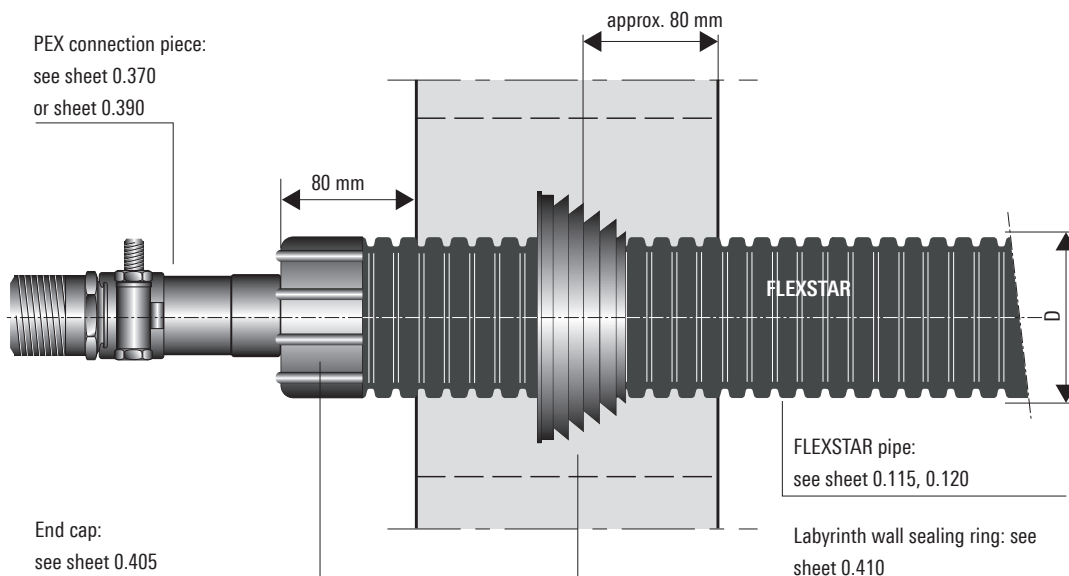
Building entry (see sheet FXS 0.415)

Building entry

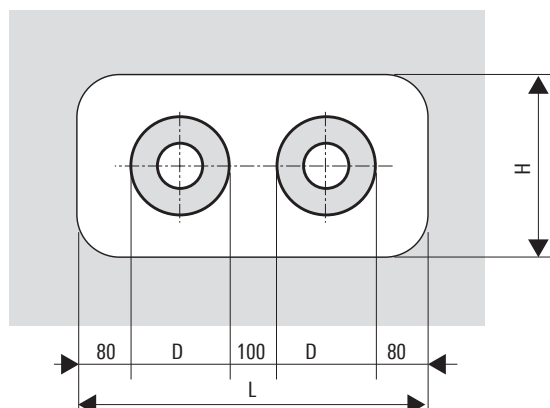
Wall opening

Wall sealing insert

PEX connection piece:
see sheet 0.370
or sheet 0.390



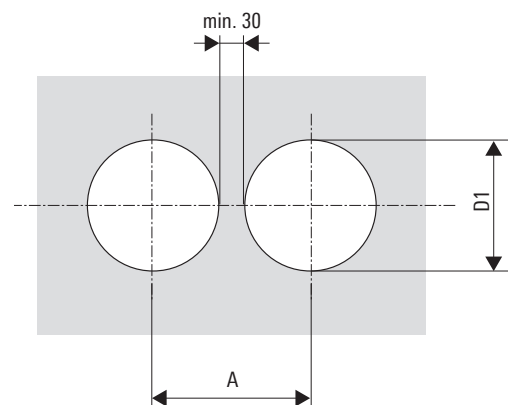
Wall opening



All figures in mm

Outer casing Ø D	L min.	H min.
mm	mm	mm
78	450	250
93	500	250
113	500	300
128	550	300
143	600	350
163	650	350
183	670	380
202	720	400
225	740	400
250	810	450

Core drillings



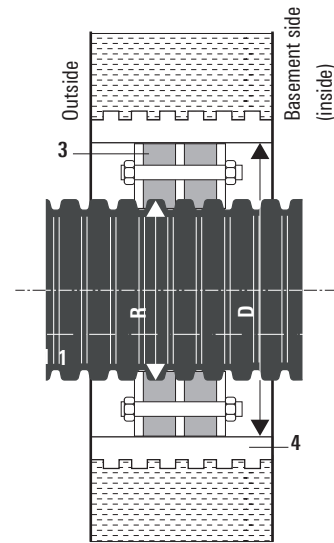
All figures in mm

Outer casing Ø D	A	D1
mm	mm	mm
78	210	180
93	230	180
113	250	220
128	270	230
143	290	230
163	310	280
183	330	280
202	400	350
225	400	350
250	420	380

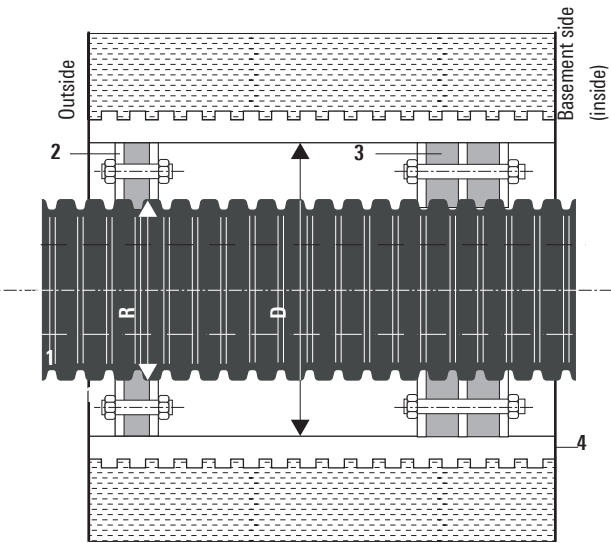
Wall sealing insert

Core drillings/cement casing pipes

Standard



With additional centring ring



- 1 FLEXSTAR heat-pump pipe
- 2 Sealing insert, single-seal with wall thickness > 30 cm/not suitable against pressing water
1 x 40 mm, Shore hardness D 35
- 3 Sealing insert, double-seal/suitable against pressing water (up to 0.5 bar)
2 x 40 mm, Shore hardness D 35
- 4 Casing pipe made of fibre cement or coated core drilling

Core drillings

The holes must be faultless for installation. As there may be hairline cracks in the concrete or these may appear as a result of the processing work, we recommend sealing the entire wall of the drill hole with a suitable sealant (e.g. AQUAGARD).

Adhering to this recommendation is the only way to ensure leak-tightness.

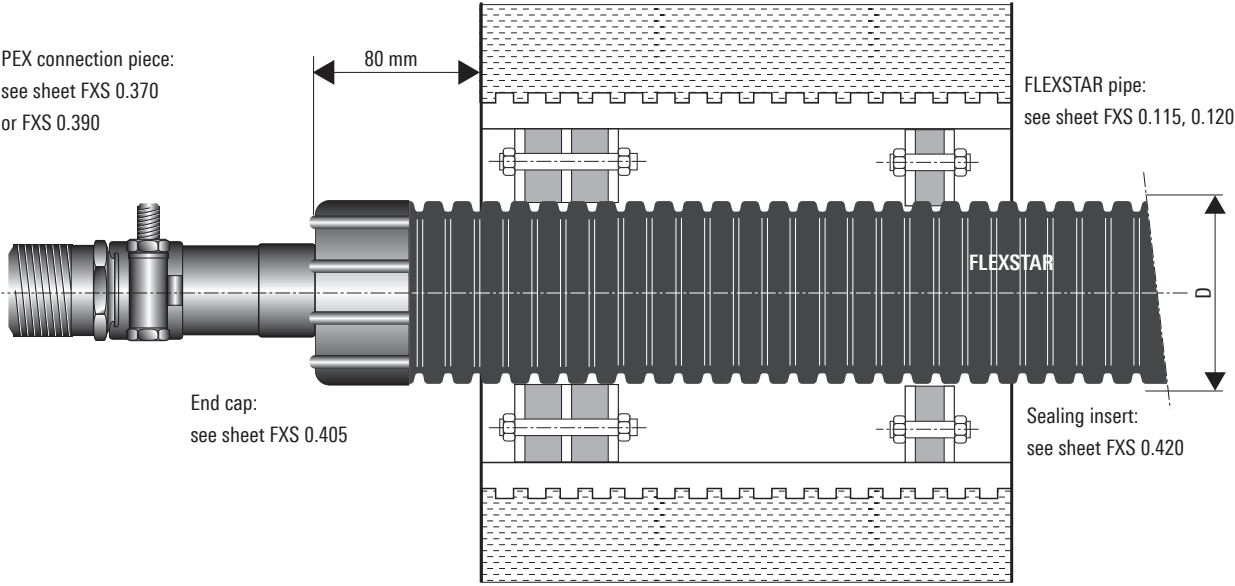
Outer pipe Ø R mm	Casing pipe Ø D mm	Sealing insert Ø inner mm	Core drilling Ø mm
70	150	78–85	150
90	150	86–94	150
105	200	105–115	200
125	200	125–135	200
150	200	137–145	200

Building entry (see sheet FXS 1.425)

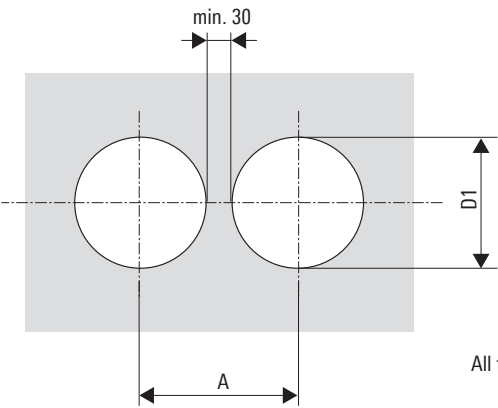
Building entry

Core drillings/cement casing pipes

Wall sealing insert



Core drillings

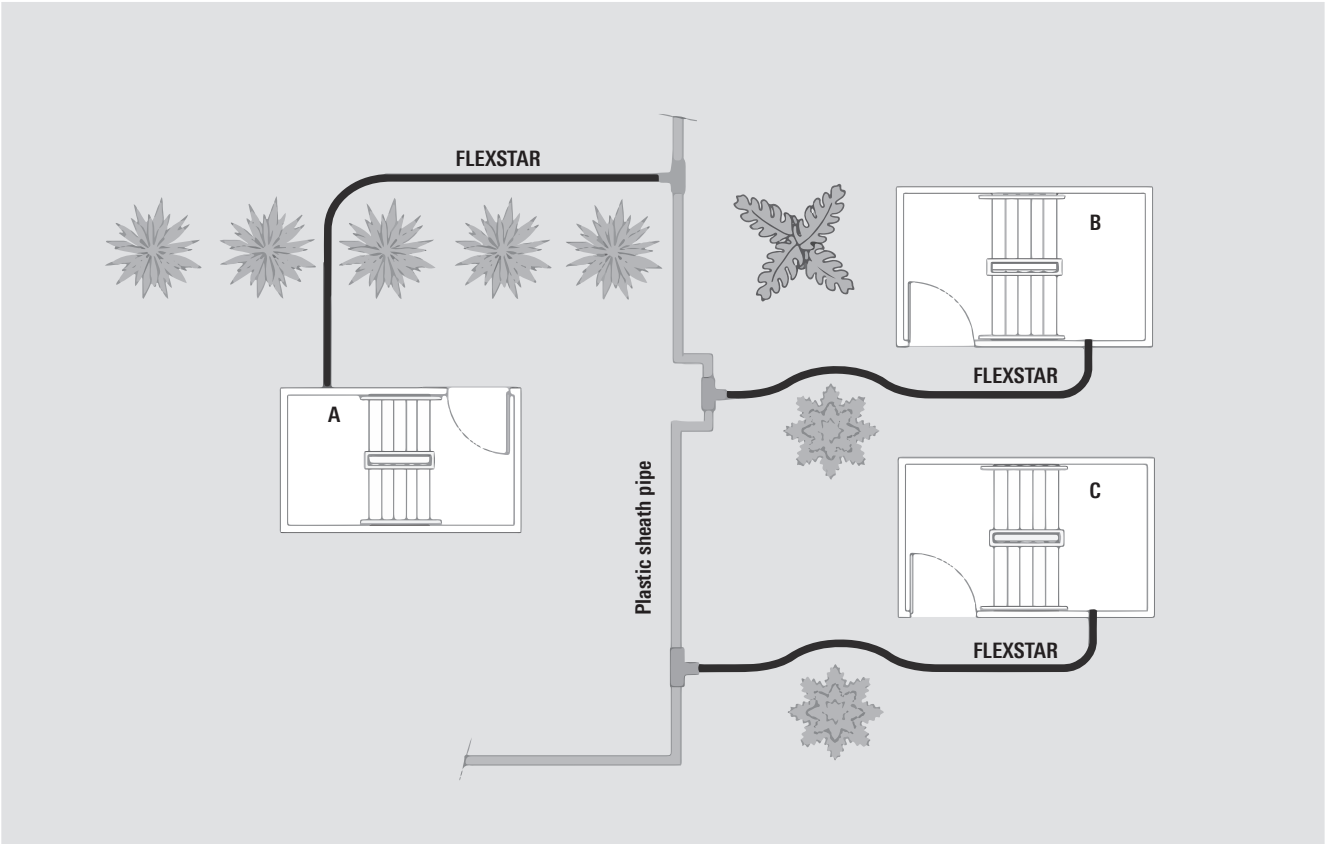


All figures in mm

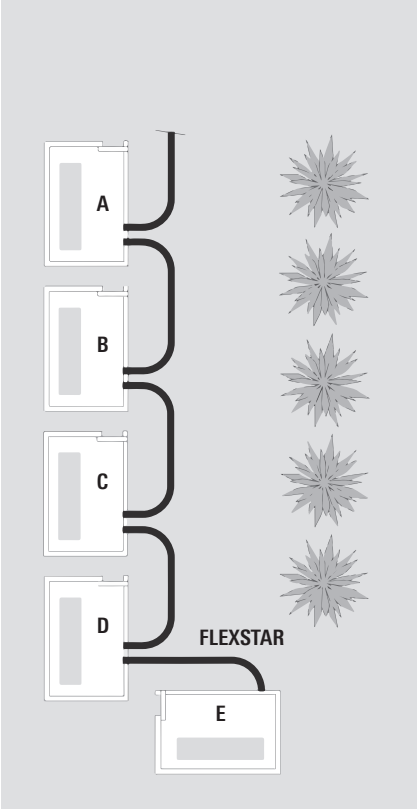
Outer casing Ø D	A	D1
mm	mm	mm
71.5	180	150
90.0	180	150
106.5	230	200
126.5	230	200
151.5	230	200

Route

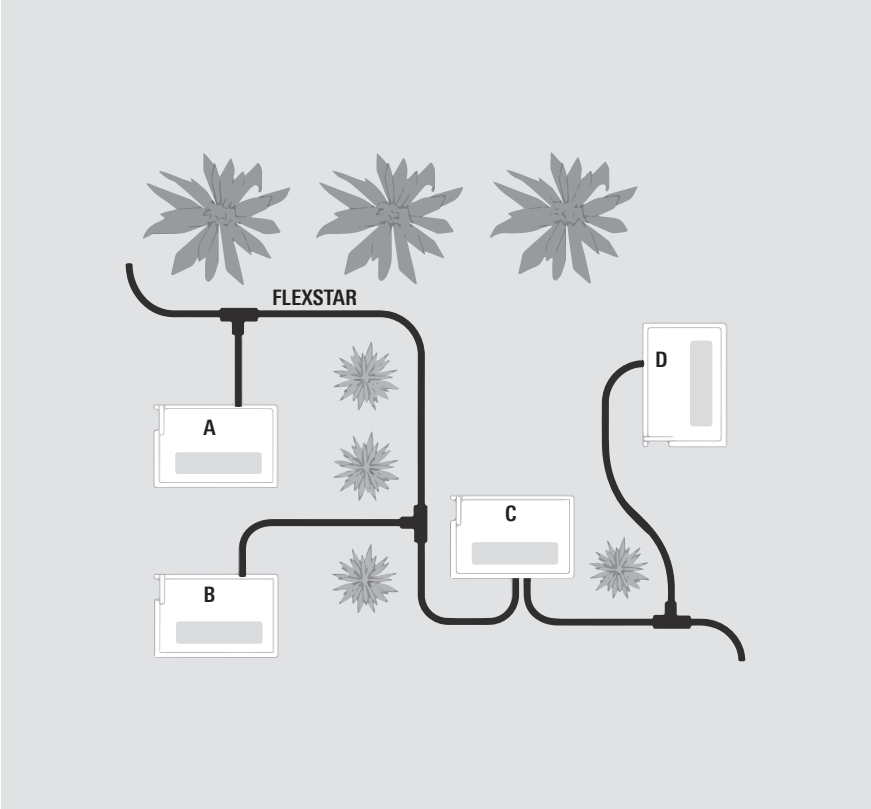
Connection between FLEXSTAR and plastic sheath pipe



Loop-in method

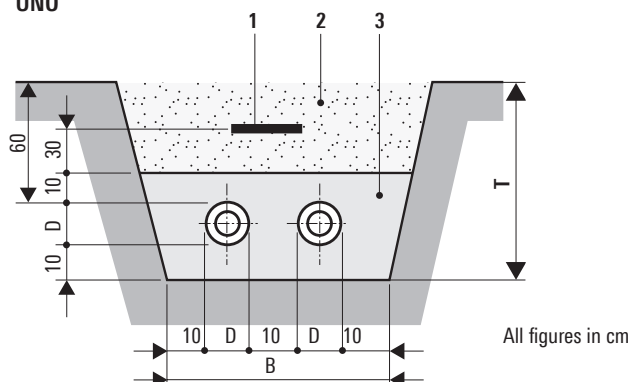


Connection between FLEXSTAR and FLEXSTAR



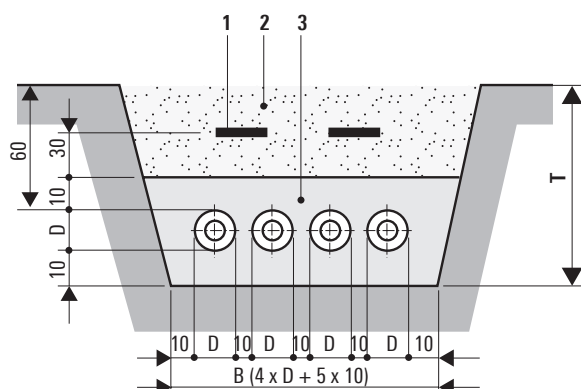
Trench profile, 2 FLEXSTAR pipes

UNO



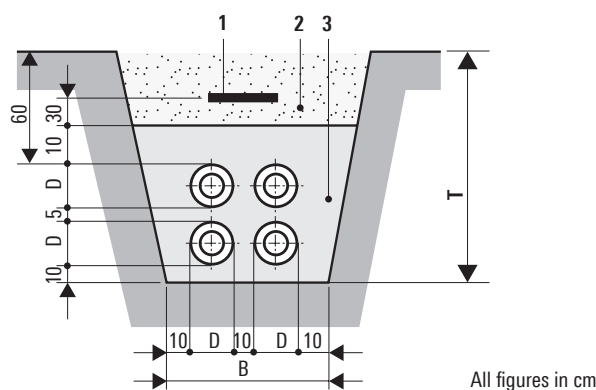
Sheath pipe Ø D mm	Width B cm	Depth T cm	Minimum bending radius m
71.5	45	80	0.30
90.0	50	80	0.30
106.5	55	85	0.30
126.5	55	85	0.35
151.5	65	90	0.40

Trench profile, 4 FLEXSTAR pipes



- 1 Pipe warning tape; see sheet FXS 1.430
2 Excavated material
3 Fill material in line with description below

Laying depth:
Max. laying depth: 2.6 m
Our approval is required for deeper installations



SLW 30 $\hat{=}$ 300 kN total load according to DIN 1072; if subject to higher traffic loads (e.g. SLW 60), a load-distributing superstructure according to RSt075 is required.

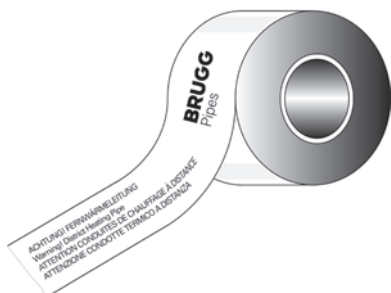
With no traffic load, the minimum trench depth **T** can be reduced by 20 cm.

The fill material in the embedment must comply with EN 13941-2 and satisfy the following minimum requirements:

- Friable, round-edged sand-gravel mixture
- Permissible grain size: 0–8 mm
- Coefficient of uniformity according to DIN EN ISO 14688-2 greater than 1.8
- Max. 10 percent by mass ≤ 0.075 mm
- Max. 3 percent by mass ≤ 0.02 mm
- Proctor density min. 94 %; ideal 97–98 %

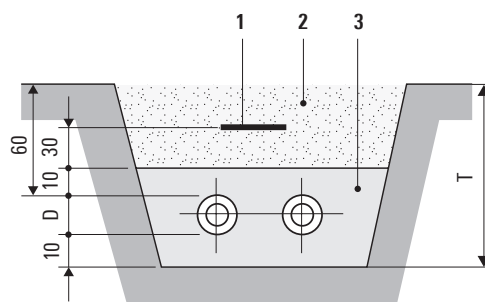
Pipe warning tape

BRUGG Pipes pipe warning tape



Pipe warning tape for laying in the ground.
Roll length 250 m

FLEXSTAR trench structure



- 1 Pipe warning tape
- 2 Excavated material
- 3 Sand, washed

For the laying depth, see sheet FXS 0.505

Laying aids

With the FLEXSTAR unwinding device and a motorised winch, you can unroll pipes quickly and with minimal effort before laying them in the ground.

Unwinding device



Dimensions: Ø 400 x 157 cm
Load-bearing capacity: 1000 kg

Motorised winch



Our recommendation:
<https://www.portablewinch.com>

Squeezing tools

for shutting of PE and PEX pipe provisionally



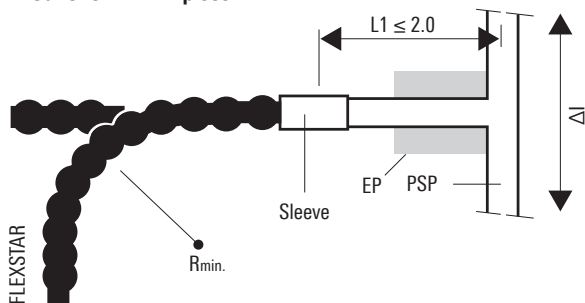
Squeezing tool Ø 32–63 mm (SDR11)

Connection (rigid/flexible)

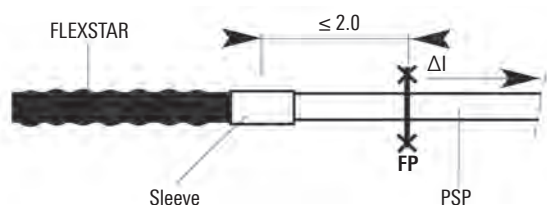
FLEXSTAR to plastic sheath pipe

Laying instructions for the transition from FLEXSTAR to plastic sheath pipe (PSP)

1. Junction with T-piece



2. Transition with fixed point

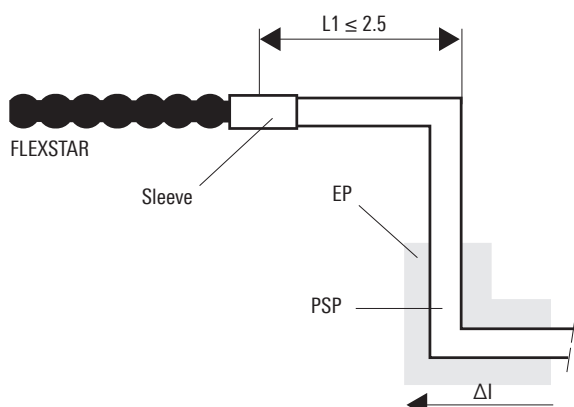


All figures in m

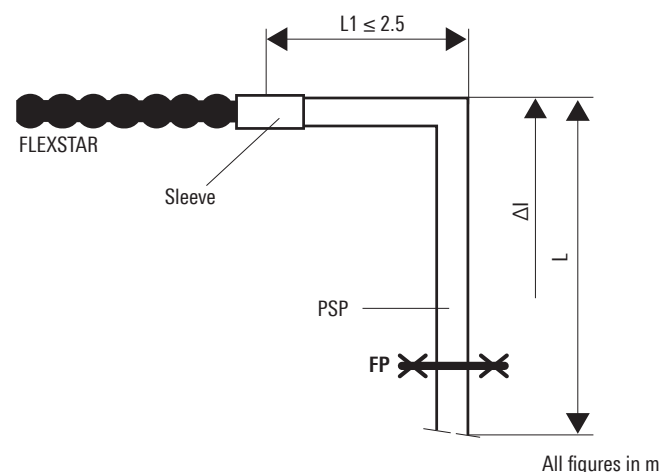
The lateral strain Δl must not exceed the expansion that can be accommodated by junction $L1$ and the FLEXSTAR pipe.

The FLEXSTAR pipes cannot compensate for the expansion Δl of the PSP (due to the increase in temperature). A fixed point must be installed.

3. Transition with Z-bend



4. Transition with expansion bend



All figures in m

Static design of the Z-bend according to expansion variable Δl .

Δl = expansion

FP = PSP fixed point

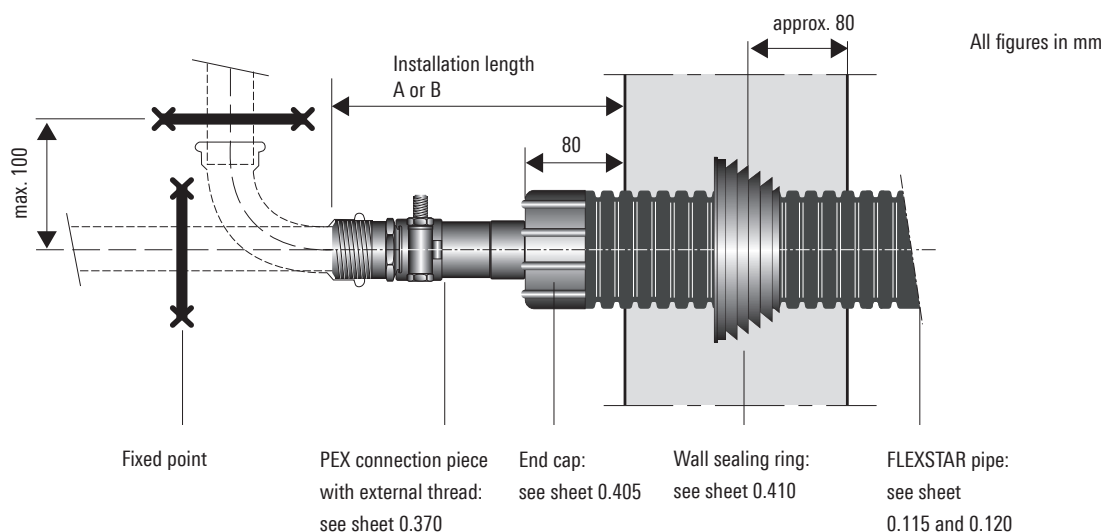
EP = expansion pad

If the pipe length L or Δl is greater than permissible for $L1$, a fixed point must be installed.

- Design of the expansion components
- Positioning of the expansion pads as per the section on PREMANT

Building connection – screw connection/press fitting

Shaft entry



Screw connector



Type A



Type B

FLEXSTAR		
Heating, 6 bar	Installation lengths	
PEX pipe	A	B
mm	mm	mm
25 x 2.3	190	190
32 x 2.9	195	190
40 x 3.7	200	200
50 x 4.6	205	210
63 x 5.8	225	215

Press fitting



Type A



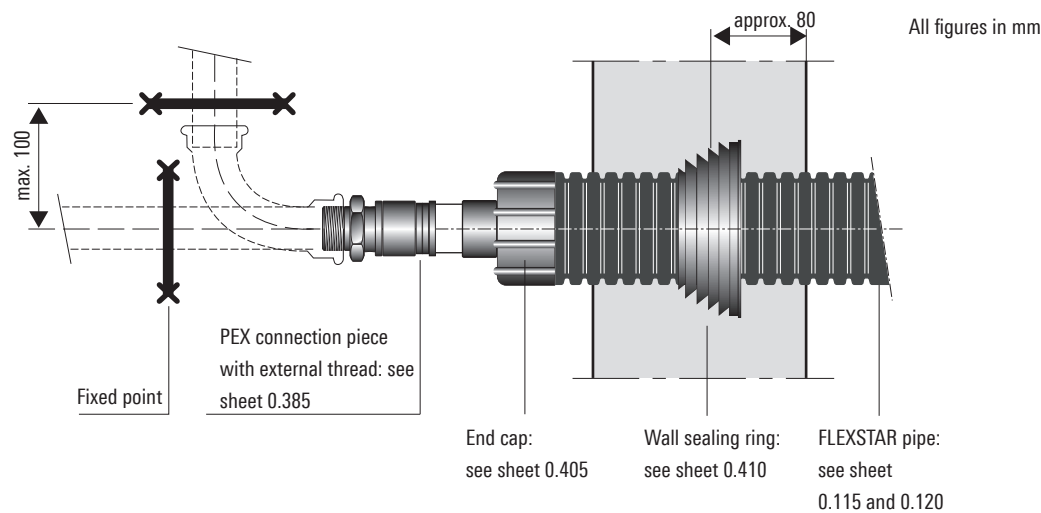
Type B

FLEXSTAR		
Heating, 6 bar	Installation lengths	
PEX pipe	A	B
mm	mm	mm
25 x 2.3	260	250
32 x 2.9	260	250
40 x 3.7	270	260
50 x 4.6	270	270
63 x 5.8	320	310

Building connection – press fitting

Fixed-point forces

Connection with external thread



Acting fixed-point forces
FLEXSTAR (heating, 6 bar)

Maximum acting fixed-point forces per pipe at:		
Op. temp. = 60 °C, op. pres. = 6 bar		Op. temp. = 90 °C, op. pres. = 6 bar
Type	Fmax [N]	Fmax [N]
25/70	640	924
32/70	1036	1493
40/90	1639	2367
50/90	2553	3686
63/105	4013	5782

Fixed points



Building connection installation



1 Mark the sheath the distance (x, y, z) + 1 cm from the end of the pipe.



2 Cut through the sheath with a saw.



3 Cut the sheath open lengthways. Do not insert the blade more than 5 mm deep.
Caution: Do not damage the medium pipe.



4 Peel off the sheath.



5 Cut back/remove the insulation along the length (x, y, z).
Caution: Do not damage the medium pipe.



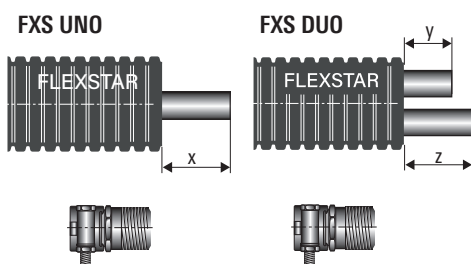
6 Install the wall sealing ring.



7 Carefully shrink the pipe end cap in line with the enclosed Raychem DHEC installation instructions.



8 Install the fitting in line with the enclosed installation instructions.

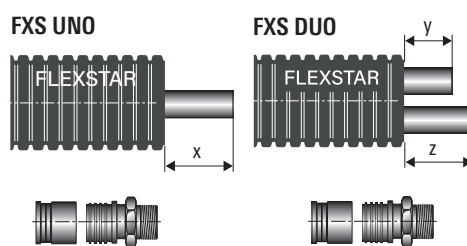


FXS UNO

Building connection:

Ø 20–75: X = 90 mm

Ø 90–110: X = 110 mm



FXS UNO

Building connection:

Ø 20–50: X = 140 mm

Ø 63–125: X = 180 mm

Shrink-on sleeves:

Ø 20–50: X = 110 mm

Ø 63–110: X = 140 mm

Ø 125–160: X = 150 mm

FXS DUO

Building connection:

Ø 20–50: Y, Z = 140 mm

Ø 63–75: Y, Z = 160 mm

Shrink-on sleeves:

Ø 20–50: Y, Z = 110 mm

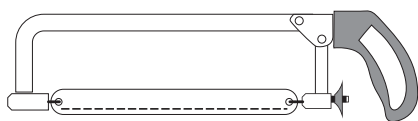
Ø 63–75: Y, Z = 140 mm

Caution: Install the CPX clip shells in line with the enclosed installation instructions.

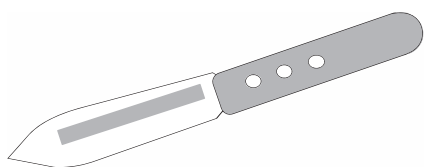
Installation tool

General and for screw connection

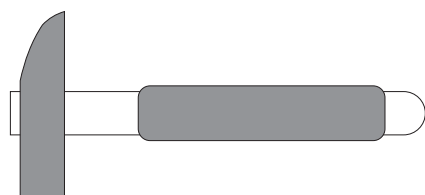
Cutting to length and removing insulation



The saw is used for cutting the sheath pipe and the insulation

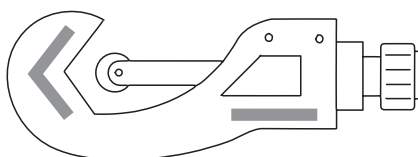


Blade for removing the insulation

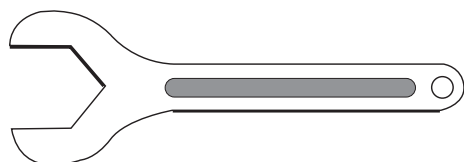


Hammer as an auxiliary tool

Cutting to length and removing insulation

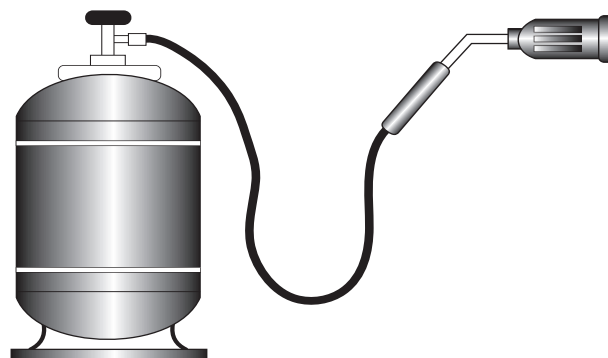


Pipe cutter for PEX pipe



Spanner

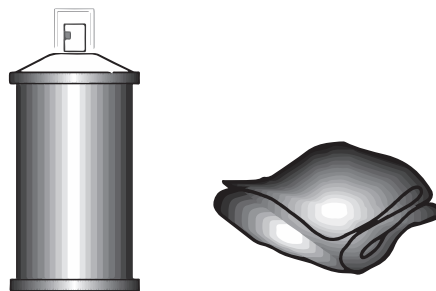
Shrinking



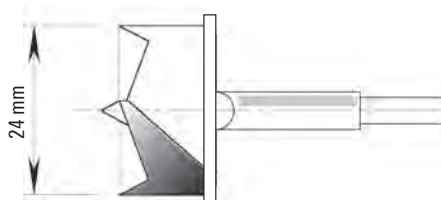
The gas burner is used to shrink hoses and sleeves



We recommend wearing gloves for shrinking work



Cleaning agents and cloths



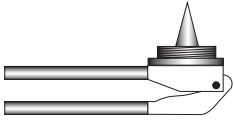
Knothole drill for foam filling hole in sleeves

Caution: Use drill with stop to avoid damage to the medium pipe.

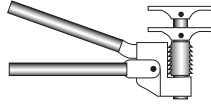
Installation tool

For connection to sliding sleeves

Manual tool for PEX Ø 20–40 mm (1 case)



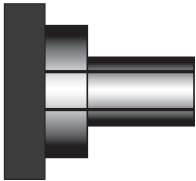
Expanding tool up to Ø 32 mm
(basic tool)



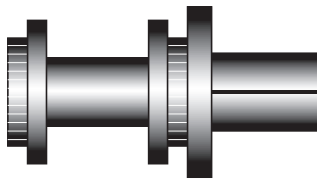
Crimping tool up to Ø 40 mm
Expanding tool for Ø 40 mm
(basic tool)



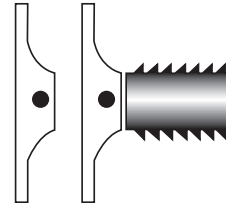
1 case with basic tool
incl. expander heads and yoke



Expander head up to Ø 32 mm

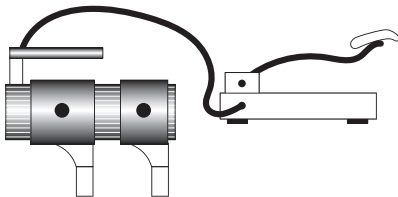


Expander head from Ø 40 mm

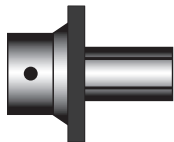


Press yoke Ø 20–40 mm

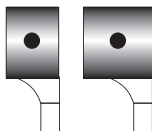
Hydraulic tool for PEX Ø 50–110 mm (2 cases)



Hydraulic tool for crimping and expanding
Ø 50–110 mm including foot pump (basic tool)



Expander head
Ø 50–110 mm



Press yoke
Ø 50, 63 mm



Case with basic tool
(without expander heads and yoke)



Case with expander heads
and press yoke