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System description

1. General

FLEXSTAR is the trademarked name for the most flexible pipe system from BRUGG Pipes, which is manufactured specially for low-temperature and heat pump applications in accordance with the current standard EN 15632-1/-2.

FLEXSTAR is ideal for use as a heat pump line and in small local heating networks.

The carrier pipes of the FLEXSTAR pipe system are made of cross-linked polyethylene PEXa and are equipped with an organic oxygen diffusion barrier (EVOH).
The material was selected due to its outstanding thermal and mechanical properties.
In addition, the carrier pipe features high corrosion and chemical resistance.
It is also easy to process by hand and fulfils the applicable standards.

FLEXSTAR uses innovative thermal insulation based on the patented elastic polyurethane foam. This foam not only has excellent thermal insulation properties, but also perfectly encases the carrier pipes during the manufacturing process.

FLEXSTAR uses innovative thermal insulation based on the patented elastic polyurethane foam. This foam not only has excellent thermal insulation properties, but also perfectly encases the carrier pipes during the manufacturing process.
The result is extremely stable adhesion and a force-locking bond that is an optimal complement to the physical properties of the PEXa carrier pipe.
This means that FLEXSTAR can be installed without fear of thermal expansion.

Thanks to it exceptional bending capabilities, FLEXSTAR can be easily adapted to any house or heat pump inlet, making it easy to bypass obstacles without incurring additional costs.

FLEXSTAR solutions are available in different configurations. They can either be delivered as sets or transported to the construction site in the desired length in endless rings or on a drum. The option of longer delivery lengths in particular allows for laying without joints in the ground, which means the required pipe trench can be considerably narrower. This leads to substantial savings in civil engineering work, especially for DUO lines.

The FLEXSTAR systems are not only technically perfect, but also significantly optimize processes on the construction site thanks to their extremely short installation time. This makes them the key to creating heat pump or local heating connections that save both time and money.
Installing the connection pieces is very simple. Whether with conventional screw connections or press fittings, installation of the connections is quick and safe.
Our extensive range of accessories also guarantees solutions for any conceivable situation.
Additional accessories such as wall seals with cable glands or EPDM end caps round out and complement our product range to even better cover your needs.

2. Application area

Heating, pipe series 5 (SDR 11):
Max. operating temp. T_{max}: 95 °C (fluctuating)
Max. operating pressure p: 6 bar

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), 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 ≤ 0.10 g / (m^3 x d) according to DIN 4726
DIN 16893 pipe rows	Series 5 (SDR 11)
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	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 · 10 E-4 1/K	DIN 52328
Linear thermal expansion coefficient	100	2.0 · 10 E-4 1/K	–

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	≤ 0.024 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

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)

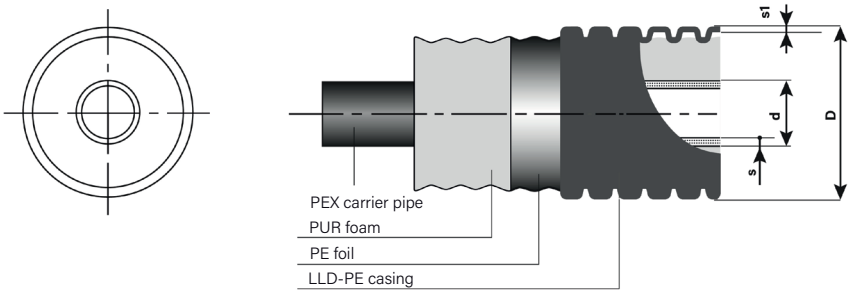
1 year = 365 days = 8760 hours.

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 heating, 6 bar, UNO

Type	PEX inner pipe d x s	Nominal diameter DN	Nominal diameter Inches	Outer casing D x s1	Minimum winding radius	Volume of inner pipe	Weight	Maximum delivery length
		mm	“	mm	m	l/m	kg/m	m
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

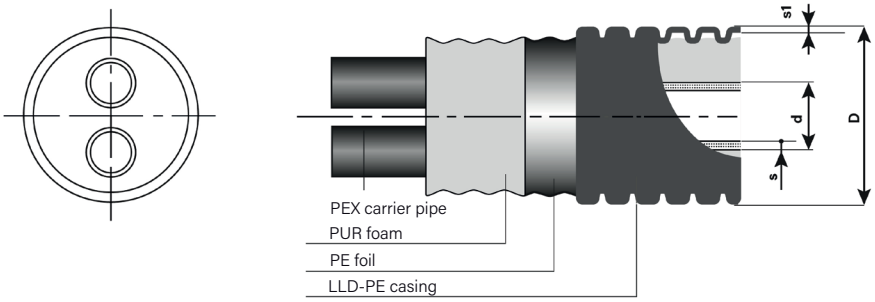
* carrier pipe PEXc

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 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)

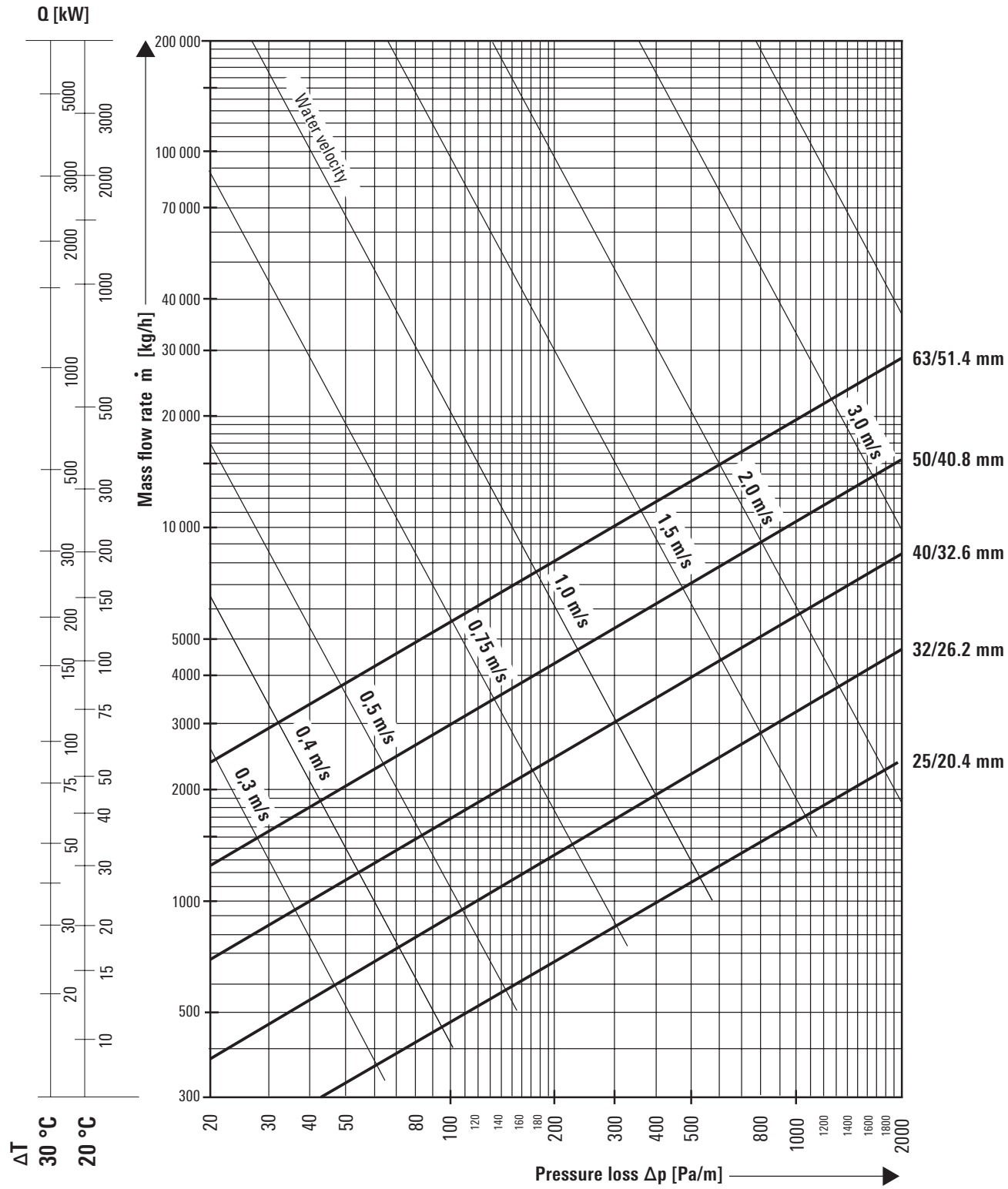
Pressure loss diagram

FLEXSTAR (heating, 6 bar)

Water temperature 80 °C
Surface roughness ε = 0.007 mm (PEX)
(1 mmWS = 9.81 Pa)

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

ṁ =	flow in kg/h
Q =	power requirement in kW
ΔT =	temperature difference Flow/return in °C



BRUGG Pipes

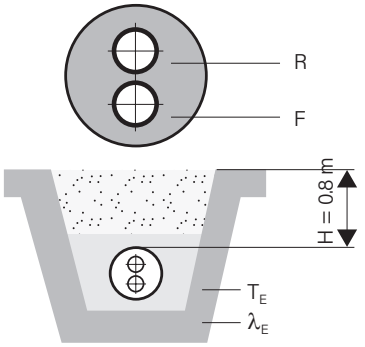
Heat loss

FLEXSTAR (heating, 6 bar)

FLEXSTAR DUO (flow and return in one pipe)

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

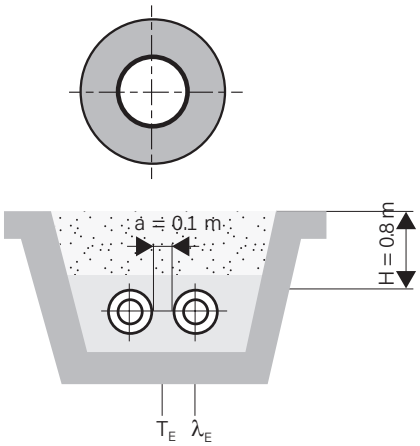
Type	U value	Average operating temperature T_B [°C]					
	[W/mK]	40°	50°	60°	70°	80°	90°
25 + 25/ 90	0.22	6.5	8.7	10.8	13.0	15.1	17.3
32 + 32/105	0.24	7.2	9.7	12.1	14.5	16.9	19.3
40 + 40/125	0.26	7.7	10.3	12.8	15.4	18.0	20.5
50 + 50/150	0.28	8.3	11.1	13.9	16.7	19.5	22.3



FLEXSTAR UNO

Heat losses q [W/m] for for two UNO pipes laid in pairs

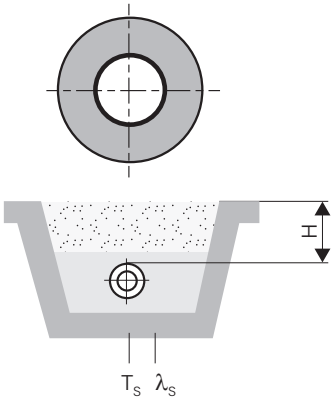
Type	U value	Average operating temperature T_B [°C]					
	[W/mK]	40°	50°	60°	70°	80°	90°
25/ 70	0.26	7.8	10.4	13.0	15.6	18.2	20.8
32/ 70	0.33	9.9	13.2	16.5	19.8	23.1	26.4
40/ 90	0.33	9.8	13.1	16.4	19.7	23.0	26.3
50/ 90	0.43	13.0	17.3	21.7	26.0	30.3	34.7
63/105	0.48	14.3	19.1	23.9	28.7	33.5	38.2



FLEXSTAR UNO

Heat losses q [W/m] for a single UNO pipe

Type	U value	Average operating temperature T_B [°C]					
	[W/mK]	40°	50°	60°	70°	80°	90°
25/ 70	0.15	4.6	6.1	7.6	9.1	10.7	12.2
32/ 70	0.20	6.1	8.1	10.2	12.2	14.2	16.3
40/ 90	0.20	5.9	7.8	9.8	11.8	13.7	15.7
50/ 90	0.28	8.3	11.1	13.8	16.6	19.4	22.1
63/105	0.31	9.3	12.4	15.5	18.6	21.7	24.8

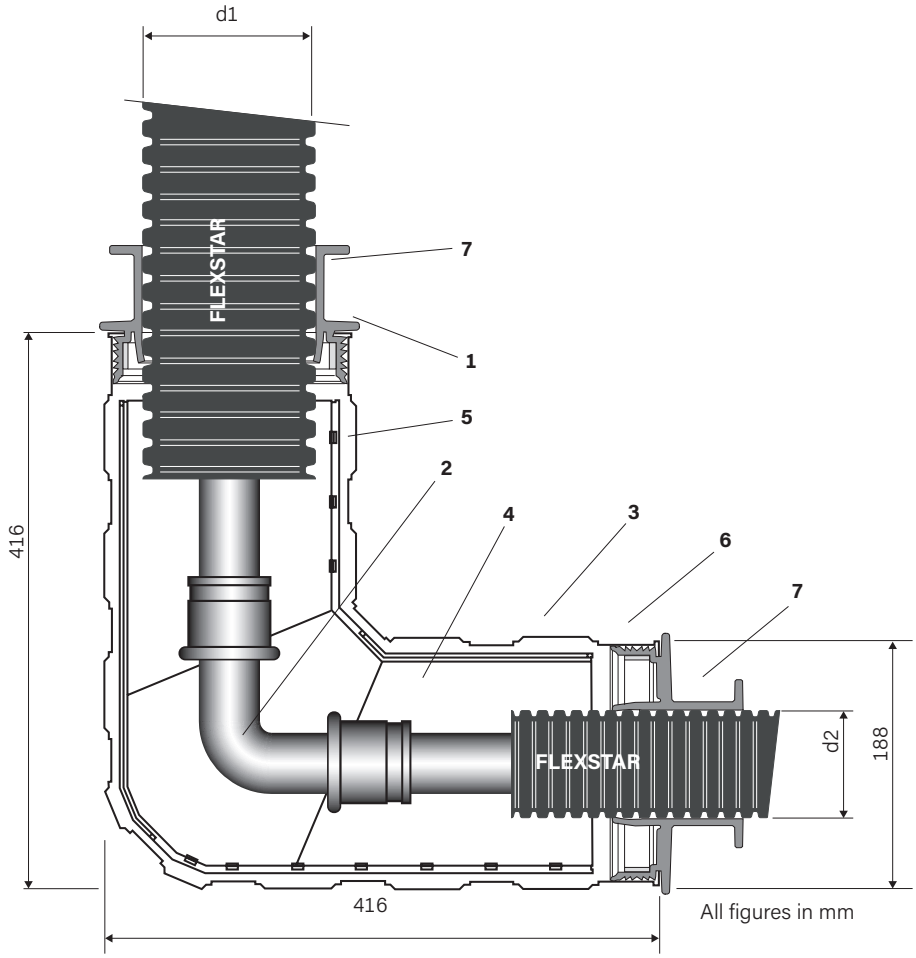


Pipe spacing:	a	= 0.10 m
Cover height:	H	= 0.80 m
Ground temperature:	T_S	= 10 °C
Conductivity of the ground:	λ_S	= 1,000 $\frac{W}{mK}$
Conductivity of the PUR foam:	λ_i	= 0.023 $\frac{W}{mK}$
Conductivity of the PE casing:	λ_{PE}	= 0,330 $\frac{W}{mK}$

average operating temperature	T_B (C°)
Flow:	F
Return:	R
thermal transmittance coefficient	U [$\frac{W}{m}$]
Heat loss during operation:	q = U (T_B-T_S) [$\frac{W}{m}$]

L-shell

Dimensions: Ø 70–125 mm



Clip-L-shell, UNO/DUO

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

F = FLEXSTAR

C = CALPEX

Structure of the half-shells

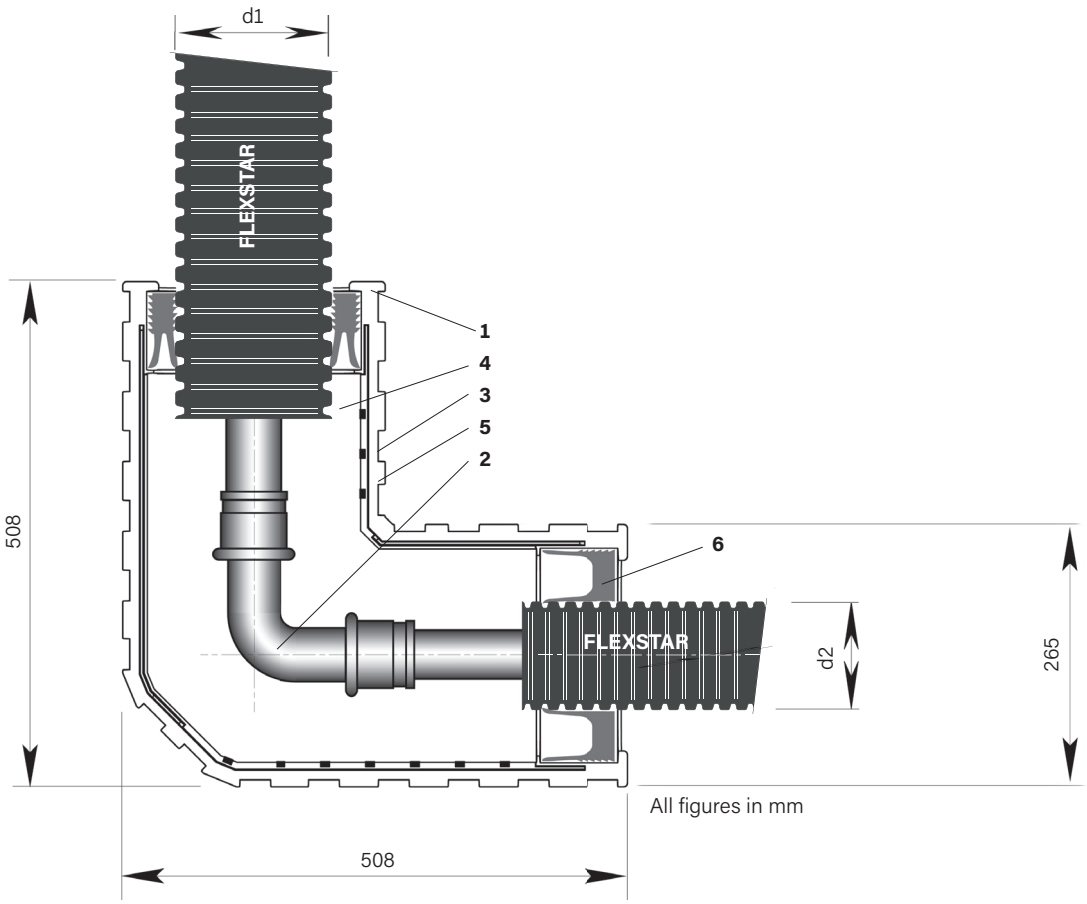
1 ABS half-shells
2 PEX angled coupling; see FXS 0.385
3 Locking clips (15 pcs.)
4 Insulating material; see FXS 0.365
5 Adhesive surfaces
6 Reducer ring or sealing ring
7 Hose clips

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

Can be combined with CALPEX sealing rings

Big L-shell

Dimensions: Ø 70–150 mm



All figures in mm

Clip-Big L-shell, UNO/DUO

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

F = FLEXSTAR

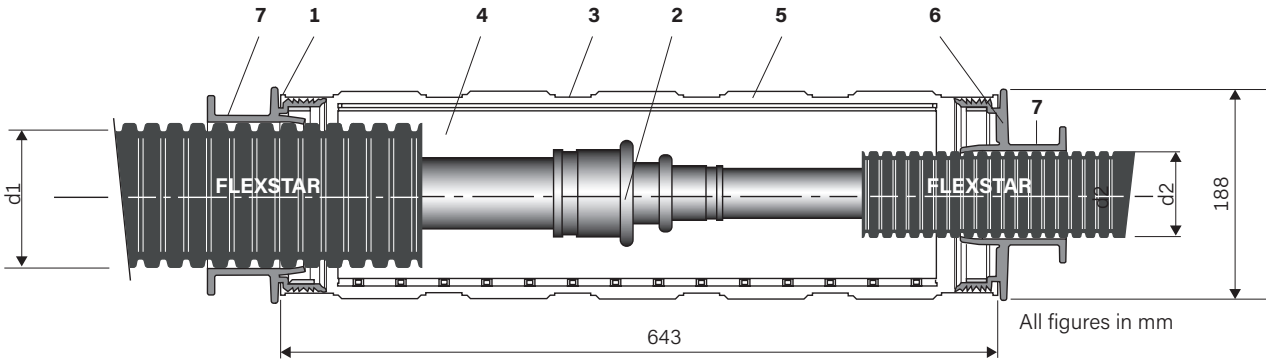
CALPEX shells must be installed so that they are protected from solar radiation if possible.

Structure of the half-shells

1 ABS half-shells
2 PEX angled coupling; see FXS 0.385
3 Locking clips (22 pcs.)
4 Insulating material; see FXS 0.365
5 Adhesive surfaces
6 Reducer ring or sealing ring

I-shell

Dimensions: Ø 70–125 mm



Clip-I-shell, UNO/DUO

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

F = FLEXSTAR
C = CALPEX

Structure of the half-shells

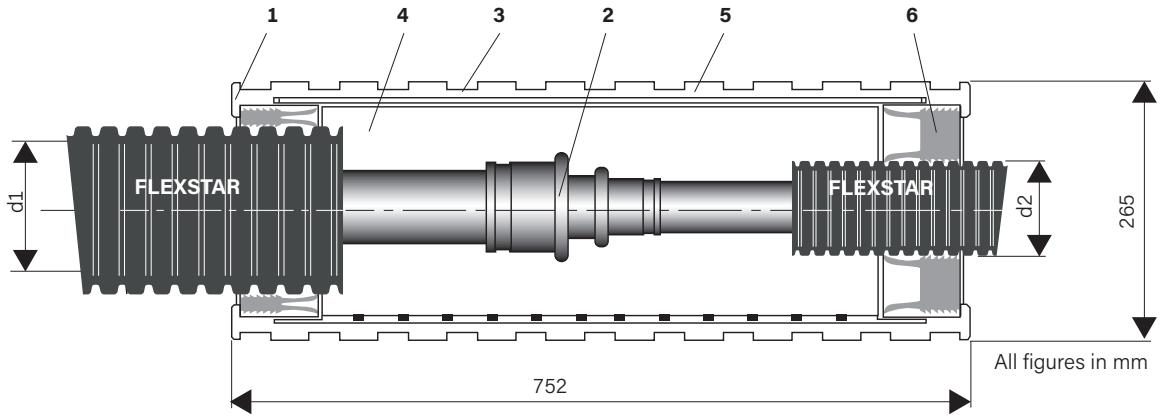
1 ABS half-shells
2 PEX angled coupling; see FXS 0.380
3 Locking clips (14 pcs.)
4 Insulating material; see FXS 0.365
5 Adhesive surfaces
6 Reducer ring or sealing ring
7 Hose clips

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

Can be combined with CALPEX sealing rings

Big I-shell

Dimensions: Ø 70–150 mm



Clip-Big I-shell, UNO/DUO/QUADRIGA

Outer casing	**Ø d2**				
Ø d1	**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 = FLEXSTAR

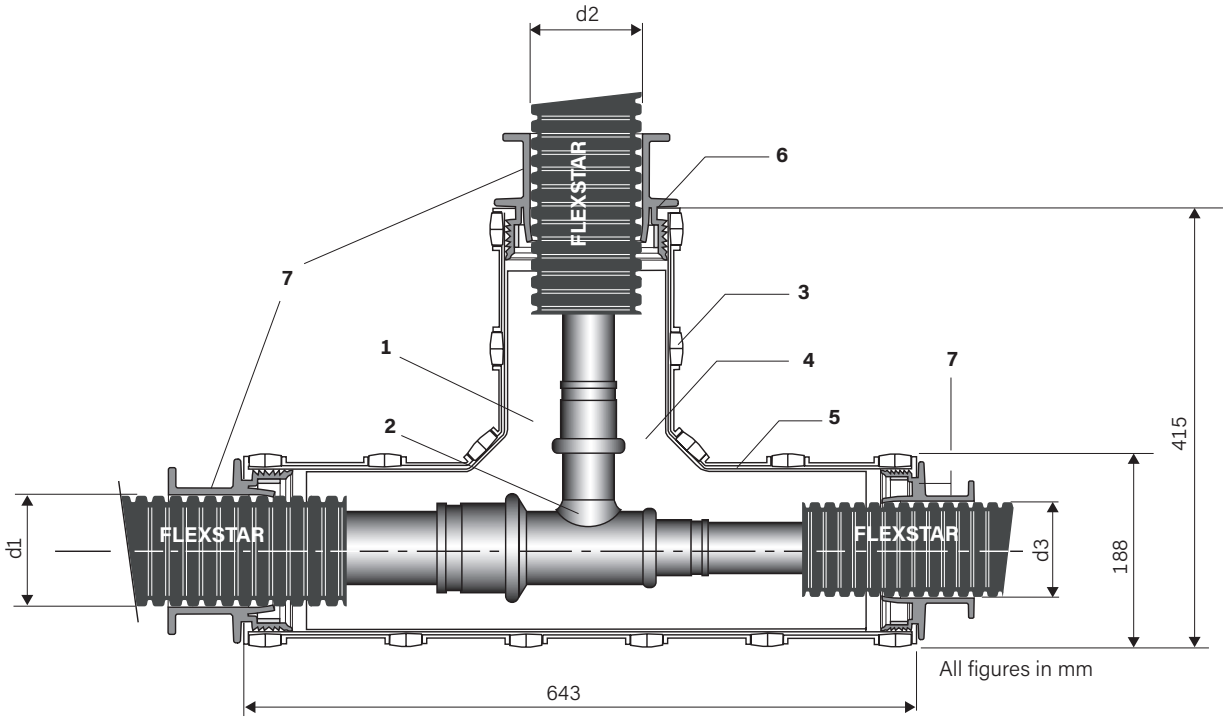
Structure of the half-shells

1 ABS half-shells
2 PEX angled coupling; see FXS 0.380
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



Clip-T-shell, UNO/DUO

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

F = FLEXSTAR

C = CALPEX

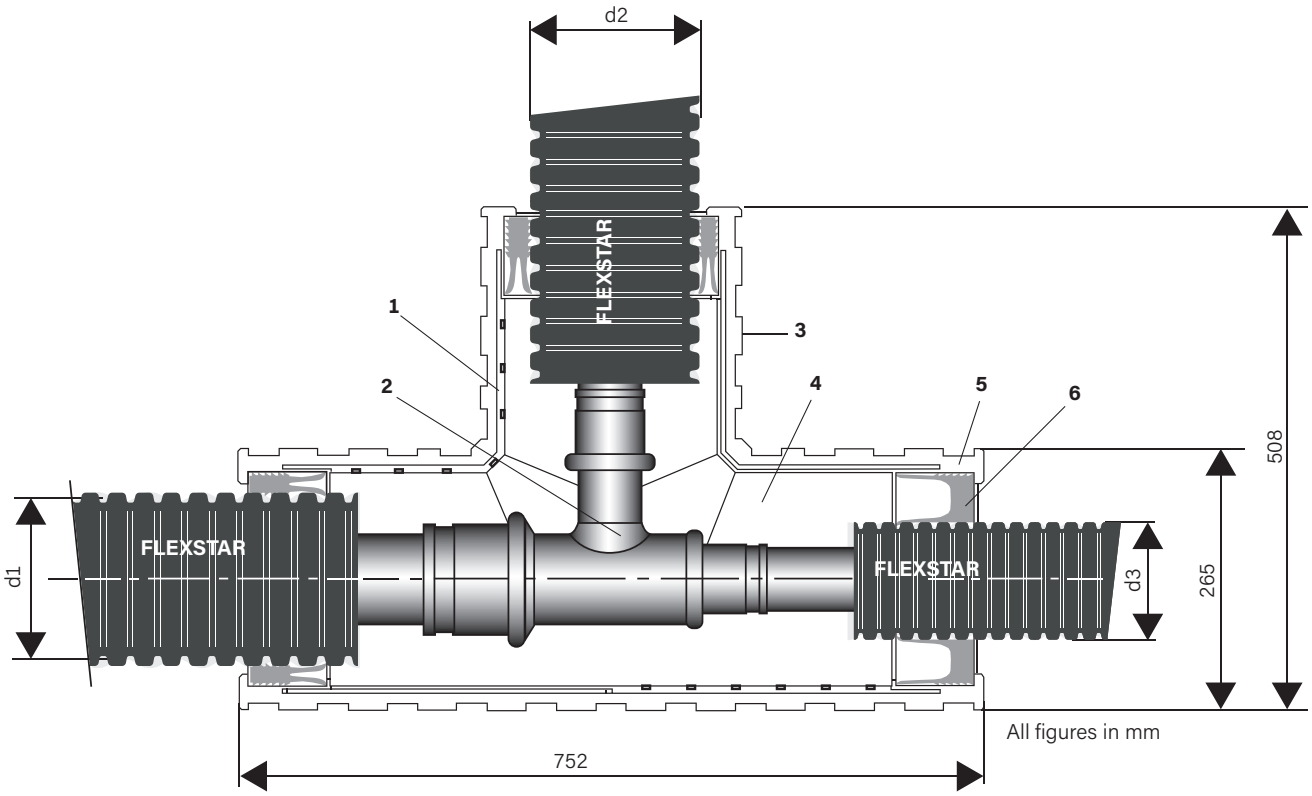
Structure of the half-shells

1 ABS half-shells
2 PEX T-piece; see FXS 0.390
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



Structure of the half-shells

1 ABS half-shells
2 PEX T-piece; see FXS 0.390
3 Locking clips (27 pcs.)
4 Insulating material; see FXS 0.365
5 Adhesive surfaces
6 Reducer ring or sealing ring

Clip-Big T-shell, UNO/DUO

Outer casing	**Ø d2**				
Ø d1	**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 = FLEXSTAR

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

Insulating material

PUR foam container

Insulating material for shrink-on sleeves and the Clip-shells

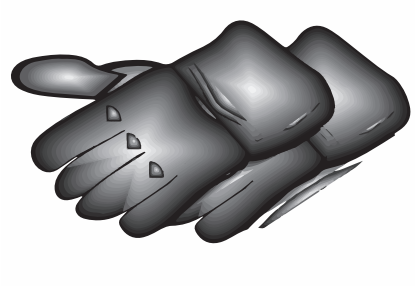
PUR foam container (25/70–50 + 50/150)
CFC-free, CO_2-blown PUR foam in plastic bottles

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

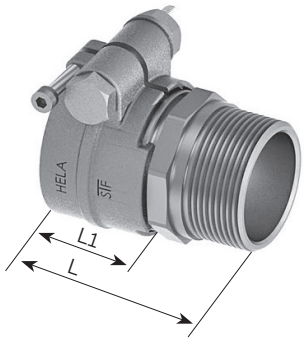


Eye protection

Screw connections

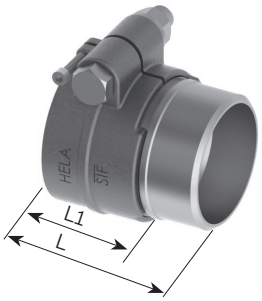
External thread, weld end

Connection with external thread



FLEXSTAR (heating, 6 bar)		
Material: Brass		
PEX pipe	**Screw connection**	**L/L1**
mm	**mm**	**mm**
25 x 2.3	25 x 2.3-¾"	61/26
32 x 2.9	32 x 2.9-1"	68/29
40 x 3.7	40 x 3.7-1¼"	77/36
50 x 4.6	50 x 4.6-1½"	79/36
63 x 5.7	63 x 5.7-2"	97/46

Connection with weld end



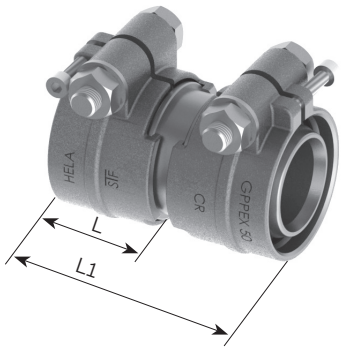
FLEXSTAR (heating, 6 bar)		
Material: Steel		
PEX pipe	**Weld end**	**L/L1**
mm	**mm**	**mm**
25 x 2.3	26.9 x 2.3	61/26
32 x 2.9	33.7 x 2.6	63/29
40 x 3.7	42.4 x 2.6	75/36
50 x 4.6	48.3 x 2.6	84/36
63 x 5.7	60.3 x 2.9	88/46

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	**Coupling**	**L/L1**
mm	**mm**	**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

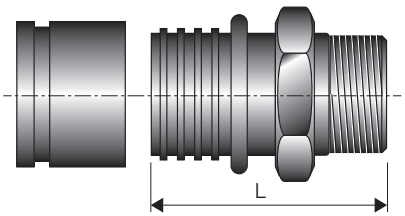
Elbow 90°

FLEXSTAR (heating, 6 bar)	
Material: Brass, soldered	
PEX pipe	**On PEX pipe**
mm	**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

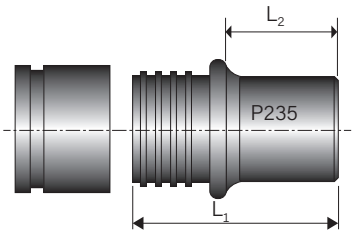


FLEXSTAR (heating, 6 bar)

Material: Brass

PEX pipe	Screw connection	L
mm	mm	mm
25 x 2.3	25 x 2.3-¾"	62
32 x 2.9	32 x 2.9-1"	72
40 x 3.7	40 x 3.7-1¼"	82
50 x 4.6	50 x 4.6-1½"	89
63 x 5.8	63 x 5.7-2"	109

Connection with weld end



FLEXSTAR (heating, 6 bar)

Material: Steel (P235)

PEX pipe	Weld end	L1	L2
mm	mm	mm	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

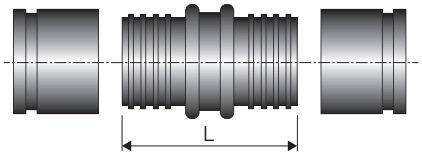
Connections with weld ends must be welded first and then crimped.

For pressing tools, see FXS 0.540

Press fittings

Coupling, any, reduced coupling, elbow 90°

Coupling

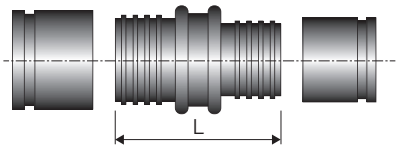


FLEXSTAR (heating, 6 bar)

Material: Brass

PEX pipe	Coupling	L
mm	mm	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

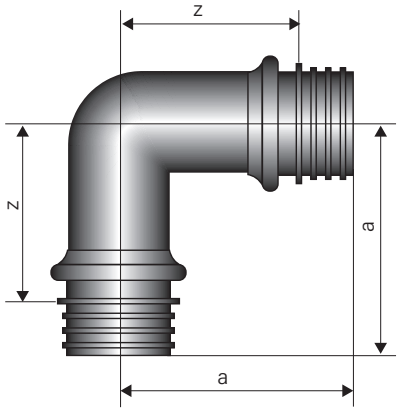


FLEXSTAR (heating, 6 bar)

Material: Brass/steel* (P235)

PEX pipe	Coupling	L
mm	mm	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)

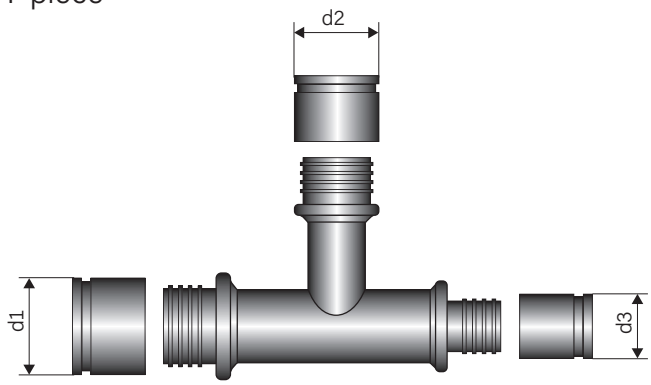
Material: Brass/steel* (P235)

PEX pipe	PEX pipe	a	z
mm	mm	mm	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

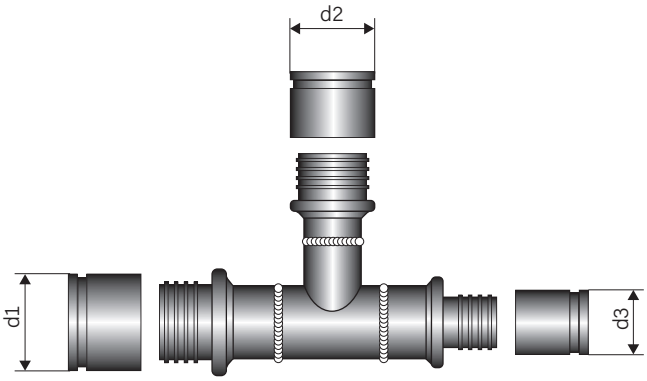
For pressing tools, see FXS 0.540

Press fittings

T-piece



Brass/CrNi



P235

FLEXSTAR (Heating, 6 bar)

ø d1 ø d3	**Branch, ø d2**				
mm	**mm**				
	25 x 2.3	32 x 2.9	40 x 3.7	50 x 4.6	63 x 5.8
25 x 2.3- 25 x 2.3	o/x				
32 x 2.9- 32 x 2.9	o/x	o/x			
32 x 2.9- 25 x 2.3	o/x				
40 x 3.7- 40 x 3.7	o/x	o/x	o/x		
40 x 3.7- 32 x 2.9	o/x[1]	o/x[1]			
50 x 4.6- 50 x 4.6	o/x	o/x	o/x	o/x	
50 x 4.6- 40 x 3.7	o/x	o/x	o/x[1]		
63 x 5.8- 63 x 5.8	o/x	o/x	o/x	o/x	o/x
63 x 5.8- 50 x 4.6	o/+	o/x	o/x	o/x	

[1] Soldered fittings
- T-pieces made of steel can be supplied on request
- Other T-pieces can be supplied on request.

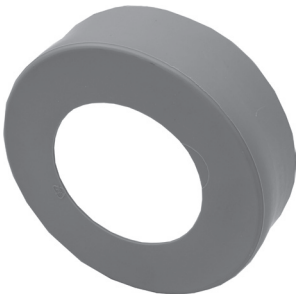
Material:
x = Brass CuZn39Pb3 (DN 20 - DN 50), Gunmetal Rg7 (DN 65 - DN 100)
o = P235 welded
+ = CrNi 1.4404, 1.4432, 1.4435 (316L)

End caps

Shrink-on end cap, UNO

End cap EPDM, UNO

End cap, UNO (LDPE)



Shrink-on end cap, DUO

End cap EPDM, DUO

End cap, DUO (LDPE)

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

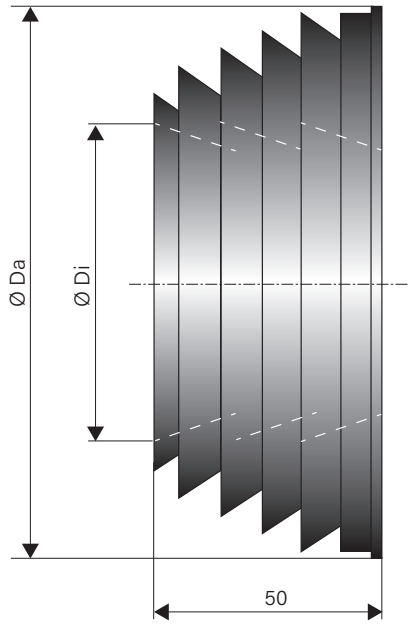
FLEXSTAR DUO
Type
25 + 25/90
32 + 32/105
40 + 40/125
50 + 50/150

LD-PE end caps are attached and are suitable for dry rooms.

EPDM end caps provide optimal protection against splash water, moisture and vermin.
With exact markings for cutting the collars. Can be installed without special tools.
If a pre-insulated pipe ends in the ground, using stainless steel tightening straps provided by the customer is mandatory.

Wall sealing insert

for wall openings



All figures in mm

FLEXSTAR UNO, DUO

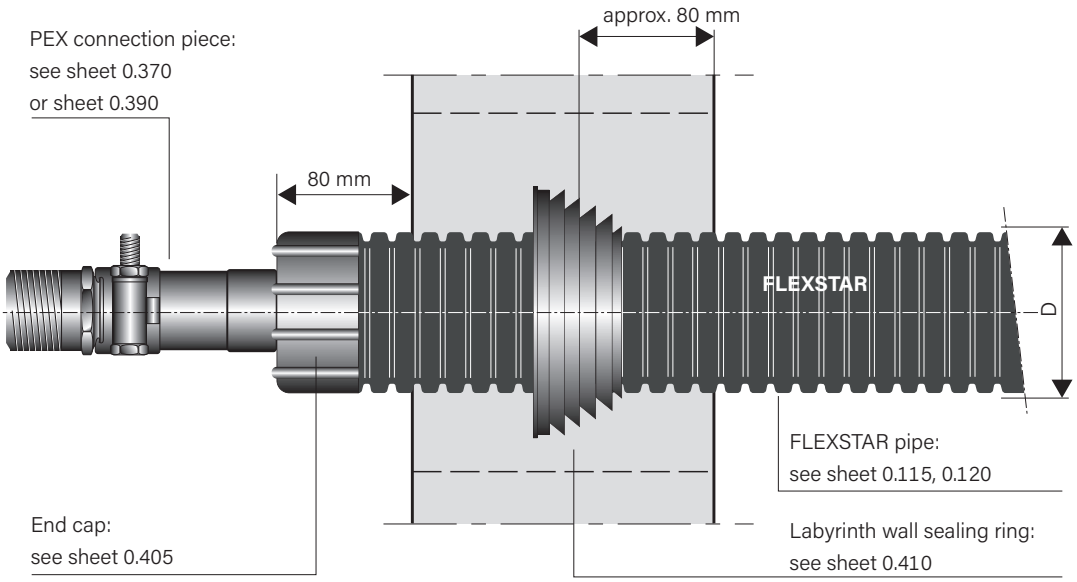
Outer casing diameter	**Labyrinth wall sealing ring**	
	Ø Di, inner	**Ø Da, outer**
mm	**mm**	**mm**
70	74	118
90	88	133
105	107	153
125	122	168
150	137	183

Building entry (see sheet FXS 0.415)

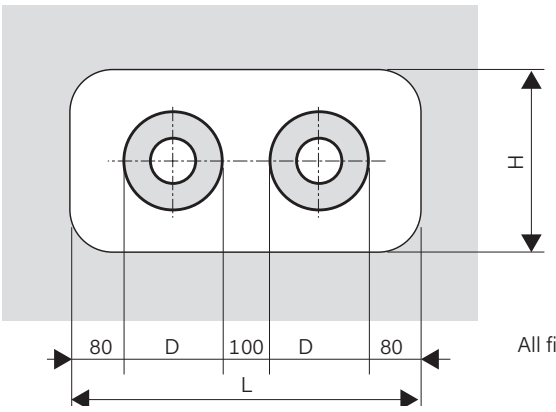
Building entry

Wall opening

Wall sealing insert



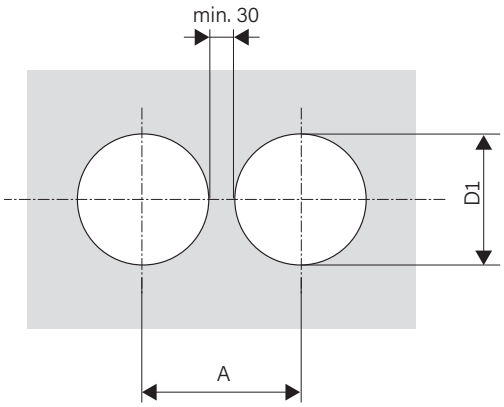
Wall opening



All figures in mm

Outer casing Ø D mm	L min. mm	H min. 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



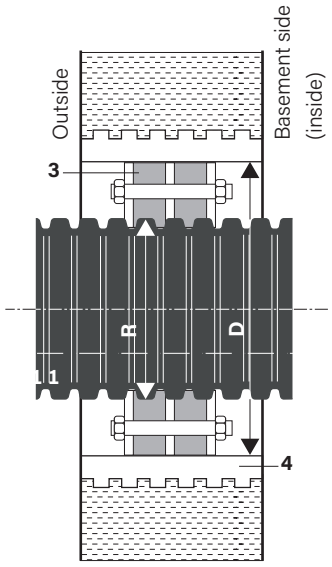
All figures in mm

Outer casing Ø D mm	A mm	D1 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

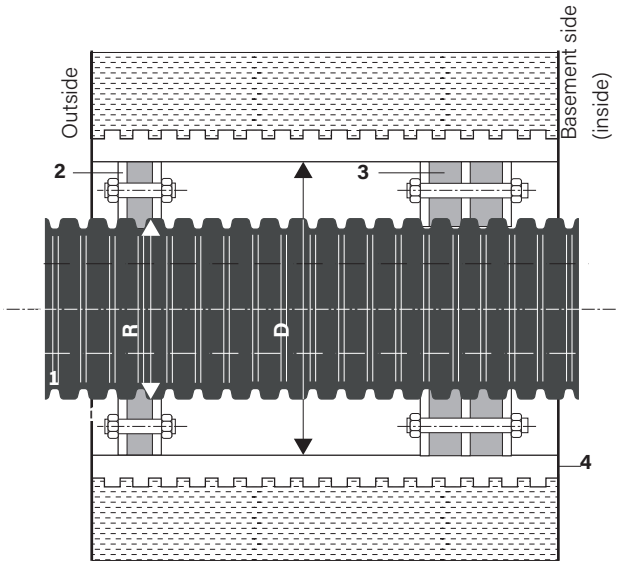
Wall sealing insert

Core drillings/cement casing pipes

Standard



With additional centring ring



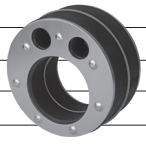
1 FLEXSTAR heat-pump pipe
2 Sealing insert, single-seal with wall thickness > 30 cm/not suitable against pressing water
1 x 40 mm, Shore hardness D 35. Also available with cable duct gland 2x Ø 32 mm.
3 Sealing insert, double-seal/suitable against pressing water (up to 0.5 bar)
2 x 40 mm, Shore hardness D 35. Also available with cable duct gland 2x Ø 32 mm.
4 Casing pipe made of fibre cement or coated core drilling

Core drillings/ Cement casing pipes

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 casing **Ø R** **mm**	**Casing pipe** **Ø D** **mm**	**Core drilling** **Ø** **mm**
70	150	150
90	150	200
105	200	200
125	200	200
150	250	250

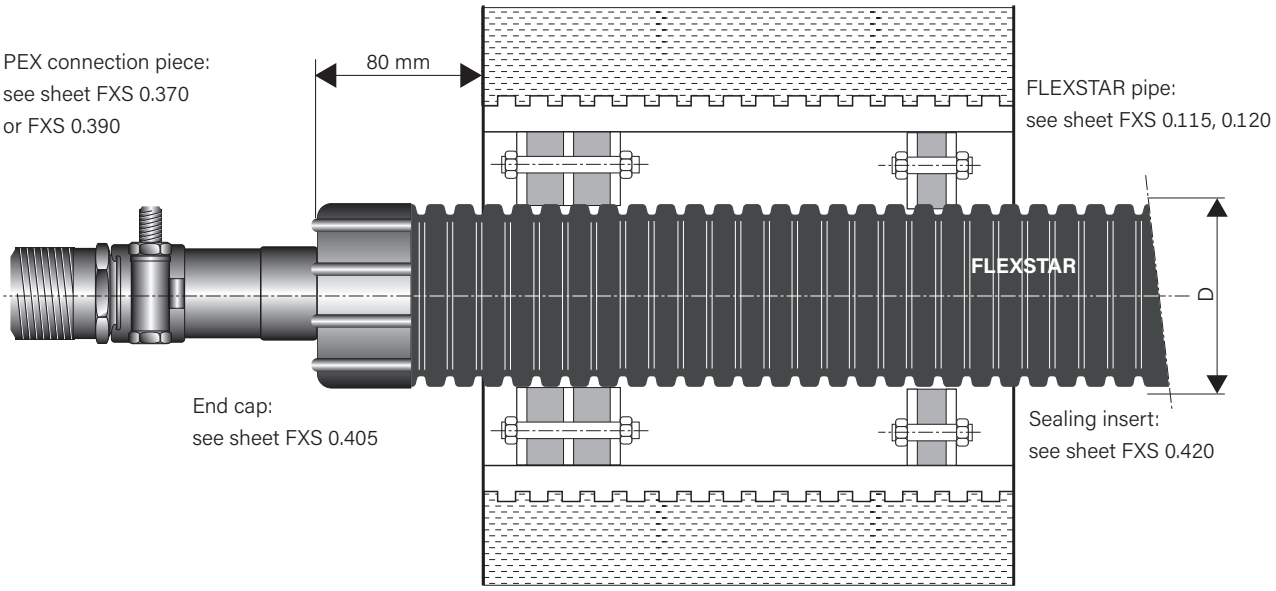


Building entry (see sheet FXS 0.425)

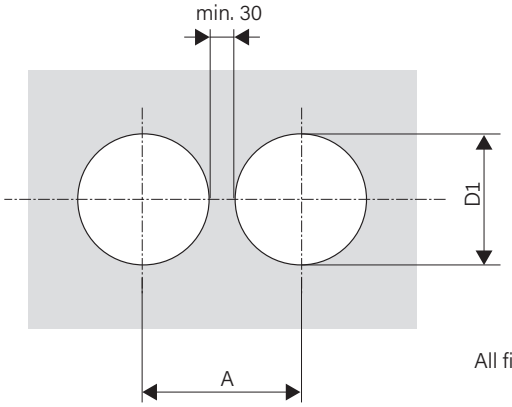
Building entry

Core drillings/cement casing pipes

Wall sealing insert



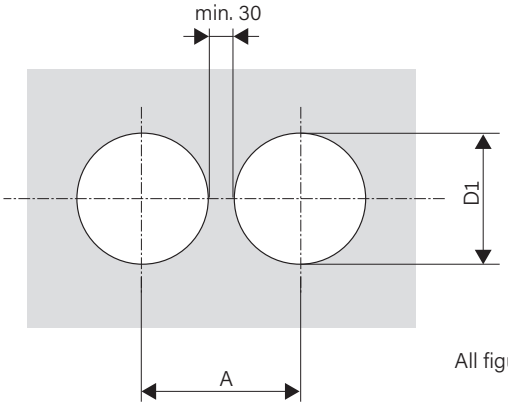
Core drillings/cement casing pipes
for wall seal without cable gland
2 x Ø 32 mm



All figures in mm

Outer casing Ø D mm	A mm	D1 mm
70	180	150
90	180	150
105	230	200
125	230	200
150	280	250

Core drillings/cement casing pipes
for wall seal with cable gland
2 x Ø 32 mm



All figures in mm

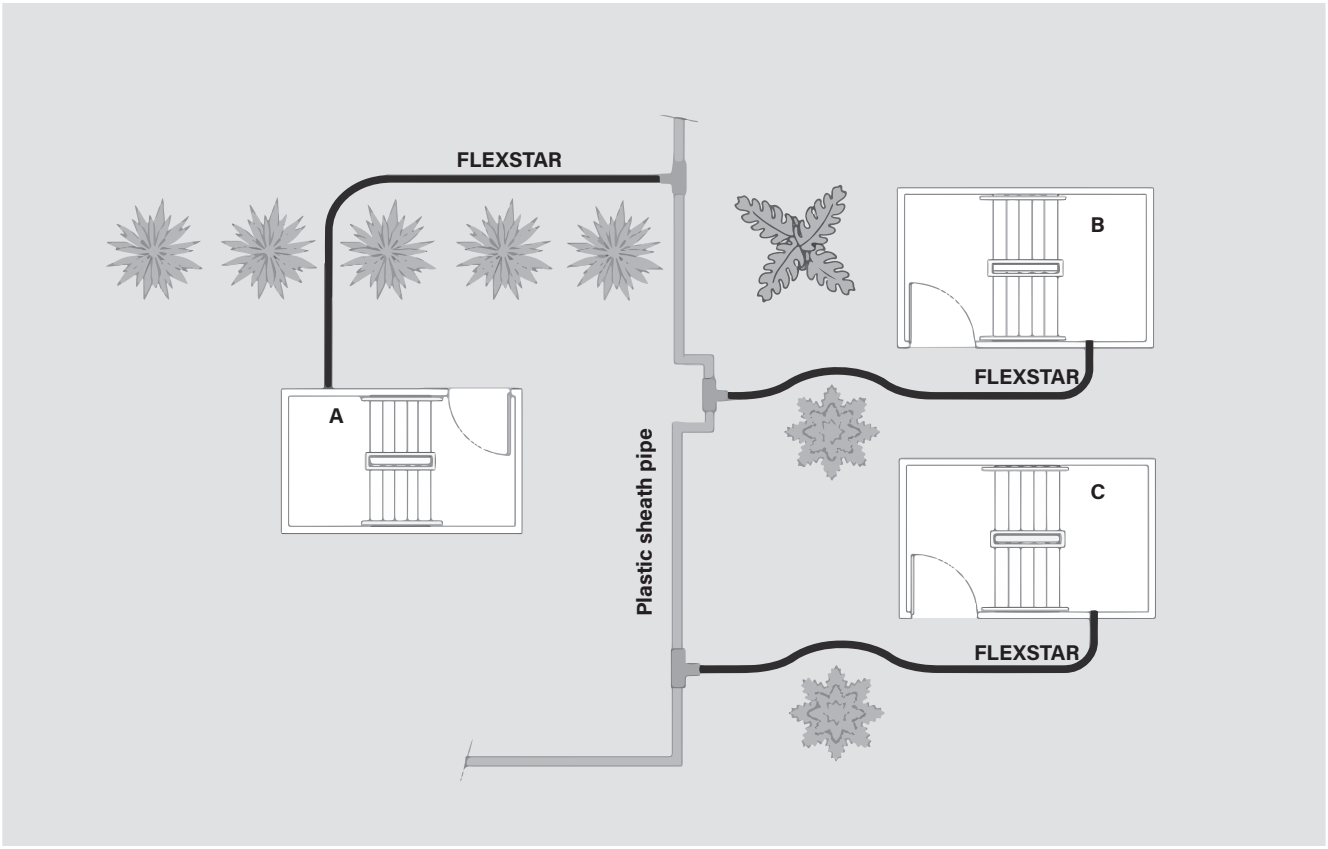
Outer casing Ø D mm	A mm	D1 mm
70	180	150
90	230	200
105	230	200
125	230	200
150	280	250

04.10.2023
Subject to technical changes.

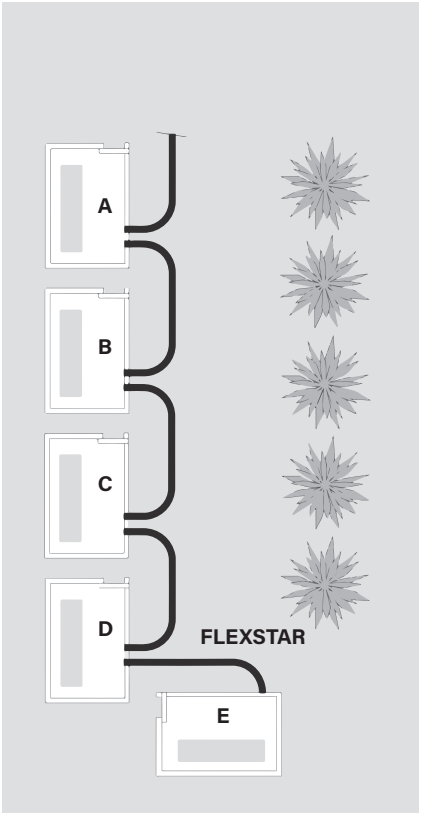
BRUGG Pipes

Route

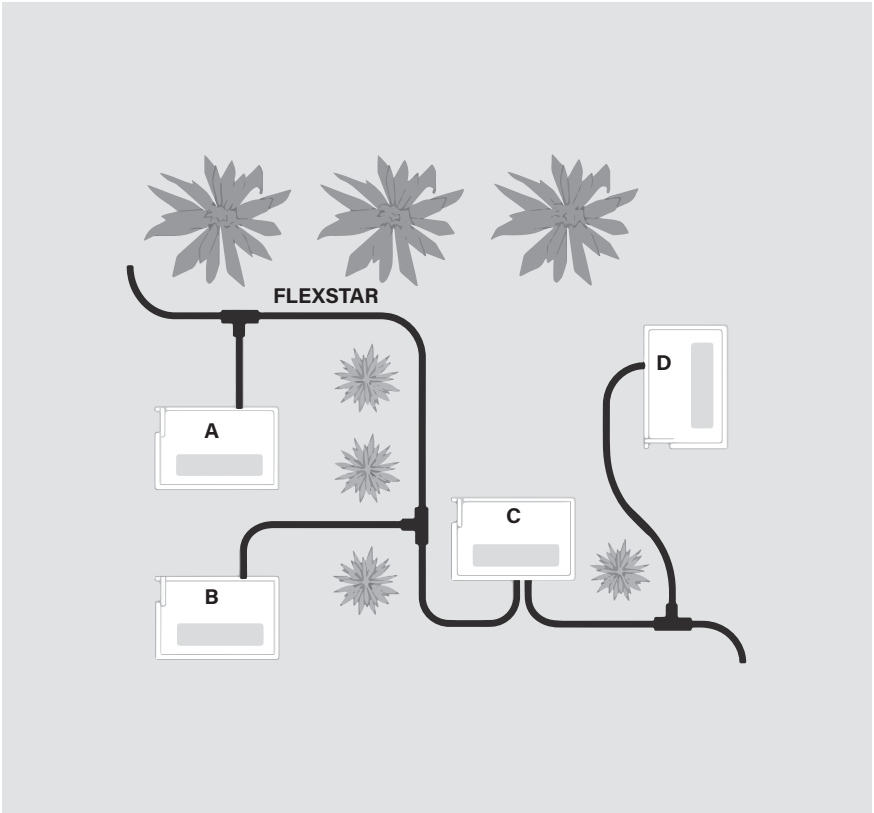
Connection between FLEXSTAR and plastic sheath pipe



Loop-in method



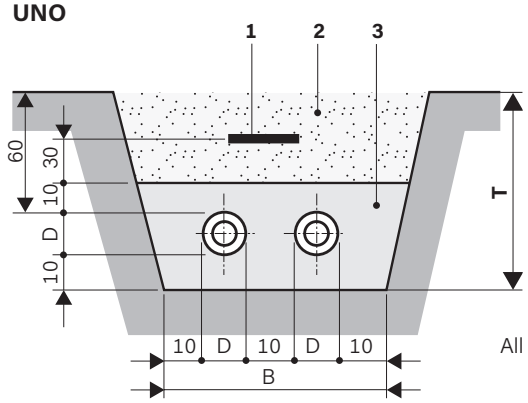
Connection between FLEXSTAR and FLEXSTAR



Trench dimensions

Trench profile, 2 FLEXSTAR pipes

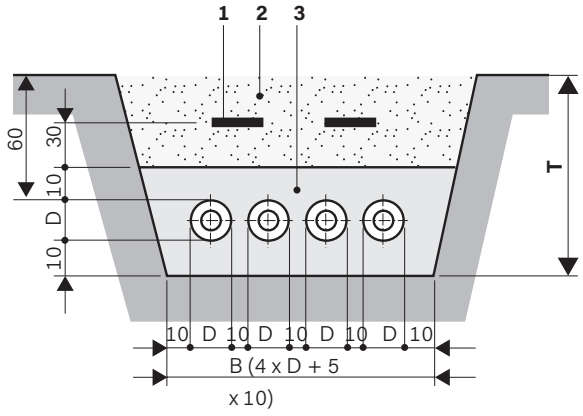
UNO



All figures in cm

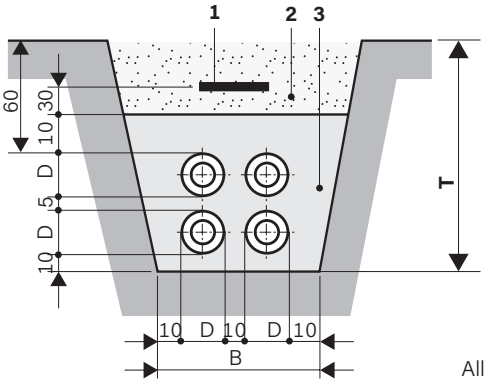
Sheath pipe Ø D mm	Width B cm	Depth T cm	Minimum bending radius m
71.5	45	80	0.30
90.0	50	80	0.30
106.5	55	85	0.30
126.5	55	85	0.35
151.5	65	90	0.40

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



All figures in cm

SLW 30 ≙ 300 kN total load according to DIN 1072; if subject to higher traffic loads (e.g. SLW 60), a load-distributing superstructure according to RStO75 is required.

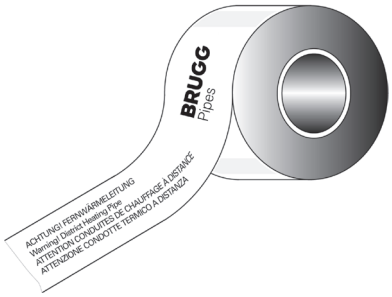
With no traffic load, the minimum trench depth **T** can be reduced by 20 cm.

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 %

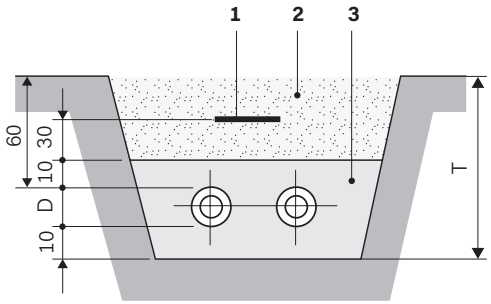
Pipe warning tape

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

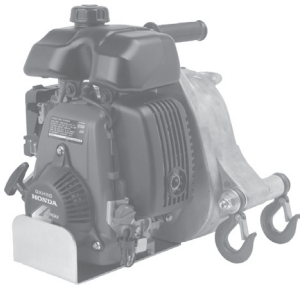
Laying aids

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

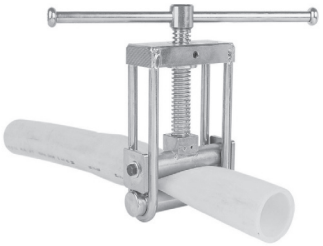
Dimensions: Ø 400 x 157 cm
Load-bearing capacity: 1000 kg

Motorised winch



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

Squeezing tools
for shutting of PE and PEX pipe provisionally



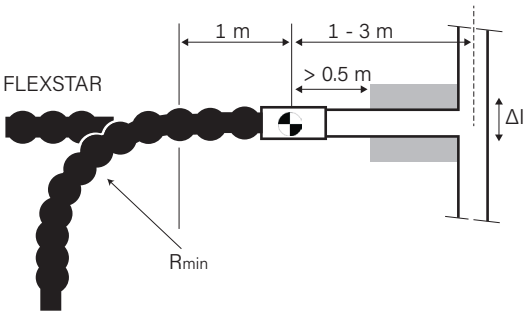
Squeezing tool Ø 32–63 mm (SDR11)

Connection (rigid/flexible)

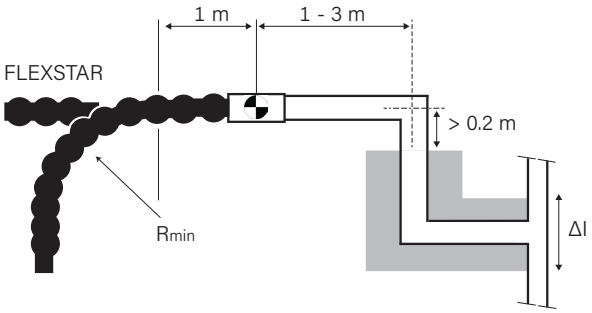
FLEXSTAR to insulated steel pipes

Installation instructions for transition from FLEXSTAR to insulated steel pipe (KMR)

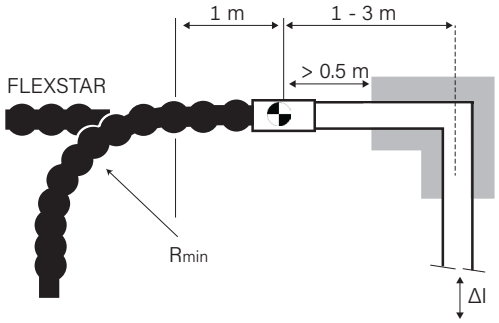
1. Connection to T-piece (ΔI small)



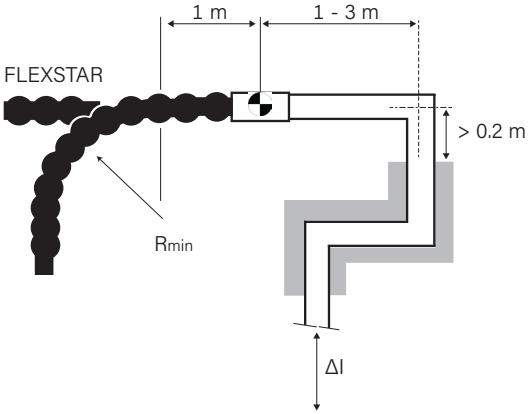
2. Connection to T-piece (ΔI large)



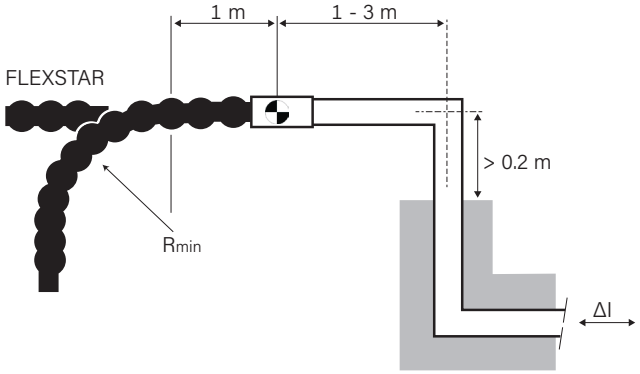
3. Connection to L-bend (ΔI small)



4. Connection to L-bend (ΔI large)



5. Connection to Z-bend



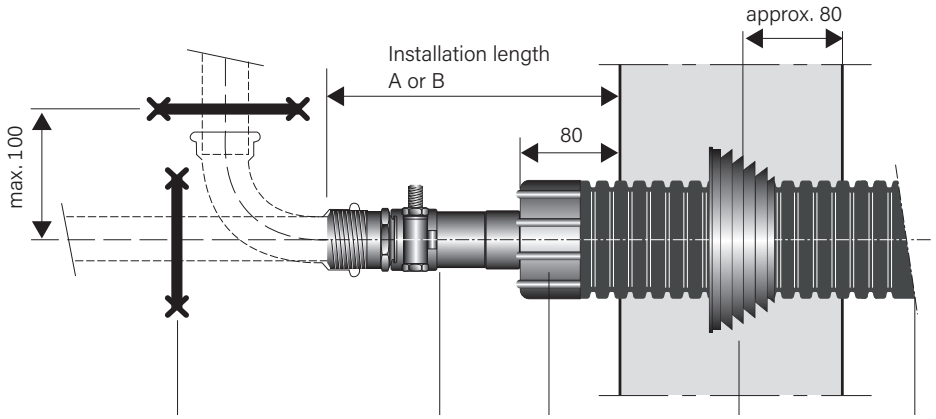
Comments:

1. Thermal elongation ΔI of the KMR system that is transferred to the centre of the connector must be less than:
axial 3 mm

2. Grey = expansion pad for the KMR system, designed in line with the state of the art

Building connection – screw connection/press fitting

Shaft entry



All figures in mm

Fixed point

PEX connection piece with external thread: see sheet 0.370

End cap: see sheet 0.405

Wall sealing ring: see sheet 0.410

FLEXSTAR pipe: see sheet 0.115 and 0.120

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

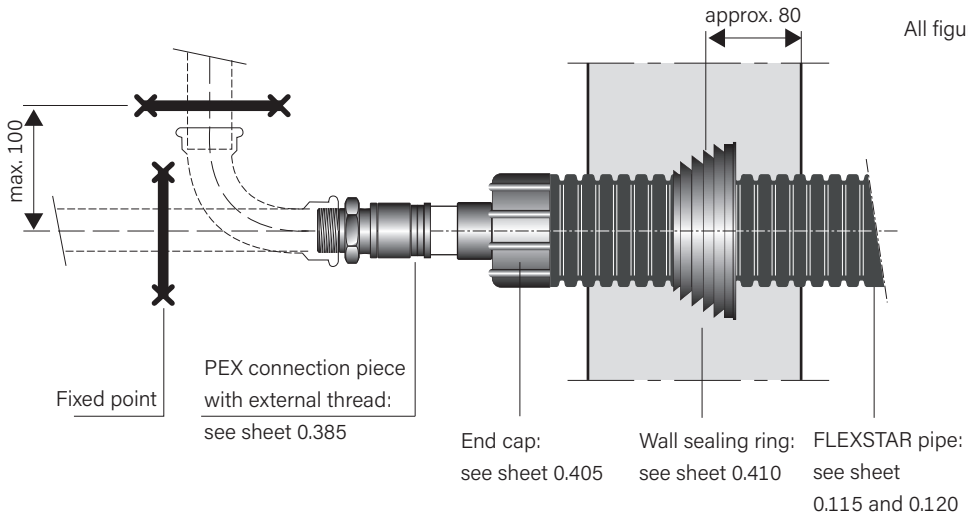
Type B

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

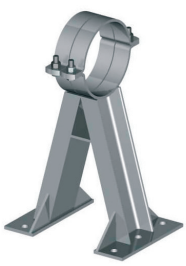
Connection with external thread



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 sheat.

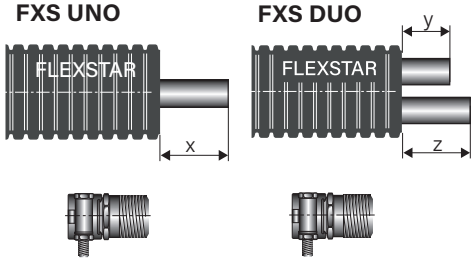
5 Cut back/remove the insulation along the length (x, y, z).
Caution: Do not damage the medium pipe.

6 Install the wall sealing ring.

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

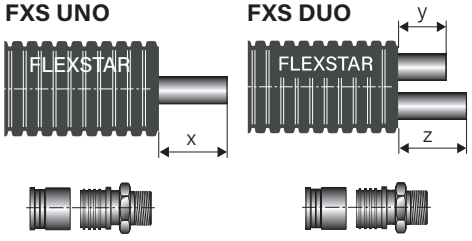
8 Install the fitting in line with the enclosed installation instructions.

FXS UNO **FXS DUO**



UNO screw connection
Building connection:
Ø 20– 75: X = **90 mm**
Ø 90–110: X = **110 mm**

FXS UNO **FXS DUO**



UNO press fitting
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**

DUO press fitting
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.

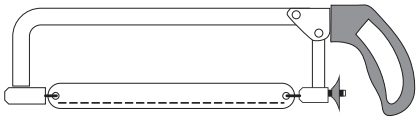
04.10.2023
Subject to technical changes.

BRUGG Pipes

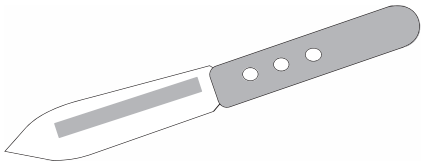
Installation tool

General and for screw connection

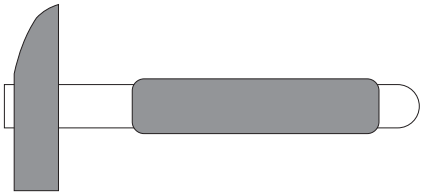
Cutting to length and removing insulation



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

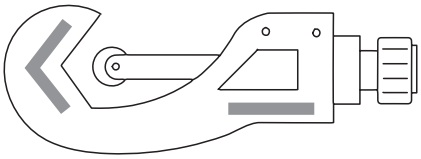


Blade for removing the insulation

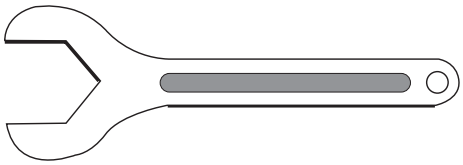


Hammer as an auxiliary tool

Cutting to length and removing insulation

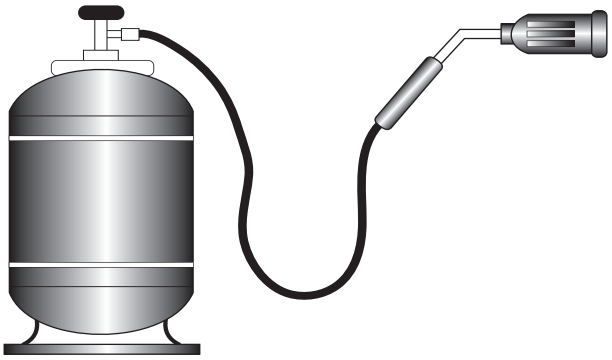


Pipe cutter for PEX pipe

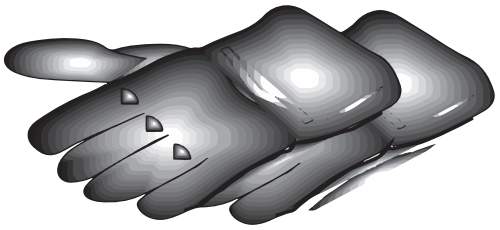


Spanner

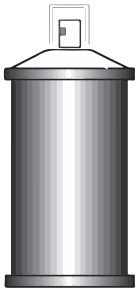
Shrinking

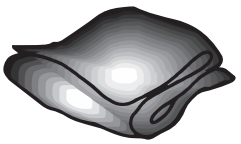


The gas burner is used to shrink hoses and sleeves

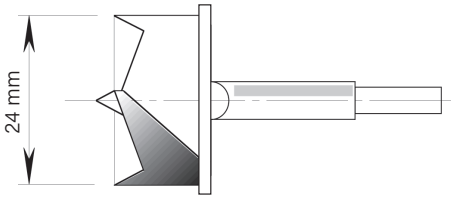


We recommend wearing gloves for shrinking work





Cleaning agents and cloths



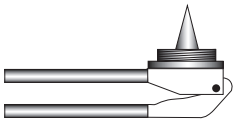
Knothole drill for foam filling hole in sleeves

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

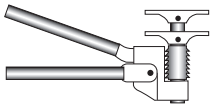
Installation tool

For connection to sliding sleeves

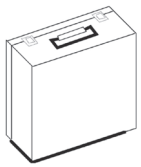
Manual tool for PEX Ø 20–40 mm (1 case)



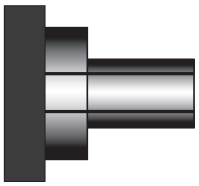
Expanding tool up to Ø 32 mm
(basic tool)



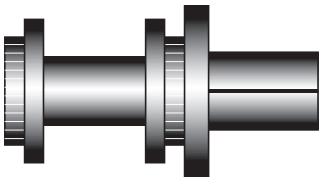
Crimping tool up to Ø 40 mm
Expanding tool for Ø 40 mm
(basic tool)



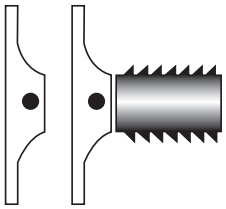
1 case with basic tool
incl. expander heads and yoke



Expander head up to Ø 32 mm

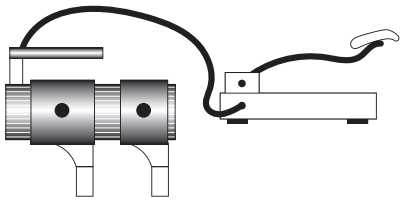


Expander head from Ø 40 mm

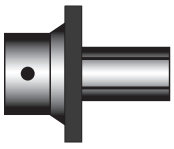


Press yoke Ø 20–40 mm

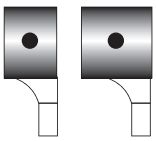
Hydraulic tool for PEX Ø 50–110 mm (2 cases)



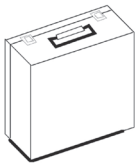
Hydraulic tool for crimping and expanding
Ø 50–110 mm including foot pump (basic tool)



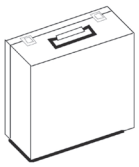
Expander head
Ø 50–110 mm



Press yoke
Ø 50, 63 mm



Case with basic tool
(without expander heads and yoke)



Case with expander heads
and press yoke