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System description

1. General

COOLFLEX is the registered trade name for a flexible pipe system.

This pipe system is especially suitable for use in local and district cooling networks, in industrial and with restrictions also for combined heat pump systems (cooling and heating).

The COOLFLEX district cooling pipe has a carrier pipe produced from high-density polyethylene (PE100) as per standard DIN EN 12201. The polyethylene pressure pipes are the standard for drinking water and waste water systems, and also for the gas supply sector. The pipes are joined by means of standard screwed connectors, mechanical pipe couplings, with normal commercial electrofusion fittings or by means of butt fusion welding technology.

The heat insulation consists of CFC-free polyurethane foam with excellent insulating properties. COOLFLEX district cooling pipe can be adapted to all pipe routing conditions without problems. It is possible to pass over or under existing supply pipes, and obstacles are easily bypassed. With the flexible COOLFLEX district cooling pipe, you can choose the shortest pipe route without considering the classical method of pipe construction.

The flexible COOLFLEX district cooling pipe is delivered to the site in continuous coils or on a drum. Generous delivery lengths enable pipes to be laid largely without underground connections. Pipe trench can be considerably narrower and this allows considerable savings on underground work.

Taking account of the very short time required for installation, COOLFLEX district cooling pipe is not only a technically perfect solution but also the key to saving time and expense when setting up district cooling networks, because less coordination is required on site and the pipes are laid simply and quickly.

2. Range of applications

Max. continuous operating temperature T_{Bmax} :
-20 to +20 °C (+40°C*)

Max. permitted operating pressure p:
max. 16 bar

*warm water application with limited lifetime and operating pressure (as per DIN 8074)

The COOLFLEX system is not authorised for use with drinking water in Germany.

System description

1. Bonded system

Requirements	Factory insulated, flexible pipe systems according EN 17414-1/-2
Fire behaviour	Building material class B2 (normally flammable) according to DIN 4102

2. Carrier pipe

Materials	Polyethylene class PE100 with high density, in accordance with DIN EN 12201/DIN 8074/DIN 8075
Life expectancy	50 years at 20 °C (16 bar) or 40 °C (11.6 bar) in accordance with DIN 8074 (SF 1.25)
Properties	Suitable as a district cooling, cold water and hot water pipe

PE carrier pipe	Reference temperature °C	Value	Test standard
Density	–	952 - 960 kg/m ³	DIN 53479
Thermal conductivity	40 °C	0.40 W/mK	DIN 52612
Tensile strength	20 °C	32 N/mm ²	DIN 53455
Modulus of elasticity	20 °C	1000 N/mm ²	DIN 53457
Linear expansion coefficient	20 °C	1.8 · 10 ⁻⁴ 1/K	DIN 52328
Crystallite melting range	–	130 - 135 °C	–

3. Thermal insulation

Materials	CFC-free, 100 % CO ₂ -blown polyurethane foam (PUR)
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PUR-Dämmung	Reference temperature °C	Value	Test standard
Density	–	> 60 kg/m ³	ISO 845
Thermal conductivity	30 °C	≤ 0.0234 W/mK	EN 253 und ISO 8497
Percentage of closed cells	–	≥ 90 %	–
Water absorption after 24 hours	–	≤ 10 %	EN 253

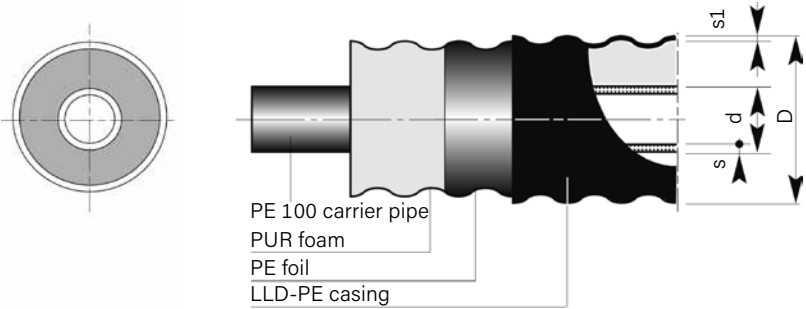
4. Protective casing

Materials	linear polyethylene, low density (LLD-PE), seamlessly extruded
Purpose	mechanical protection and moisture resistance

LLD-PE-Schutzmantel	Reference temperature °C	Value	Test standard
Density	–	918 - 922 kg/m ³	ISO 1183
Thermal conductivity	–	0.33 W/mK	DIN 52612
Percentage of closed cells	–	122 °C	ISO 11357-3

COOLFLEX range

Dimensions SDR 11 (coils)



Dimensions SDR 11

Type	PE inner pipe		Outer casing	Minimum Bending radius	Volume Inner pipe	Weight	Maximum delivery lengths*	
	d x s	mm					Jumbo coil	Maxi coil
25/ 76	25 x 2.3		78 x 2.0	0.7	0.327	0.90	520	780
32/ 76	32 x 2.9		78 x 2.0	0.7	0.539	1.00	520	780
40/ 91	40 x 3.7		93 x 2.2	0.8	0.835	1.39	370	570
50/ 91	50 x 4.6		93 x 2.2	0.8	1.307	1.54	370	570
63/126	63 x 5.8		128 x 2.7	1.0	2.091	2.60	192	291
75/126	75 x 6.8		128 x 2.7	1.0	2.961	2.75	192	291
90/162	90 x 8.2		163 x 3.2	1.2	4.254	4.56	92	149
110/162	110 x 10.0		163 x 3.2	1.2	6.362	5.69	92	149
125/182	125 x 11.4		183 x 3.3	1.4	8.200	6.37	52	86
140/202	140 x 12.7		202 x 3.3	1.4	10.310	8.40	46	80

* Partial lengths can be delivered

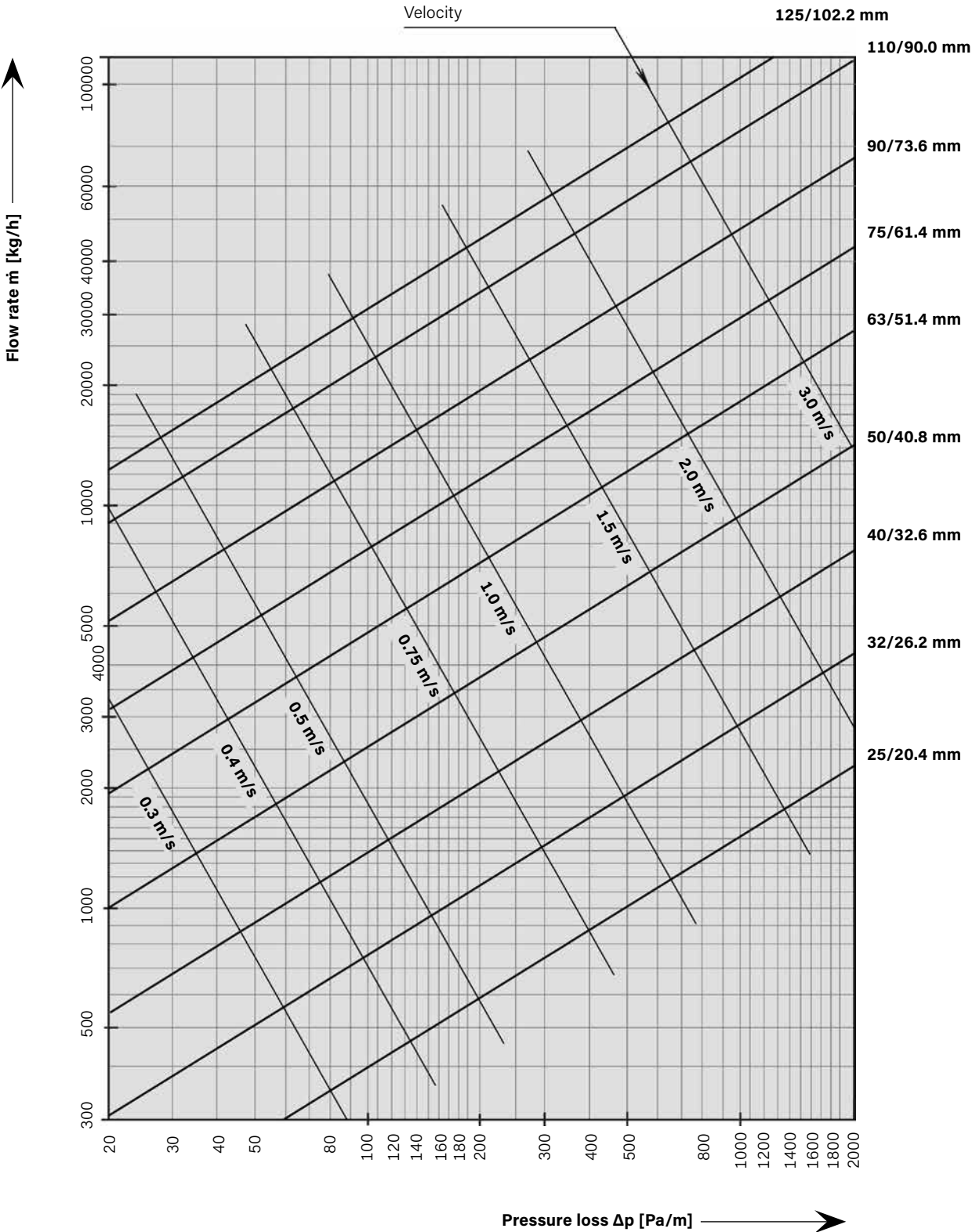
- All dimensions are available in straight lengths on request.
- We will produce different dimensions or special items on request (> 500 m).
- Larger or smaller delivery lengths can be supplied on drums if requested.
- Coil dimensions:
 - Jumbo coil** outer diameter 2800 mm x 800 mm (width)
 - Maxi coil** outer diameter 2800 mm x 1200 mm (width)

Pressure loss chart for water

SDR 11

Water temperature 10 °C

Roughness $\varepsilon = 0.01$ mm (PE100)

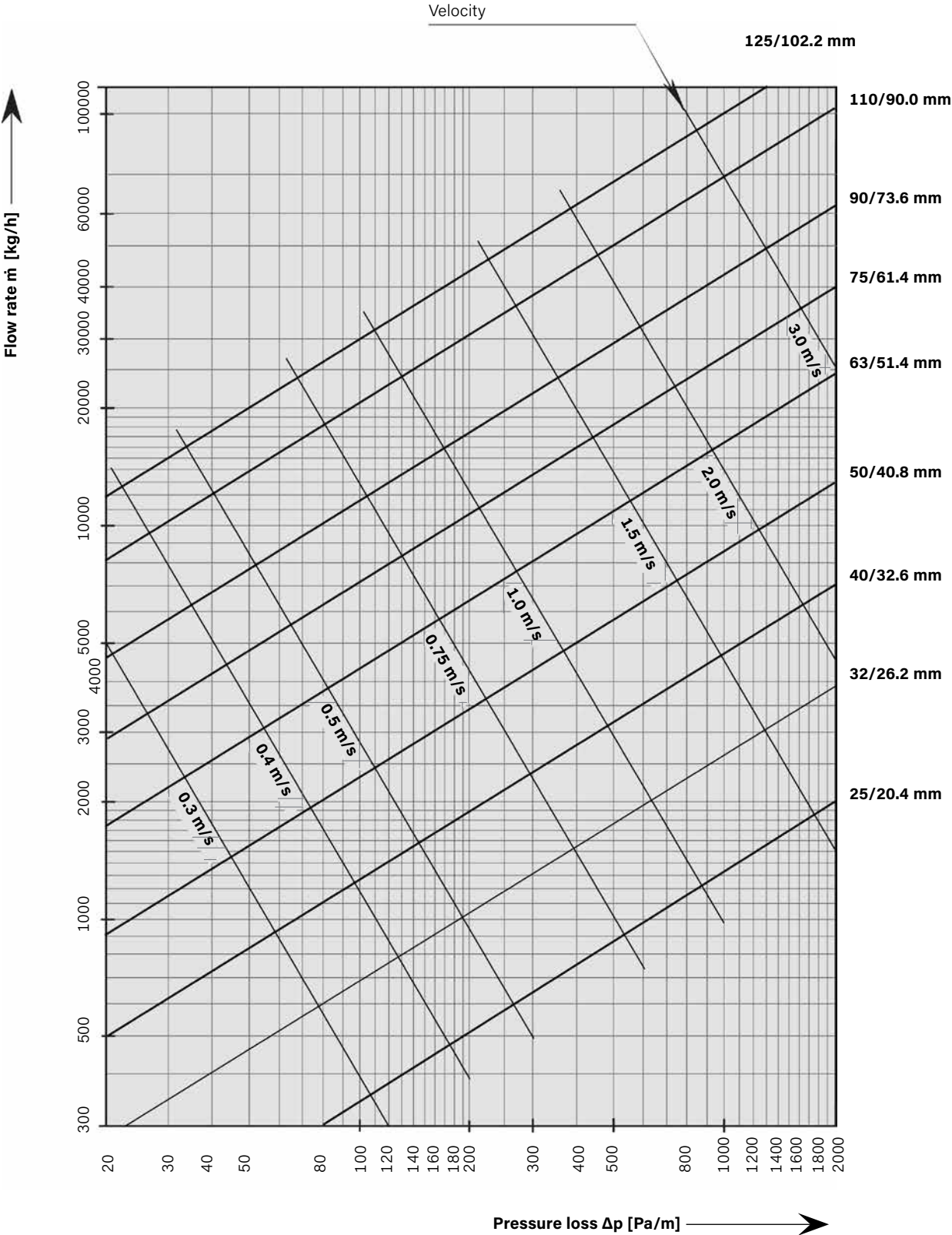


Pressure loss chart for ethylene glycol concentration

SDR 11

Medium temperature 10 °C
Ethylene glycol 30 % concentration

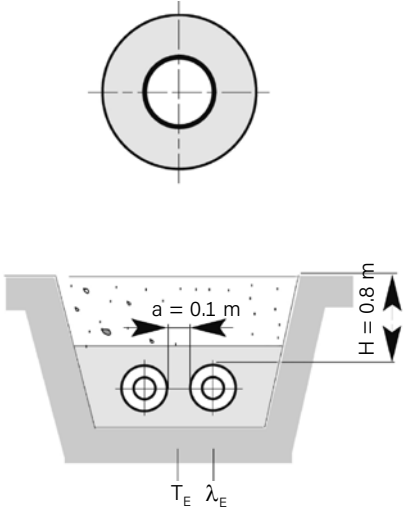
Roughness $\varepsilon = 0.01$ mm (PE100)



Energy losses

Laid in the ground

Heat losses q [W/m]						
COOLFLEX	U-value [W/mK]	Average operating temperature T _B [°C]				
		4°	8°	12°	16°	20°
25/ 76	0.1127	-0.68	-0.23	0.23	0.68	1.13
32/ 76	0.1392	-0.84	-0.28	0.28	0.84	1.39
40/ 91	0.1447	-0.87	-0.29	0.29	0.87	1.45
50/ 91	0.1857	-1.11	-0.37	0.37	1.11	1.86
63/126	0.1662	-1.00	-0.33	0.33	1.00	1.66
75/126	0.2076	-1.25	-0.42	0.42	1.25	2.08
90/162	0.1895	-1.14	-0.38	0.38	1.14	1.90
110/162	0.2557	-1.53	-0.51	0.51	1.53	2.56
125/182	0.2603	-1.56	-0.52	0.52	1.56	2.60
140/202	0.2642	-1.59	-0.53	0.53	1.59	2.64

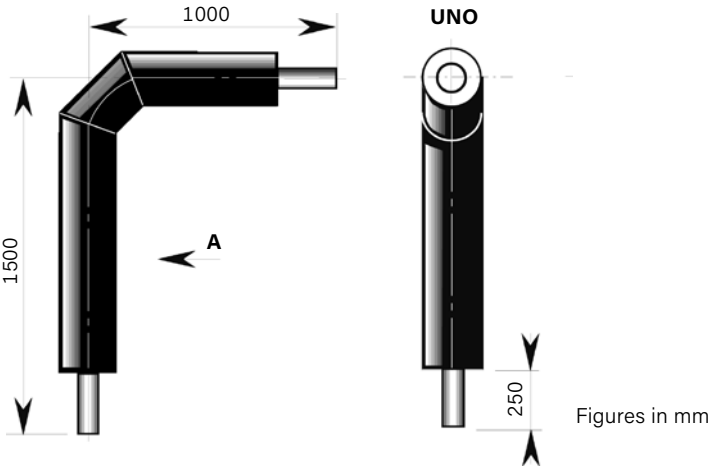


Installation type CLX: 2-pipe, laid in the ground
Pipe distance: a = 0.10 m
Cover above pipe: H = 0.80 m
Ground temperature: T_E = 10°C
Soil conductivity: λ_E = 1.2 W/mK
Conductivity of PUR foam: λ_{PU} = 0.0234 W/mK
Conductivity of PE pipe: λ_{PE} = 0.40 W/mK
Conductivity of PE casing: λ_{PE} = 0.33 W/mK

Heat loss during operation:
q = U (T_B - T_E) [W/m]
U = Heat transfer coefficient [W/mK]
T_B = Average operating temperature [°C]
T_E = Average ground temperature [°C]
VL= Flow
RL= Return

On request, we shall be glad to calculate the heat losses for surface mounted pipe systems.

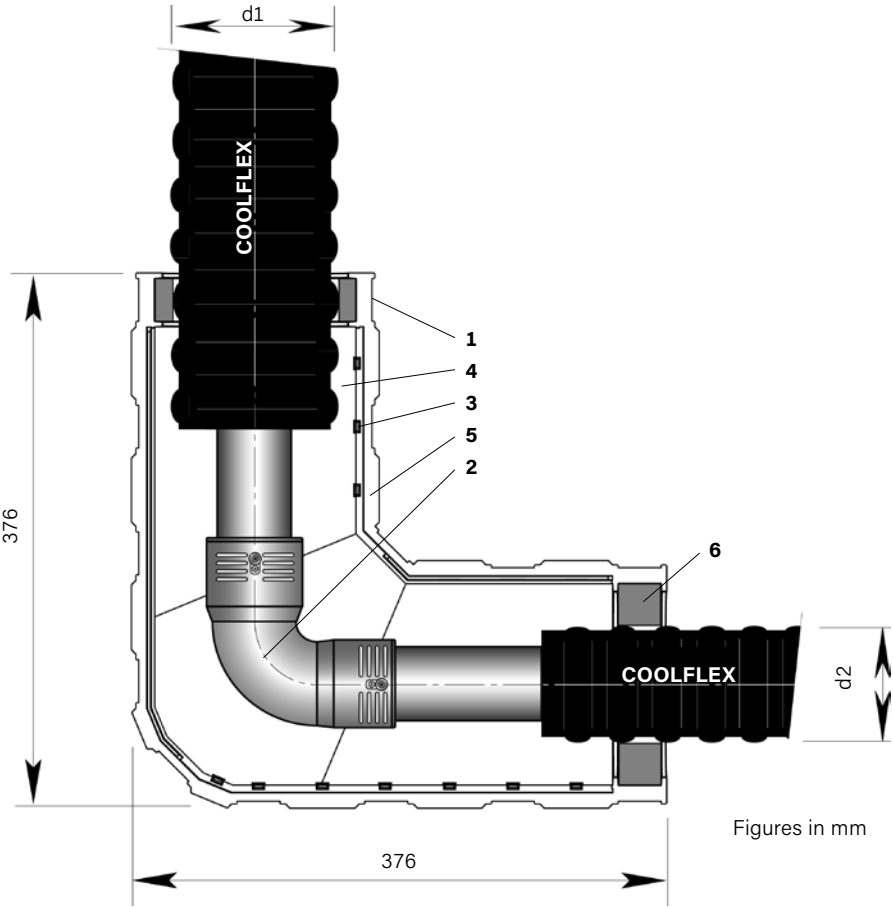
Bend, 90°



Type	PE inner pipe d x s mm	Outer pipe D x s1 mm	Volume Inner pipe l/m
25/ 76	25 x 2.3	75 x 4.5	0.327
32/ 76	32 x 2.9	75 x 4.5	0.539
40/ 91	40 x 3.7	90 x 3.5	0.835
50/ 91	50 x 4.6	90 x 3.5	1.307
63/126	63 x 5.8	125 x 4.8	2.091
75/126	75 x 6.8	125 x 4.8	2.961
90/162	90 x 8.2	160 x 4.9	4.254
110/162	110 x 10.0	160 x 4.9	6.362
125/182	125 x 11.4	180 x 5.5	8.200
140/202	140 x 12.7	202 x 4.9	10.310

COOLFLEX L-shell

Ø 76 - 126 mm



Figures in mm

COOLFLEX L-shell

Outer casing Ø d1	Ø d2		
	76	91	126
76	x		
91		x	
126			x

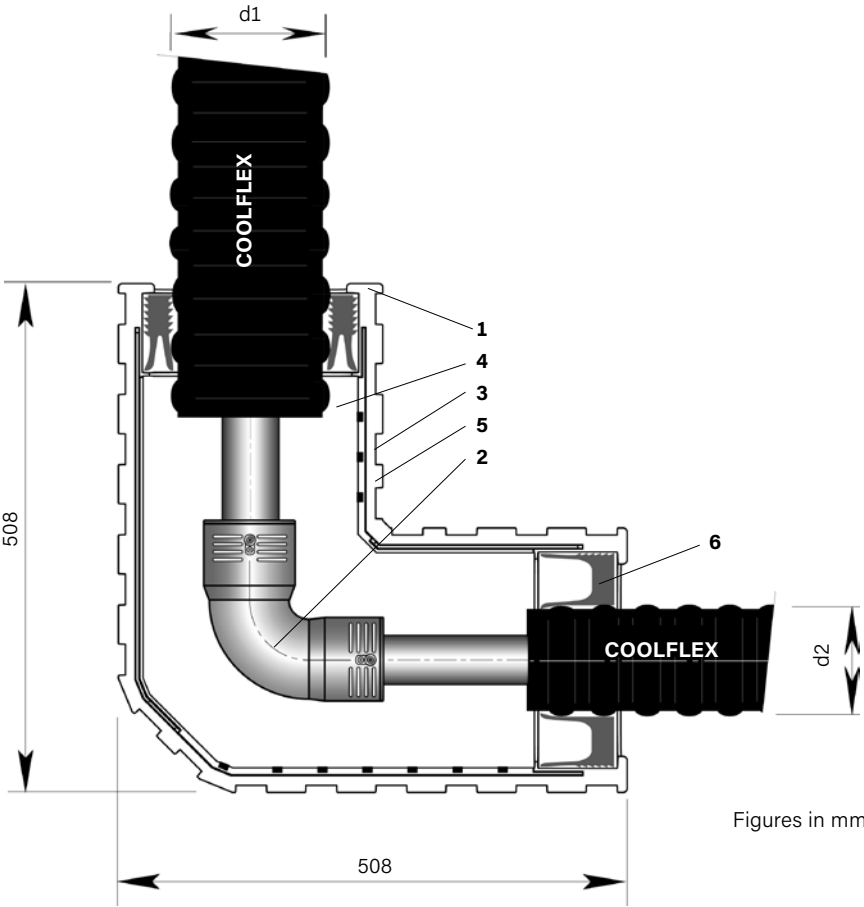
PE jointing methods; see CLX 2.350 - 2.360

Structure of the half-shell

- 1 ABS half-shells
- 2 PE fusion welded joints; see CLX 2.359
- 3 Sealing clamps (14 pcs.)
- 4 Insulation material; see CLX 2.345
- 5 Glued surface
- 6 Reducer ring or sealing ring

COOLFLEX Big L-shell

Ø 162 - 202 mm



Figures in mm

COOLFLEX Big L-shell

Outer casing Ø d1	Ø d2					
	76	91	126	162	182	202
76						
91						
126						
162				x		
182					x	
202						x

COOLFLEX Big-shells are freely reducible from Ø 202 mm to Ø 76 mm
PE jointing methods; see CLX 2.350 - 2.360

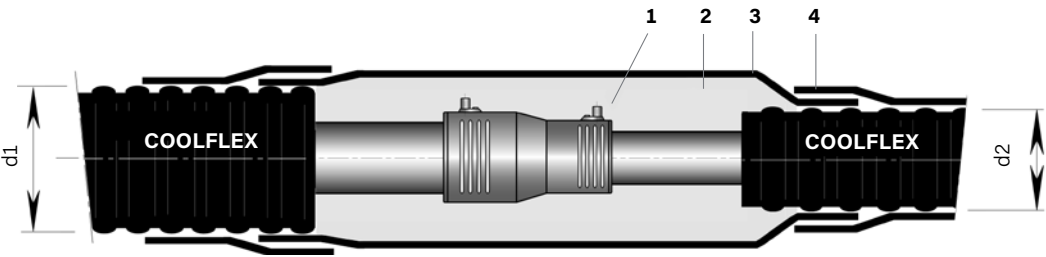
Structure of the half-shell

- 1 ABS half-shells
- 2 PE fusion welded joints; see CLX 2.359
- 3 Sealing clamps (24 pcs.)
- 4 Insulation material; see CLX 2.345
- 5 Glued surface
- 6 Reducer ring or sealing ring

Joint using PE-HD shrink sleeve

Dimensions Ø 76 - 202 mm

COOLFLEX joints and reduction joints



- 1 PE fusion welded joints; see CLX 2.359
- 2 Insulation material, PUR or PE; see CLX 2.345
- 3 Shrink sleeve pipe
- 4 Shrink hose

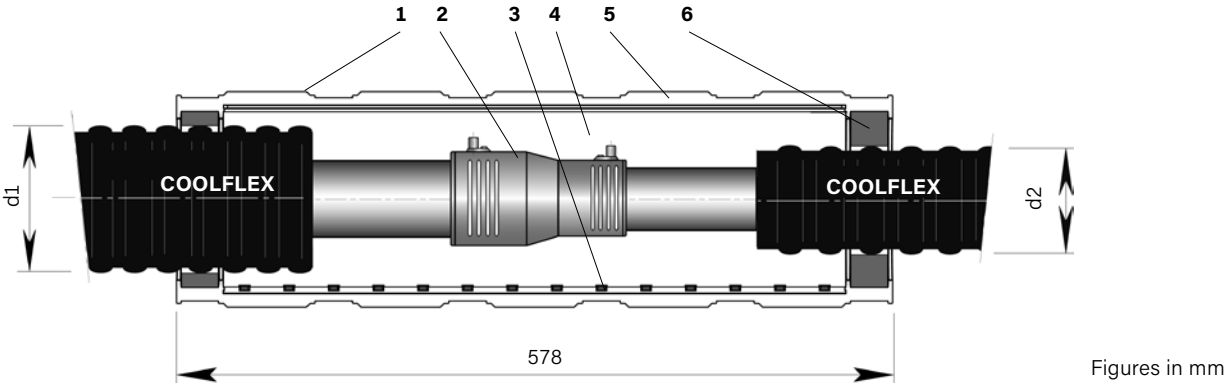
COOLFLEX - COOLFLEX

Ø d2	76	91	126	162	182	202
Ø d1	76	x				
	91	x	x			
	126	x	x	x		
	162			x	x	
	182			x	x	x
	202				x	x

PE jointing methods; see CLX 2.350 - 2.360

COOLFLEX I-shell

Ø 76 - 126 mm



COOLFLEX I-shell

Outer casing Ø d1	Ø d2		
	76	91	126
76	x		
91	x	x	
126	x	x	x

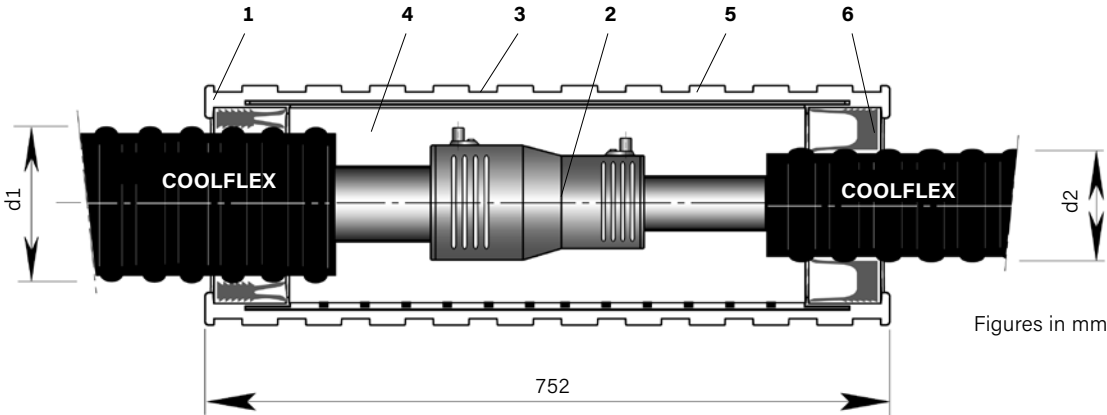
PE jointing methods; see CLX 2.350 - 2.360

Structure of the half-shell

- 1 ABS half-shells
- 2 PE fusion welded joints; see CLX 2.359
- 3 Sealing clamps (12 pcs.)
- 4 Insulation material; see CLX 2.345
- 5 Glued surface
- 6 Reducer ring or sealing ring

COOLFLEX Big I-shell

Ø 162 - 202 mm



COOLFLEX Big I-shell

Outer casing Ø d1	Ø d2					
	76	91	126	162	182	202
76						
91						
126						
162			x	x		
182				x	x	
202				x	x	x

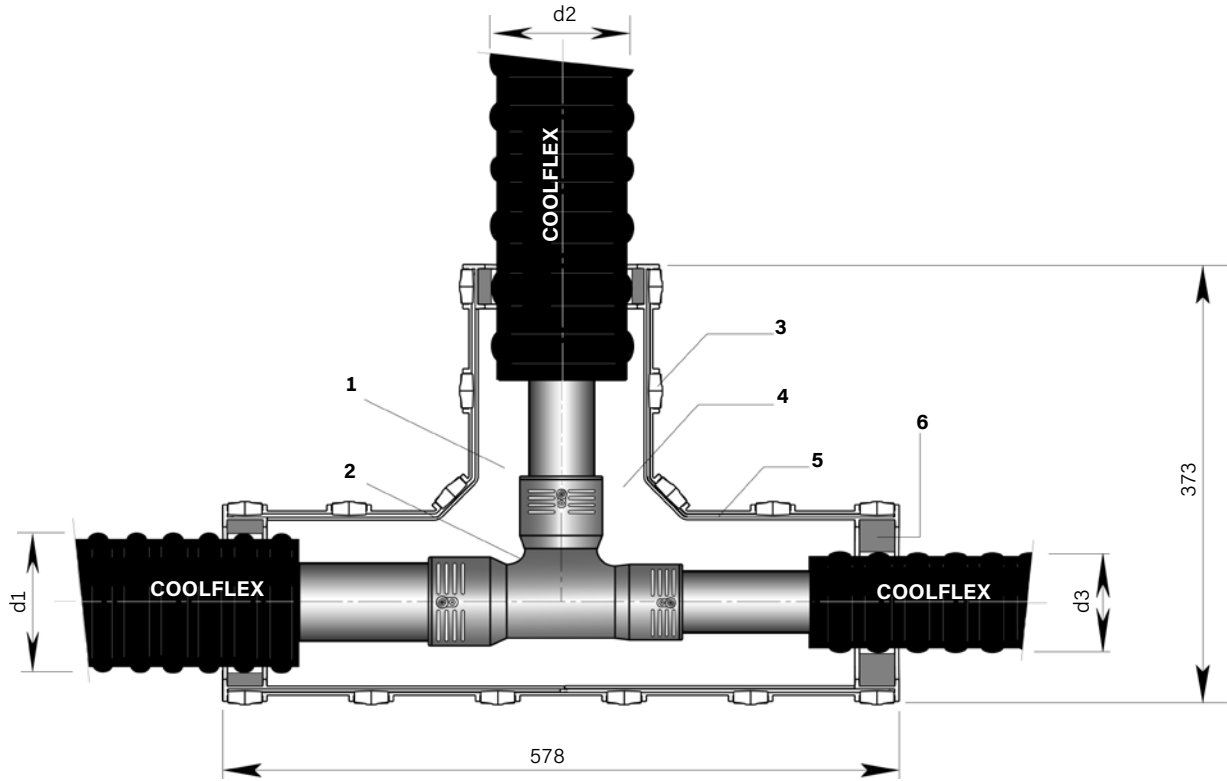
COOLFLEX Big-shells are freely reducible from Ø 202 mm to Ø 76 mm
PE jointing methods; see CLX 2.350 - 2.360

Structure of the half-shell

- 1 ABS half-shells
- 2 PE fusion welded joints; see CLX 2.359
- 3 Sealing clamps (22 pcs.)
- 4 Insulation material; see CLX 2.345
- 5 Glued surface
- 6 Reducer ring or sealing ring

COOLFLEX T-shell

Ø 76 - 126 mm



Figures in mm

COOLFLEX T-shell

Outer pipe Ø d1 - Ø d3	Branch, Ø d2		
	76	91	126
76 - 76	x	x	x
91 - 91	x	x	x
91 - 76	x	x	x
126 - 126	x	x	x
126 - 91	x	x	x
126 - 76	x	x	x

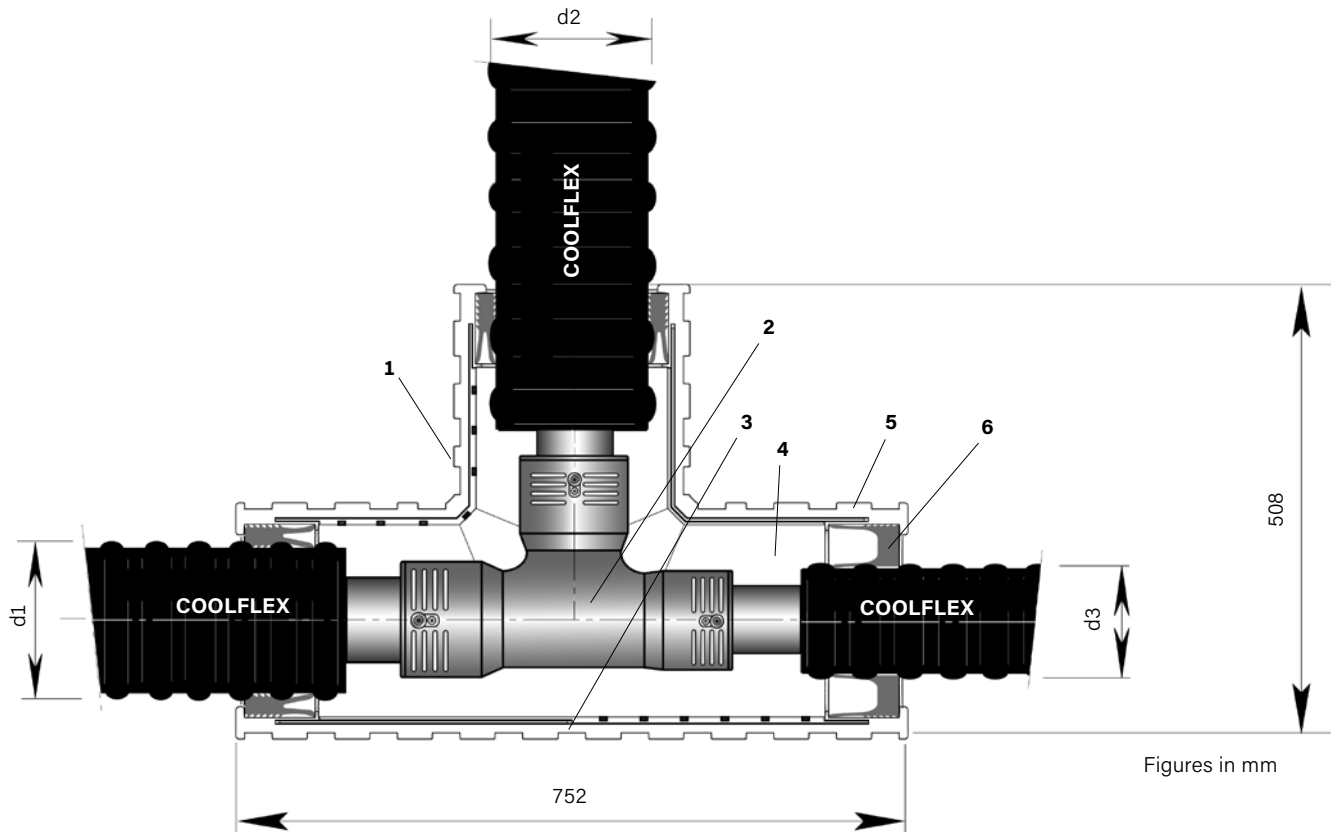
PE jointing methods; see CLX 2.350 - 2.360

Structure of the half-shell

- 1 ABS half-shells
- 2 PE T-piece; see CLX 2.359
- 3 Sealing clamps (16 pcs.)
- 4 Insulation material; see CLX 2.345
- 5 Glued surface
- 6 Reducer ring or sealing ring

COOLFLEX Big T-shell

Ø 162 - 202 mm



COOLFLEX Big T-shell

Outer pipe Ø d1 - Ø d3	Branch, Ø d2					
	76	91	126	162	182	202
162 - 162	x	x	x	x	x	x
162 - 126	x	x	x	x	x	x
162 - 91	x	x	x	x	x	x
162 - 76	x	x	x	x	x	
182 - 182	x	x	x	x	x	x
182 - 162	x	x	x	x	x	x
182 - 126	x	x	x	x	x	x
182 - 91	x	x	x	x	x	x
182 - 76	x	x	x	x	x	x
202 - 202	x	x	x	x	x	x
202 - 182	x	x	x	x	x	x
202 - 162	x	x	x	x	x	x
202 - 126	x	x	x	x	x	x
202 - 91	x	x	x	x	x	x
202 - 76	x	x	x	x	x	x

PE jointing methods; see CLX 2.350 - 2.360

Structure of the half-shell

- 1 ABS half-shells
- 2 PE T-piece; see CLX 2.359
- 3 Sealing clamps (27 pcs.)
- 4 Insulation material; see CLX 2.345
- 5 Glued surface
- 6 Reducer ring or sealing ring

Insulation material

DN 20 - DN 125

Insulation material for shrink joints and shell systems

PUR foam containers

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

The required quantity of polyurethane foam is delivered in suitable container sizes for the various joints and T-pieces. The components are supplied separately in two bottles, and are only mixed together when needed. Please note the safety regulations in the installation instructions supplied with the product.



Safety regulations

Protective goggles and gloves must be worn during the foaming process.

Synthetic gloves



Protective goggles



Screwed connectors

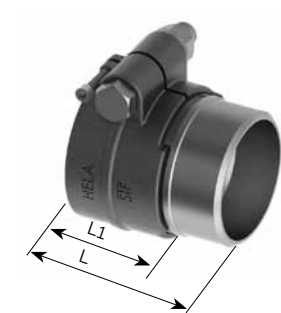
Outer thread, weld end

Connection with external thread



COOLFLEX (Cooling, 16 bar at 20° C)		
Material: brass		
PE-pipe mm	Screwed connector mm	L/L1 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
75 x 6.8	75 x 6.8-2½"	107/53
90 x 8.2	90 x 8.2-3"	119/58
110 x 10.0	110 x 10.0-4"	135/70
125 x 11.4	125 x 11.4-5"	144/69
140 x 12.7	140 x 12.7-4"	145/70

Connection with weld end

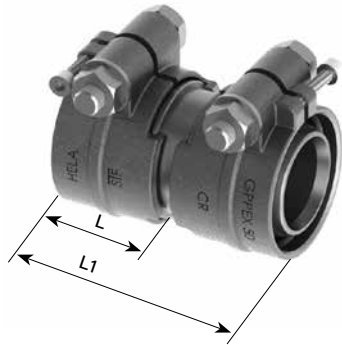


COOLFLEX (Cooling, 16 bar at 20° C)		
Material: steel		
PE-pipe mm	Weld end mm	L/L1 mm
25 x 2.3	26.9 x 2.3	61/26
32 x 2.9	33.7 x 2.6	63/29
40 x 3.7	42.4 x 2.6	75/36
50 x 4.6	48.3 x 2.6	84/36
63 x 5.7	60.3 x 2.9	88/46
75 x 6.8	76.1 x 2.9	101/53
90 x 8.2	88.9 x 3.2	108/58
110 x 10.0	114.3 x 3.6	114/70
125 x 11.4	114.3 x 3.6	120/69
140 x 12.7	139.7 x 3.6	120/75

Screwed connector

Coupling: equal, elbow 90°

Coupling, equal



COOLFLEX (Cooling, 16 bar at 20° C)		
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
75 x 6.8	75 x 6.8	128/52
90 x 8.2	90 x 8.2	144/58
110 x 10.0	110 x 10.0	168/70
125 x 11.4	125 x 11.4	167/69
140 x 12.7	140 x 12.7	-
160 x 14.6	160 x 14.6	168/70

On request reduced couplings (soldered) are available

Elbow 90°



COOLFLEX (Cooling, 16 bar at 20° C)	
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
75 x 6.8	75 x 6.8
90 x 8.2	90 x 8.2
110 x 10.0	110 x 10.0
125 x 11.4	125 x 11.4
140 x 12.7	140 x 12.7

Electrofusion fittings

Dimension Ø 25 - 140 mm

T-piece equal



COOLFLEX	
(Cooling, 16 bar at 20° C)	
Material: cross-linked polyethylene	
PE-pipe	
mm	
25	
32	
40	
50	
63	
75	
90	
110	
125	
140	

Angle piece, 90°



COOLFLEX	
(Cooling, 16 bar at 20° C)	
Material: cross-linked polyethylene	
PE-pipe	PE-pipe
mm	mm
25	25
32	32
40	40
50	50
63	63
75	75

T-piece equal (without welding socket)



COOLFLEX	
(Cooling, 16 bar at 20° C)	
Material: cross-linked polyethylene	
PE-pipe	
mm	
25	
32	
40	
50	
63	
75	
90	
110	
125	
140	

Angle piece, 90° (without welding socket)



COOLFLEX	
(Cooling, 16 bar at 20° C)	
Material: cross-linked polyethylene	
PE-pipe	PE-pipe
mm	mm
90	90
110	110
125	125
140	140

Sleeves



COOLFLEX	
(Cooling, 16 bar at 20° C)	
Material: cross-linked polyethylene	
PE-pipe	PE-pipe
mm	mm
25	25
32	32
40	40
50	50
63	63
75	75
90	90
110	110
125	125
140	140

(Source: Georg Fischer
Rohrleitungssysteme AG)

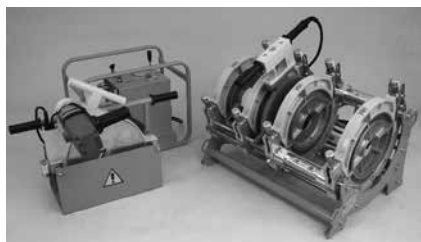
The electrofusion couplers for PE connections must only be installed by trained personnel using suitable welding equipment.

All connection techniques listed on this sheet are available on request.

PE jointing methods

Alternative connections

Butt fusion



(Source: PF-Schweisstechnologie GmbH)

Mechanical pipe couplings



To join:

plastic to plastic, or
plastic to metal pipes
Ø 40 - 250 mm

(Source: Straub Werke AG)

All jointing methods listed on this sheet are available on request.

End caps

Shrink end cap UNO



EPDM end cap UNO



LD-PE end cap UNO



COOLFLEX

Type

- 25/ 76
- 32/ 76
- 40/ 91
- 50/ 91
- 63/126
- 75/126
- 90/162
- 110/162
- 125/182
- 140/202

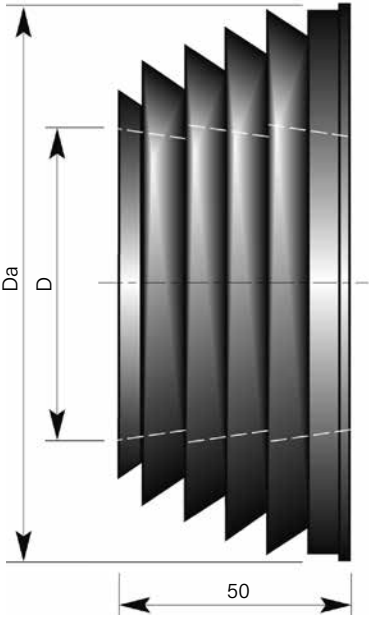
LD-PE end caps are pushed on and are suitable for dry rooms.

EPDM end caps offer optimum protection against splash water, moisture and vermin.
With precise markings for cutting off the collars. Can be fitted without special tools.
If a pre-insulated pipe ends in the ground, stainless steel clamping straps must be used on site.

Wall sealing ring

for wall openings

Wall sealing ring

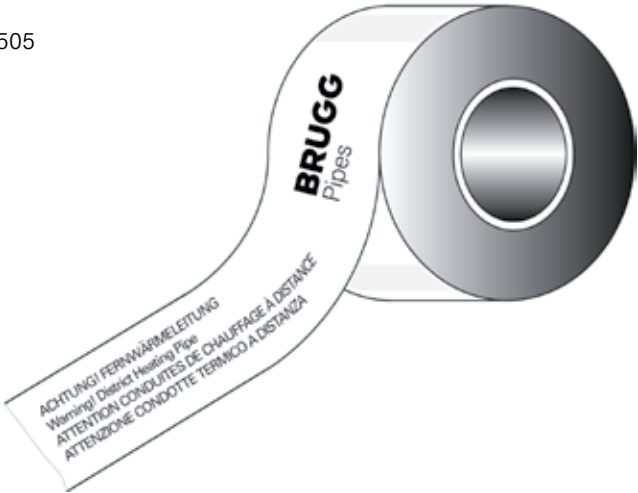


COOLFLEX

Type CLX	Da
25/ 76	118
32/ 76	118
40/ 91	133
50/ 91	133
63/126	168
75/126	168
90/162	203
110/162	203
125/182	223
140/202	230

Pipe warning tape

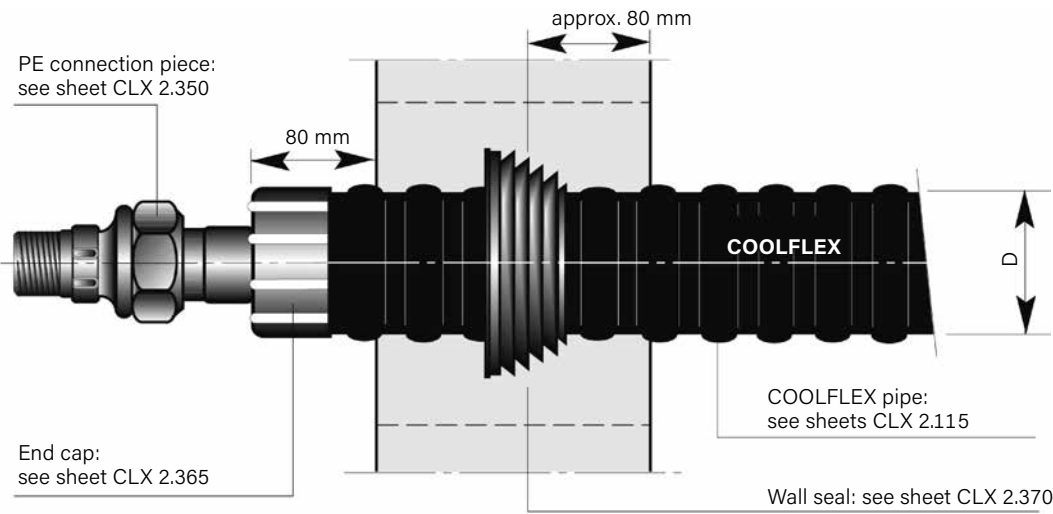
- To be laid in the ground
- Standard roll length: 250 m
- Installation depth: see sheet CLX 2.505



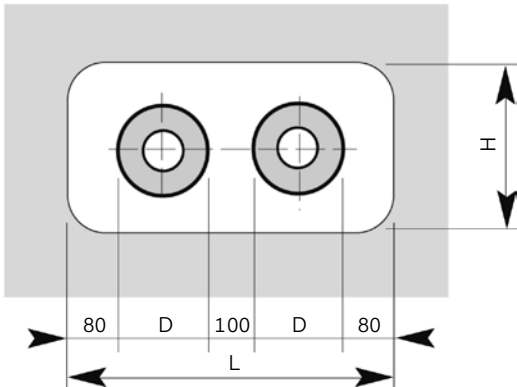
Building entry

Wall opening

Wall leadthrough



Wall opening



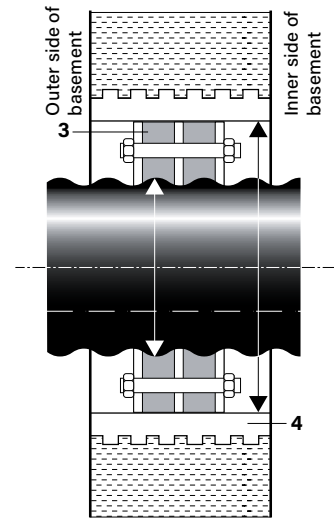
Figures in mm

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

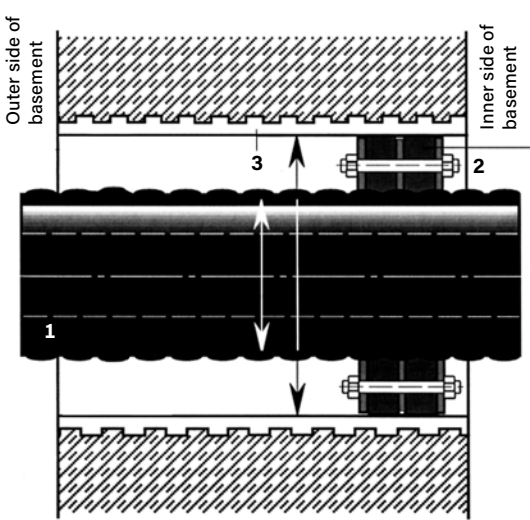
Wall seal

Core bores/cement liner pipes

Standard



With additional centering ring



- 1 COOLFLEX district cooling pipe
- 2 Seal set, double-seal* suitable for pressure from water up to 0.5 bar
2 x 40 mm, Shore hardness D 35
- 3 Liner pipe: made of fibre cement or coated core bore

Core bores

Perfect bores are required for installation. As hairline cracks may be present in the concrete or result from drilling, it is advisable to seal the entire length of the borehole with suitable sealant (such as AQUAGARD).

Tightness can only be guaranteed if this recommendation is followed.

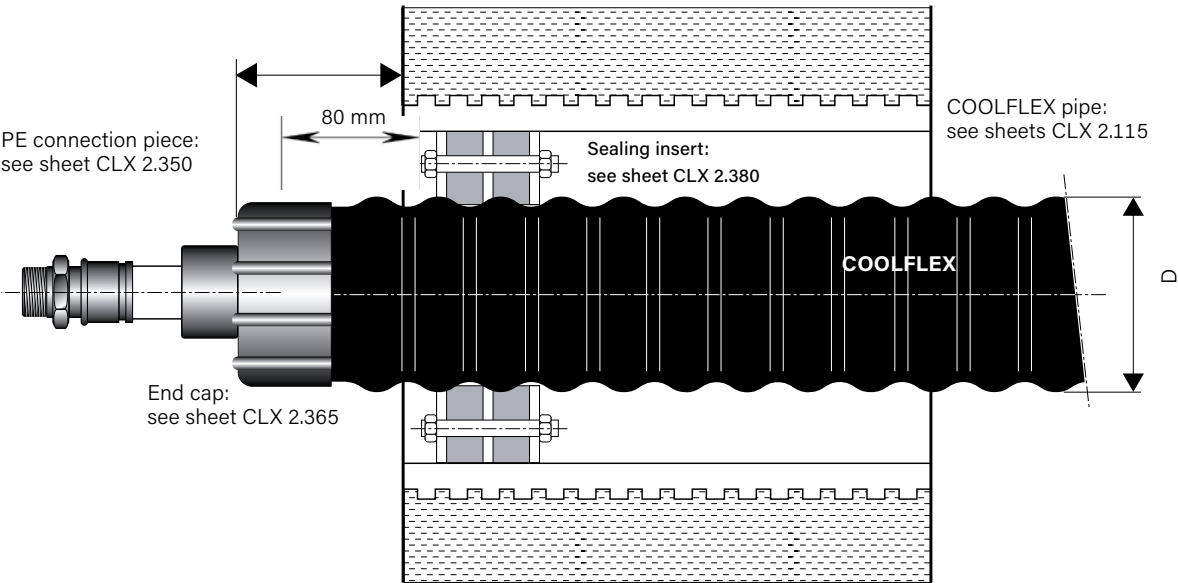
Outer pipe Ø R mm	Liner pipe, core bore Ø D mm	Seal set Ø innen mm	Core bore Ø mm
76	150	78 - 85	150
91	150	86 - 94	150
111	200	105 - 115	200
126	200	125 - 135	200
142	200	137 - 145	200
162	250	157 - 165	250
182	250	180 - 190	250

Building entry (see sheet CLX 2.375)

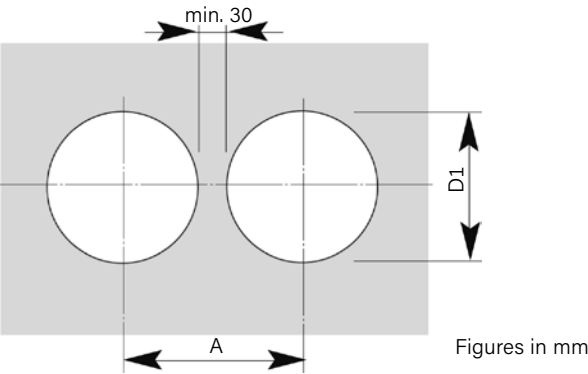
Building entry

Core bores/cement pipe liners

Wall leadthrough



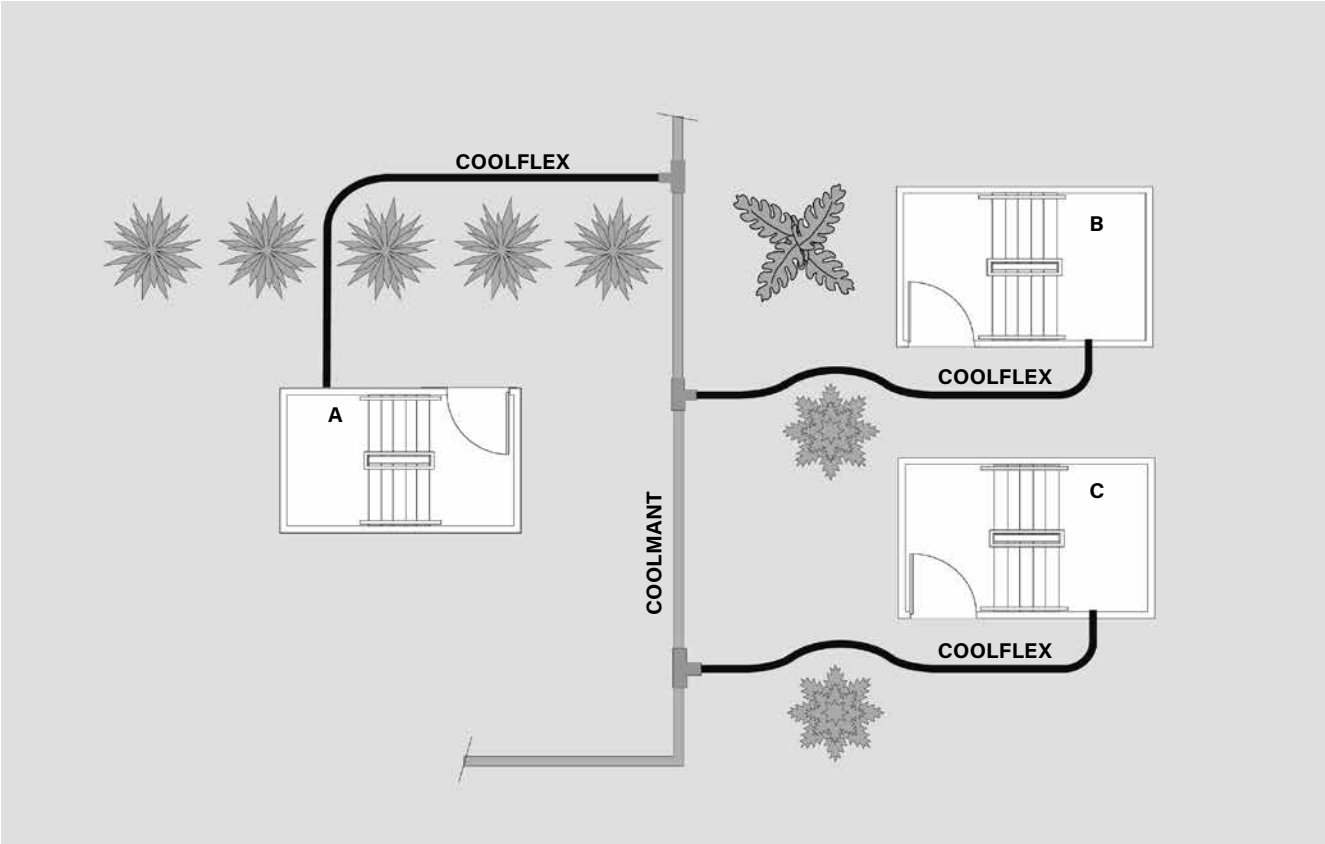
Core bores



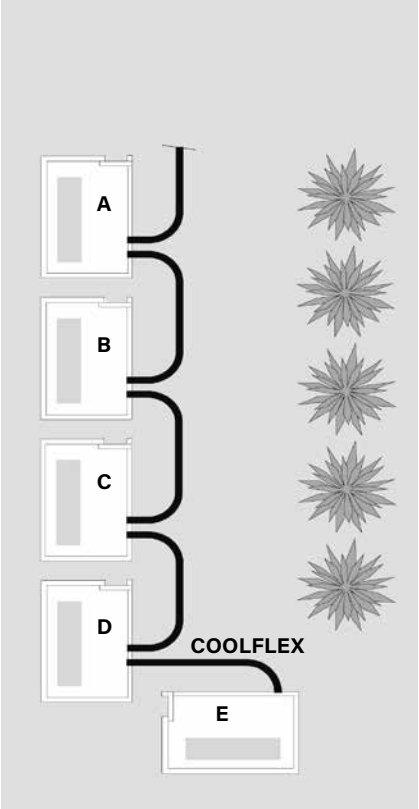
Outer casing Ø D	D1	A
mm	mm	mm
78	180	150
93	180	150
113	230	200
128	230	200
143	230	200
163	280	250
183	280	250
202	280	250

Pipe routing

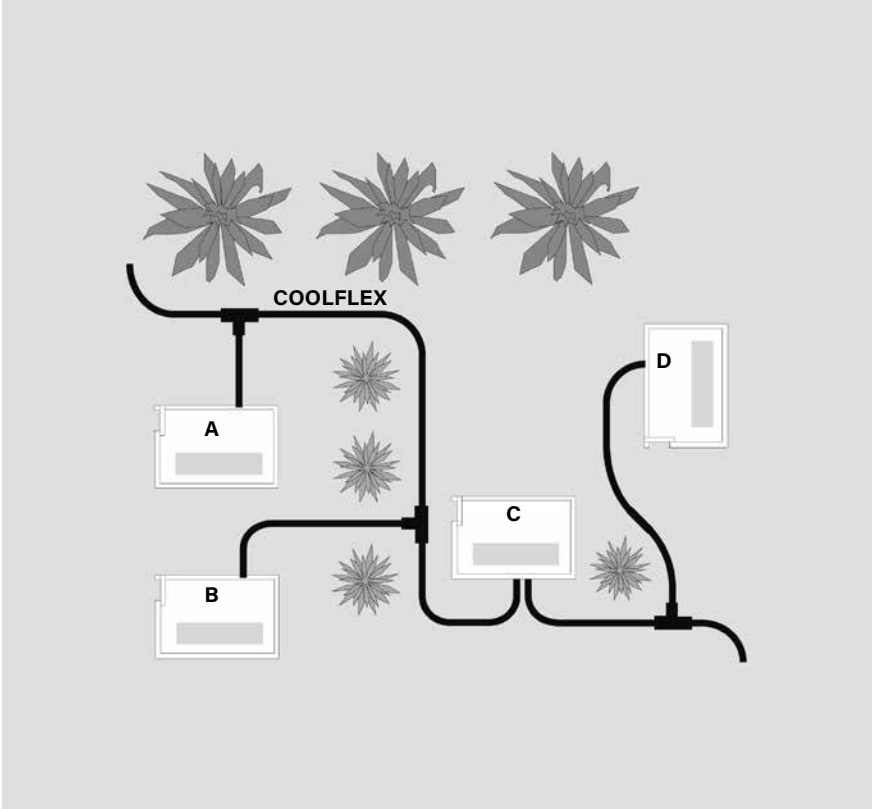
COOLFLEX - COOLMANT connection



Loop-in method



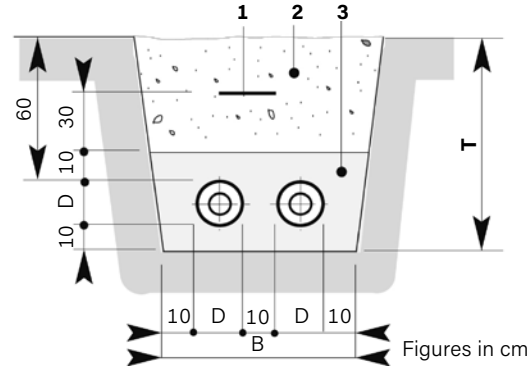
COOLFLEX - COOLFLEX connection



Trench dimensions

Trench profile, 2 COOLFLEX pipes

UNO



- 1 Pipe warning tape; see sheet CLX 2.370
- 2 Excavated material
- 3 Sand, washed, max. grain size 8 mm

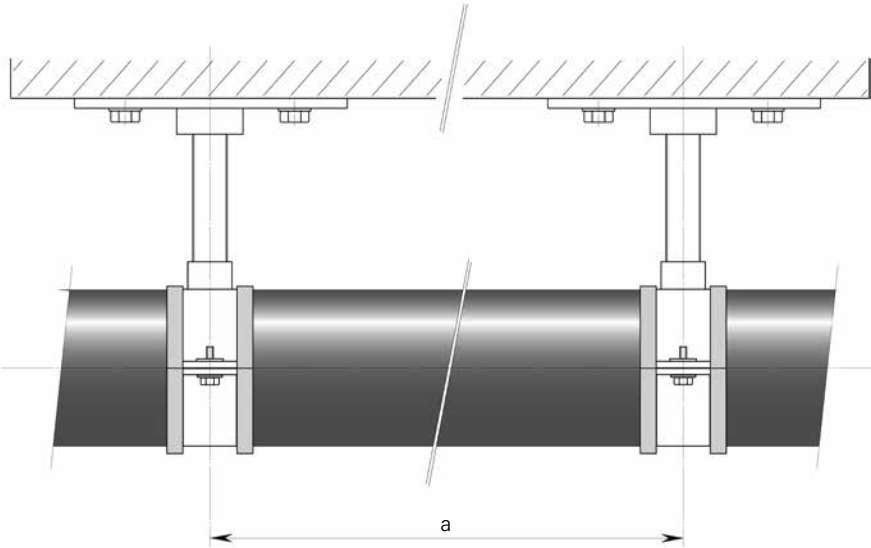
Casing pipe Ø D mm	Width B cm	Depth T cm
78	45	80
93	50	80
113	55	85
128	55	85
143	60	85
163	65	90
183	70	95
202	75	95

Installation depth:
max. installation depth: 2.6 m
Our approval is required for installation at greater depths.

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

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

Surface installation



Special measures are required for surface installation of COOLFLEX district cooling pipes:

- Provide supports for changes of direction
- Secure with clamps and pressure distribution plates at specified intervals, in the 90° bend
- Clamps
- Fix ends with fixed points
- Assistance with design engineering and planning from BRUGG

Type	Weight including water kg/m	Minimum Bending radius m	distance between clamps a m
25/ 76	1.2	0.7	0.6
32/ 76	1.5	0.7	0.8
40/ 91	2.2	0.8	1.0
50/ 91	2.8	0.8	1.2
63/126	4.7	1.0	1.4
75/126	5.7	1.0	1.7
90/162	8.8	1.2	1.8
110/162	12.1	1.2	2.1
125/182	14.6	1.4	2.2
140/202	18.7	1.4	2.4