TWIN PIPE
STAR PIPE SYSTEM

STAR PIPE
Polska

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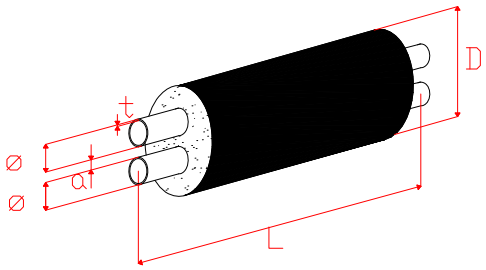
1.INTRODUCTION



Twin pipe STAR PIPE

STAR PIPE TWIN PIPE is a pipe system in which the feed and return pipes are integrated in the same casing pipe. This both reduces the cost of installing the pipe network and minimises heat loss during operation (20-30% less heat loss compared with a conventional preinsulated pipe system, depending on the dimensions).

TWIN PIPE goes in the trench with the feed and return service pipes positioned one above the other with the feed pipe at the bottom.

STAR PIPE TWIN PIPE is a rigid-foam system. The pipes are insulated with environmentally friendly cyclopentane foam, which ensures that heat loss is kept to an absolute minimum.

STAR PIPE TWIN PIPE is a complete pipe system that includes both pre-insulated pipes with a steel service pipe supplied in lengths of 6, 12 m. The range also includes a complete system of fittings and joints, which means that the pipe system can be adapted to any task.

The system offers a full range of components in dimensions from DN20 up to and including DN150.

STAR PIPE TWIN PIPE can be supplied with or without alarm wires.

STAR PIPE TWIN PIPE follows the cold-laying principle, i.e. no compensators, expansion loops or the like are used. Prestressing can be used if necessary.

The steel pipes are secured in relation to each other in the fittings by means of welded fixing plates in order to neutralise different expansion forces from the feed and return pipes. In straight sections the steel pipes are not secured by means of welded plates. Here the forces are neutralised by the foam. Since it is a rigid-foam system, the resulting expansion of the foam-joined pipe pair is equivalent to the expansion from the mean temperature of the feed and return pipes.

The max. operating temperature for STAR PIPE TWIN PIPE is 140°C for steel service pipes.

The max. temperature difference between the feed and return pipes is 60°C.

The space requirement for the pipe trench is 10 cm at the sides – plus an additional space requirement at joint holes and min. 60 cm of cover.

STAR PIPE TWIN PIPE produced by our company meet certificates AT/2000-02-0890-02 and standard PN-EN 15698

2. TECHNICAL SPECIFICATIONS

2.1. Straight pipes:

Steel service pipe – standard straight pipes:

Type	Longitudinally welded steel pipes as per EN253
Material	P235 TR1, P235 TR2, P235 Gh
Production	PN-EN 10217-1, PN-EN 10217-2
Certificate	EN 10204 - 3.1
Welding edge	Ø ≥ 88.9 mm, welding edges as per DIN2559/2.2

Outside diameter / wall thickness:

DN	Longitudinally welded steel pipes mm	Seamless steel pipes mm
20	26,9 x 2,3	26,9 x 2,3
25	33,7 x 2,6	33,7 x 2,6
32	42,3 x 2,6	42,3 x 2,6
40	48,3 x 2,6	48,3 x 2,6
50	60,3 x 2,9	60,3 x 2,9
65	76,1 x 2,9	76,1 x 2,9
80	88,9 x 3,2	88,9 x 3,2
100	114,3 x 3,6	114,3 x 3,6
125	139,7 x 3,6	139,7 x 4,0
150	168,3 x 3,6	168,3 x 4,5

Seamless steel pipes are supplied to order. Other wall thicknesses and material qualities are available on request.

2.2. Bends:

Steel service pipe – horizontal bends:

Type	Longitudinally welded steel pipes as per EN253
Material	P235 TR1, P235 TR2, P235 Gh
Production	PN-EN 10217-1, PN-EN 10217-2
Certificate	EN 10204 - 3.1
Welding edge	Ø ≥ 88.9 mm, welding edges as per DIN2559/2.2
Bending radius	2.5 x d

Steel service pipe – vertical bends:

Type	Longitudinally welded steel pipes as per EN253
Material	P235 TR1, P235 TR2, P235 Gh
Production	PN-EN 10217-1, PN-EN 10217-2
Certificate	EN 10204 - 3.1
Welding edge	Ø ≥ 88.9 mm, welding edges as per DIN2559/2.2
Bending radius	2.5 x d (outside, cold-bent), 1.5 x d (inside, welded)

Outside diameter / wall thickness – horizontal and vertical bends:

DN	Longitudinally welded steel pipes mm	Seamless steel pipes mm
20	26,9 x 2,3	26,9 x 2,3
25	33,7 x 2,6	33,7 x 2,6
32	42,3 x 2,6	42,3 x 2,6
40	48,3 x 2,6	48,3 x 2,6
50	60,3 x 2,9	60,3 x 2,9
65	76,1 x 2,9	76,1 x 2,9
80	88,9 x 3,2	88,9 x 3,2
100	114,3 x 4,0	114,3 x 3,6
125	139,7 x 4,0	139,7 x 4,0
150	168,3 x 4,5	168,3 x 4,5

Seamless steel pipes are supplied to order. Other wall thicknesses and material qualities are available on request.
Other dimensions and variants – angles of inclination, etc. – made to order.

2.3. T-pieces:

Steel pipe – standard T-pieces:

Main pipe:

Type	Longitudinally welded steel pipes as per EN253
Material	P235 Gh
Wall thickness	As for straight seamless pipes as per table
Production	PN-EN 10217-2
Welding edge	Ø ≥ 88.9 mm, welding edges as per DIN2559/2.2
Certificate	EN 10204 - 3.1

Branch:

Type	Longitudinally welded steel pipes as per EN253
Material	P235 Gh
Wall thickness	As for straight seamless pipes as per table

2.4. Casing pipes:

Casing pipe – straight pipes and fittings:

Material	HDPE (High Density Polyethylene), Bimodal PE80
Production	Acc. EN 253
Surface treatment	Corona treatment
Density	$\geq$ 935 kg/m^3
Yield point	22 N/mm^2
Elongation at fracture	$\geq$ 650% zgodnie z ISO 6259
CLT – long-term mechanical properties	EN253, point 4.3.1.4, 4 N/mm^2 at 80°C min. 1000 hours
Melt flow index	0.4 – 0.8 g/10 min. as per ISO1133, cond. 18
Thermal conductivity coefficient	0,4 W/mK

Casing pipe – straight pipes and fittings – dimensions / wall thicknesses:

PEH casing Straight pipes		**PEH casing Fittings**	
Outside diameter mm	**Wall thickness (min.) mm**	**Outside diameter mm**	**Wall thickness mm**
125	3,0	125	3,5
140	3,0	140	3,7
160	3,0	160	3,9
180	3,0	180	4,4
200	3,2	200	4,9
225	3,4	225	5,5
250	3,6	250	6,1
315	4,1	315	6,2
400	4,8	400	7,8
450	5,2	450	8,8

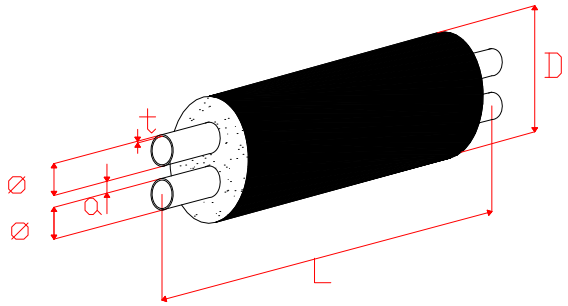
2.5. Polyurethane foam:

PUR insulation:

Material	PUR (polyurethane), blowing agent cyclopentane, 100% freon free
Production	as per EN253
Thermal conductivity coefficient	λ = 0,027 W/mK zgodnie z DIN 52613
Max. operating temperature	140°C (estimated service life min. 30 years)
Density	$\geq$ 60 kg/m^3 core density
Water absorption	$\leq$ 10%
Proportion of open cells	$\geq$ 88%
Tangential shear stress	$\geq$ 0.20 N/mm^2 (aged as per EN253
Axial shear stress	$\geq$ 0.12 N/mm^2 (aged as per EN253)
Compressive strength at 10% deformation	$\geq$ 0.30 N/mm^2

3. PRODUCT RANGE

3.1. Straight pipes

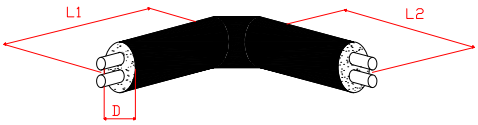


STAR PIPE can supply the following dimensions as standard:

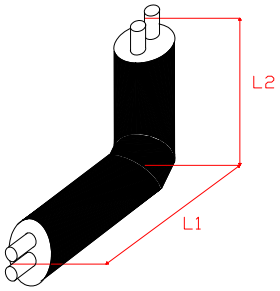
Outside diameter of steel pipe ø [mm]	DN	Spacing a [mm]	Wall thick-ness t [mm]	Length L [m]	Weight [kg/m]	Capacity [l/m]	Casing pipe dimension D [mm]
26,9+26,9	20	19	2,3	6	4,7	0,8	125
33,7+33,7	25	19	2,6	6	6,4	1,2	140
42,4+42,4	32	19	2,6	6/12	8,0	2,2	160
48,3+48,3	40	19	2,6	6/12	8,8	3,0	160
60,3+60,3	50	20	2,9	6/12	12,5	4,6	200
76,1+76,1	65	20	2,9	6/12	15,5	7,8	225
88,9+88,9	80	25	3,2	6/12	19,3	10,8	250
114,3+114,3	100	25	3,6	6/12	28,6	17,8	315
139,7+139,7	125	30	3,6	6/12/16	38,8	27,6	400
168,3+168,3	150	40	4,0	6/12/16	52,3	40,4	450

Other dimensions and wall thicknesses can be supplied to order..

3.2. Bends



Horizontal bend



Vertical bend

STAR PIPE can supply the following dimensions in horizontal and vertical versions as standard.

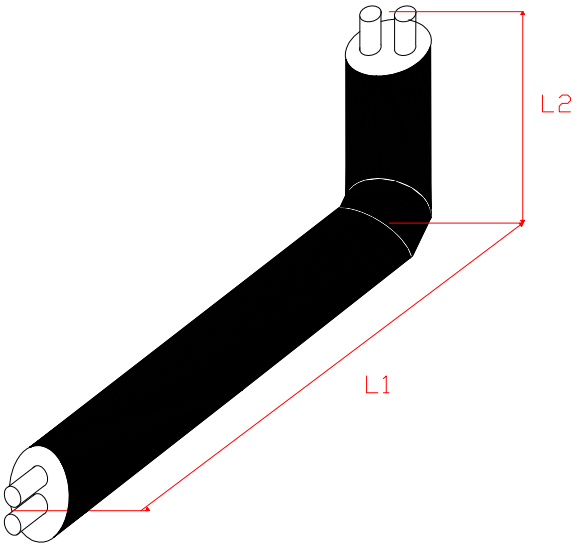
Standard angle 90°.

Outside diameter of steel pipe ø [mm]	DN	Spacing a [mm]	Wall thickness t [mm]	Casing pipe dimension D [mm]	Leg lengths L_1 x L_2 [m]
26,9+26,9	20	19	2,3	125	1 x 1
33,7+33,7	25	19	2,6	140	1 x 1
42,4+42,4	32	19	2,6	160	1 x 1
48,3+48,3	40	19	2,6	160	1 x 1
60,3+60,3	50	20	2,9	200	1 x 1
76,1+76,1	65	20	2,9	225	1 x 1
88,9+88,9	80	25	3,2	250	1 x 1
114,3+114,3	100	25	3,6	315	1 x 1
139,7+139,7	125	30	4,0	400	1,2 x 1,2
168,3+168,3	150	40	4,0	450	1,2 x 1,2

Other angles, dimensions and wall thicknesses can be supplied to order.

Reinforced bends can be supplied.

3.3. In-lead bends



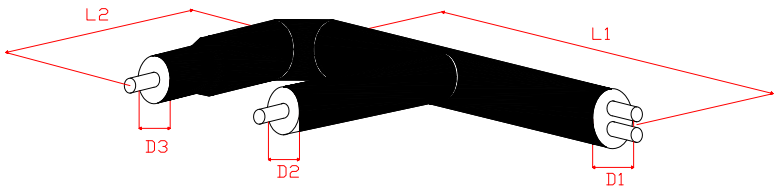
STAR PIPE can supply the following dimensions in horizontal and vertical versions as standard.

Standard angle 90°.

Outside diameter of steel pipe ø [mm]	DN	Spacing a [mm]	Wall thickness t [mm]	Casing pipe dimension D [mm]	Leg lengths L_1 x L_2 [m]	Leg lengths L_1 x L_2 [m]	Leg lengths L_1 x L_2 [m]	Leg lengths L_1 x L_2 [m]
26,9+26,9	20	19	2,3	125	1 x 2	1 x 3	1 x 4	1 x 5
33,7+33,7	25	19	2,6	140	1 x 2	1 x 3	1 x 4	1 x 5
42,4+42,4	32	19	2,6	160	1 x 2	1 x 3	1 x 4	1 x 5
48,3+48,3	40	19	2,6	160	1 x 2	1 x 3	1 x 4	1 x 5
60,3+60,3	50	20	2,9	200	1 x 2	1 x 3	1 x 4	1 x 5
76,1+76,1	65	20	2,9	225	1 x 2	1 x 3	1 x 4	1 x 5
88,9+88,9	80	25	3,2	250	1 x 2	1 x 3	1 x 4	1 x 5
114,3+114,3	100	25	3,6	315	1 x 2	1 x 3	1 x 4	1 x 5
139,7+139,7	125	30	4,0	400	1,2 x 2	1,2 x 3	1,2 x 4	1,2 x 5
168,3+168,3	150	40	4,0	450	1,2 x 2	1,2 x 3	1,2 x 4	1,2 x 5

Other angles, dimensions and wall thicknesses can be supplied to order..

3.4. Connection bends



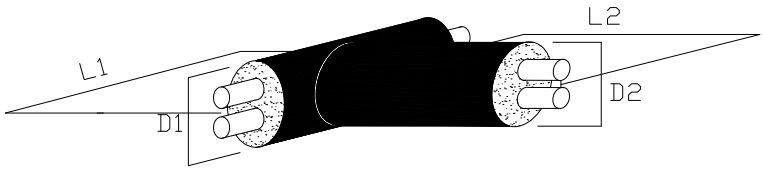
STAR PIPE can supply the following dimensions as standard.

Standard angle 90°.

Outside diameter of steel pipe ø [mm]	DN	Spacing a [mm]	Wall thickness t [mm]	Casing dimension D_1 [mm]	Casing dimension $D_2 + D_3$ [mm]	Leg lengths L_1 [m]	Leg lengths L_2 [m]
26,9+26,9	20	19	2,3	125	90	2	1
33,7+33,7	25	19	2,6	140	90	2	1
42,4+42,4	32	19	2,6	160	110	2	1
48,3+48,3	40	19	2,6	160	110	2	1
60,3+60,3	50	20	2,9	200	125	2	1
76,1+76,1	65	20	2,9	225	140	2	1
88,9+88,9	80	25	3,2	250	160	2	1
114,3+114,3	100	25	3,6	315	200	2	1
139,7+139,7	125	30	4,0	400	225	2	1
168,3+168,3	150	40	4,0	450	250	2	1

Other casing dimensions and wall thicknesses can be supplied to order.

3.5. T-pieces, without jump



STAR PIPE can supply the following dimensions as standard.

Main pipe [mm]	Branch pipe from - to [mm]	Wall thickness main pipe [mm]
26,9+26,9/125	26,9+26,9/125 - 26,9+26,9/125	2,3
33,7+33,7/140	26,9+26,9/125 - 33,7+33,7/140	2,6
42,4+42,4/160	26,9+26,9/125 - 42,4+42,4/160	2,6
48,3+48,3/160	26,9+26,9/125 - 48,3+48,3/160	2,6
60,3+60,3/200	26,9+26,9/125 - 60,3+60,3/200	2,9
76,1+76,1/225	26,9+26,9/125 - 76,1+76,1/225	2,9
88,9+88,9/250	26,9+26,9/125 - 88,9+88,9/250	3,2
114,3+114,3/315	26,9+26,9/125 - 114,3+114,3/315	3,6
139,7+139,7/400	26,9+26,9/125 - 139,7+139,7/400	4,0
168,3+168,3/450	26,9+26,9/125 - 168,3+168,3/450	4,5

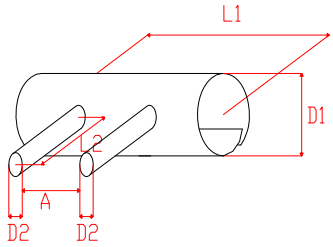
Table of main pipe lengths (L1).
The branch height (L2) is 1000 mm for all dimensions.

D1 \ D2		125	140	160	160	200	225	250	315	400	450
125	L1	1,0									
140	L1	1,0	1,0								
160	L1	1,0	1,0	1,0							
160	L1	1,0	1,0	1,0	1,0						
200	L1	1,0	1,0	1,0	1,0	1,0					
225	L1	1,0	1,0	1,0	1,0	1,0	1,3				
250	L1	1,0	1,0	1,0	1,0	1,0	1,0	1,3			
315	L1	1,0	1,0	1,0	1,0	1,0	1,0	1,3	1,3		
400	L1	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	
450	L1	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,5	1,5

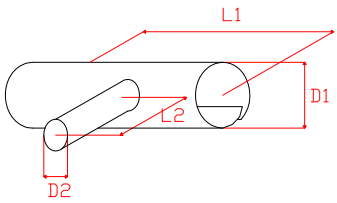
Other dimensions and wall thicknesses can be supplied to order.

Please note that the figures in the above table are based on free ends of 150 mm.

3.6. Assembly T-joints
a) PEH-assembly T-joints:



with single branch



with two branches

The PEH-assembly T-joint consists of a slotted main pipe casing with one or two branch casings welded on. Sealing is done with a slotted shrink sleeve with patch and a shrink sleeve respectively..

The STAR PIPE PEH-assembly T-joint with a single branch can be supplied in the following dimensions as standard.

The main pipe length – L1 – for branch dimensions ø 61 - ø125 = 450 mm
The main pipe length – L1 – for branch dimensions ø140 - ø200 = 500 mm
The main pipe length – L1 – for branch dimensions ø225 - ø250 = 500 mm

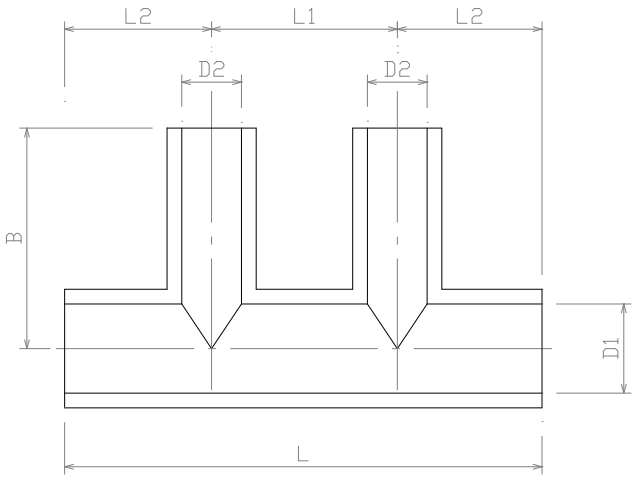
The branch length – L2 – is 500 mm for all dimensions.

The STAR PIPE PEH-assembly T-joint with two branches can be supplied in the following dimensions with a max. branch dimension of ø 125 as standard – to order. Ask for L1 measurement for actual dimension.
The branch length – L2 – is 500 mm for all dimensions.
The spacing – A – between the branches is 100 mm for D2 = ø63 and ø75, and 150 mm for all another dimensions.

D2 / D1	61	75	93	125	140	160	180	200	225	250	315	400	450
125	X	X	X										
140	X	X	X	X									
160	X	X	X	X	X								
180	X	X	X	X	X	X							
200	X	X	X	X	X	X	X						
225	X	X	X	X	X	X	X	X					
250	X	X	X	X	X	X	X	X	X				
315	X	X	X	X	X	X	X	X	X	X			
400	X	X	X	X	X	X	X	X	X	X			
450	X	X	X	X	X	X	X	X	X	X			

Other dimensions can be supplied to order.
Please note that the figures in the above table are based on free ends of 150 mm.

b) Split steel joint T - joints



The split steel T-joint can be used on pipes with a smooth casing and **is** suitable for use on Flex pipes provided that at least three seams in the sealing zone are filled with sealing strip. This is **not** necessary for Flex pipes with smooth casing.

The split steel joint is a single-seal joint that can be used on casing dimensions of ø90 to ø315. Because it is a single-seal joint, it cannot be recommended unreservedly for pipes that are exposed to frequent movements or are below the water table.

After installation the joint can be pressure-tested in accordance with EN 448.

The joint consists of two moulded metal half-shells, a complete set of hot-galvanised bolts, nuts and washers, one zinc sacrificial anode, sealing strip, two plugs and two Bitutene fobs.

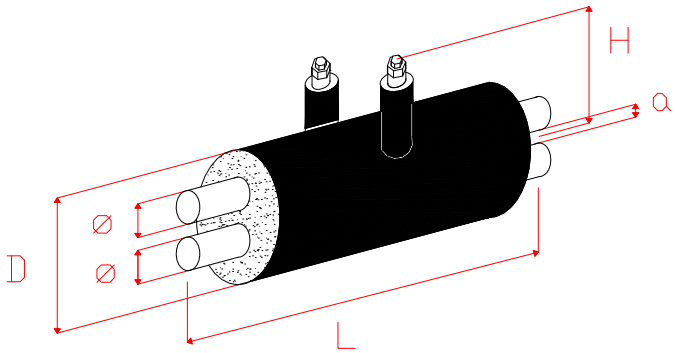
Sealing strip is used for ø90 – ø315 joints (ø10 mastic tape). **Sealing strip must be ordered separately.**

STAR PIPE can supply the following dimensions as standard.

D1 [mm] \ D2 [mm]		90	110	125	140	160	200
90	L [mm]	700					
	L1 [mm]	240					
	B [mm]	350					
110	L [mm]	700	700				
	L1 [mm]	240	260				
	B [mm]	360	360				
125	L [mm]	700	700	700			
	L1 [mm]	240	260	275			
	B [mm]	365	365	365			
140	L [mm]	700	700	700	700		
	L1 [mm]	240	260	275	290		
	B [mm]	373	373	373	373		
160	L [mm]	700	700	700	700	800	
	L1 [mm]	240	260	275	290	310	
	B [mm]	383	383	383	383	383	
200	L [mm]	700	700	700	700	800	800
	L1 [mm]	240	260	275	290	310	350
	B [mm]	403	403	403	403	403	403
225	L [mm]	700	700	700	700	800	800
	L1 [mm]	240	260	275	290	310	350
	B [mm]	415	415	415	415	415	415
250	L [mm]	700	700	700	700	800	800
	L1 [mm]	240	260	275	290	310	350
	B [mm]	428	428	428	428	428	428
315	L [mm]	700	700	700	700	800	800
	L1 [mm]	240	260	275	290	310	350
	B [mm]	458	458	458	458	458	458

Other dimensions can be supplied to order.

3.7. Valves

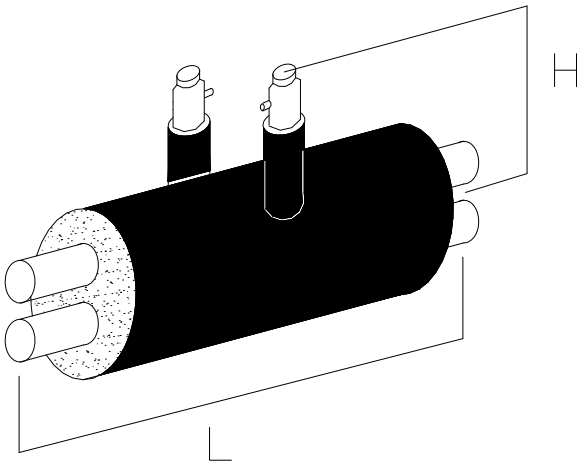


STAR PIPE can supply the following dimensions as standard.

Outside diameter of steel pipe ø [mm]	DN	Casing dimension D [mm]	Spacing a [mm]	Wall thickness t [mm]	Length L [m]	Spindle height H [mm]
26,9+26,9	20	125	19	2,3	1800	453
33,7+33,7	25	140	19	2,6	1800	460
42,4+42,4	32	160	19	2,6	1800	480
48,3+48,3	40	160	19	2,6	1800	490
60,3+60,3	50	200	20	2,9	1800	520
76,1+76,1	65	225	20	2,9	1800	533
88,9+88,9	80	250	25	3,2	2300	568
114,3+114,3	100	315	25	3,6	2300	620
139,7+139,7	125	400	30	3,6	2800	670
168,3+168,3	150	450	40	4,0	2800	720

Other dimensions, wall thicknesses or a specified make of ball valve can be supplied to order.

3.8. Drains/vents

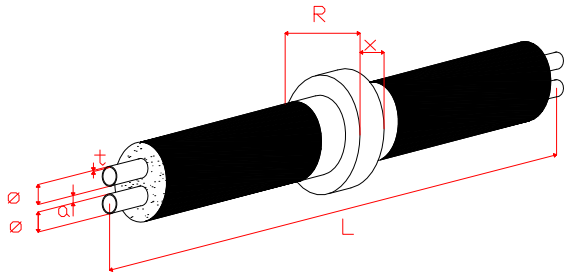


STAR PIPE can supply the following dimensions as standard.

Main pipe [mm]	Drain/vent [mm]	Length [mm]	Height [mm]	Wall thickness main pipe [mm]
48,3+48,3/160	48,3	1800	319	2,6
60,3+60,3/200	48,3	1800	325	2,9
76,1+76,1/225	48,3	1800	338	2,9
88,9+88,9/250	48,3	1800	354	3,2
114,3+114,3/315	48,3	1800	367	3,6
139,7+139,7/400	48,3	1800	390	3,6
168,3+168,3/450	48,3	1800	404	4,0

Other dimensions and wall thicknesses can be supplied to order.

3.9. Anchors



STAR PIPE can supply the following dimensions as standard.

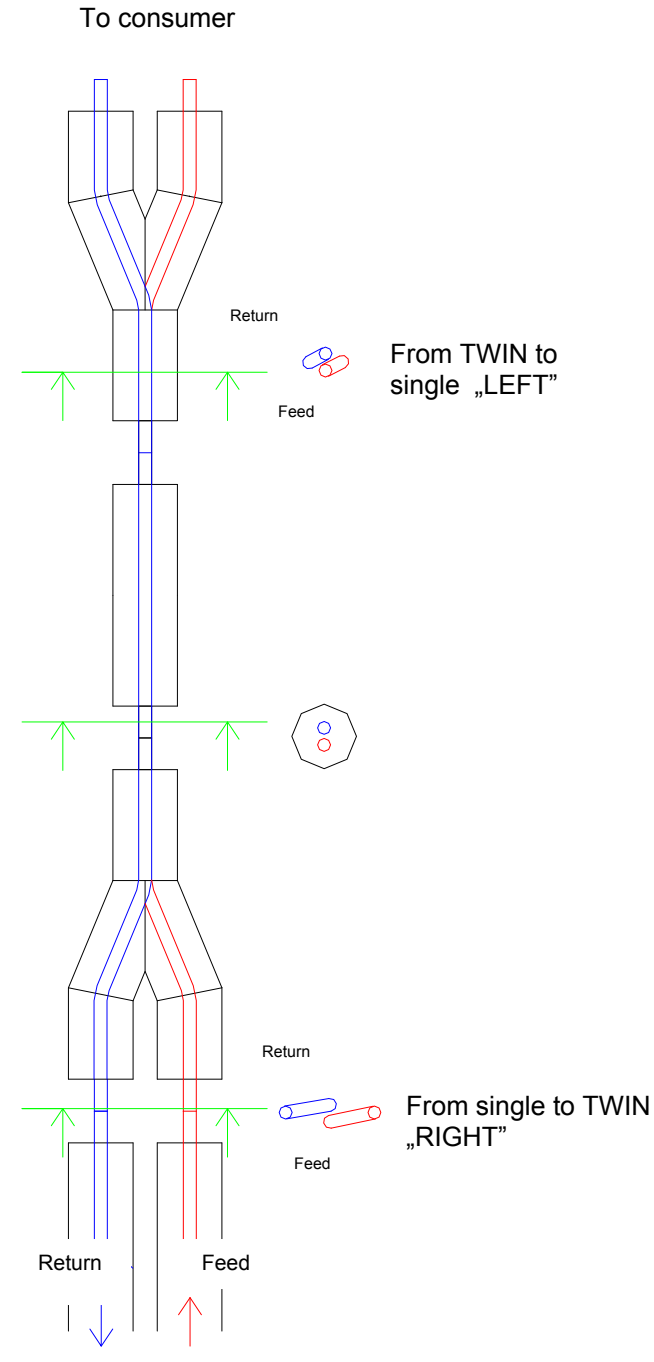
Outside diameter of steel pipe ø [mm]	DN	Casing pipe dimension D [mm]	Spacing a [mm]	Wall thickness t [mm]	Length L [m]	Flange diameter R [mm]	Flange thickness x [mm]
26,9+26,9	20	125	19	2,3	2000	230	16
33,7+33,7	25	140	19	2,6	2000	250	18
42,4+42,4	32	160	19	2,6	2000	270	20
48,3+48,3	40	160	19	2,6	2000	270	20
60,3+60,3	50	200	20	2,9	2000	310	20
76,1+76,1	65	225	20	2,9	2000	335	25
88,9+88,9	80	250	25	3,2	2000	365	25
114,3+114,3	100	315	25	3,6	2000	450	25
139,7+139,7	125	400	30	3,6	2000	560	30
168,3+168,3	150	450	40	4,0	2000	630	35

Other dimensions and wall thicknesses can be supplied to order.

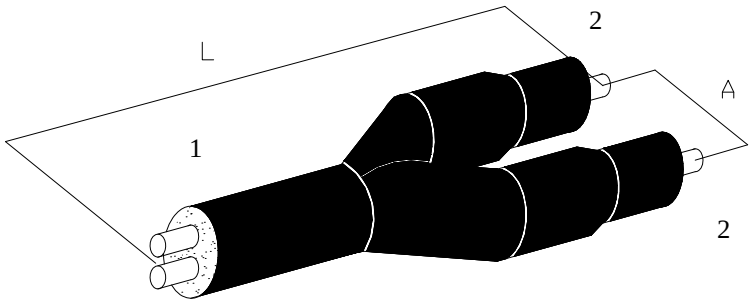
3.10. Y - pipes

a) Y - pipes – vertical – rotated right and left

Y- pipes are available as a combination of horizontal, vertical, rotated right or rotated left, all depending on where the component is to be installed in the system – see sketch.



b) Y - pipes – vertical – rotated right or left



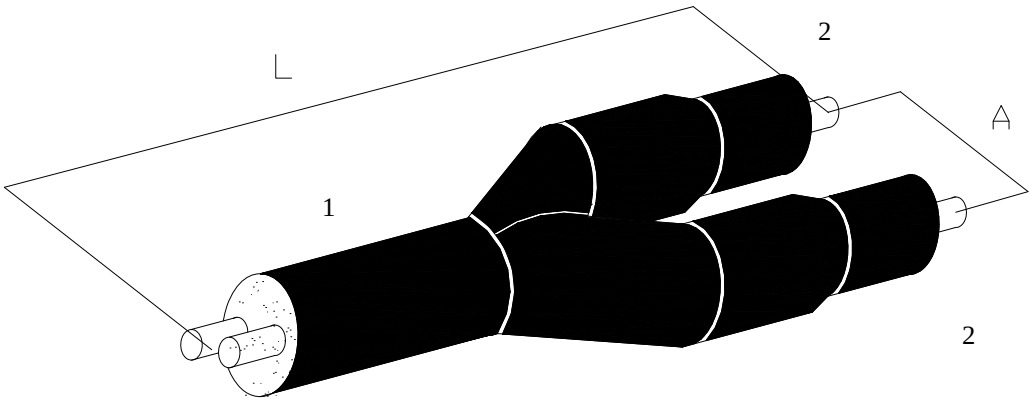
Y - pipes come rotated to the right or left, all depending on where in the system the component is to be installed – see sketch on next page.

STAR PIPE can supply the following dimensions as standard – in both versions.

Outside diameter of steel pipe ø [mm]	DN	Wall thickness t [mm]	Casing dimension 1 [mm]	Casing dimension 2 [mm]	Spacing A [mm]	Length L [mm]
26,9+26,9	20	2,3	125	110	275	2000
33,7+33,7	25	2,6	140	110	290	2000
42,4+42,4	32	2,6	160	125	310	2000
48,3+48,3	40	2,6	160	125	310	2000
60,3+60,3	50	2,9	200	140	350	2000
76,1+76,1	65	2,9	225	160	375	2000
88,9+88,9	80	3,2	250	180	400	2200
114,3+114,3	100	3,6	315	225	465	2200
139,7+139,7	125	4,0	400	250	550	2400
168,3+168,3	150	4,0	450	280	600	2400

Other dimensions and wall thicknesses can be supplied to order.

c) Y - pipes - horizontal

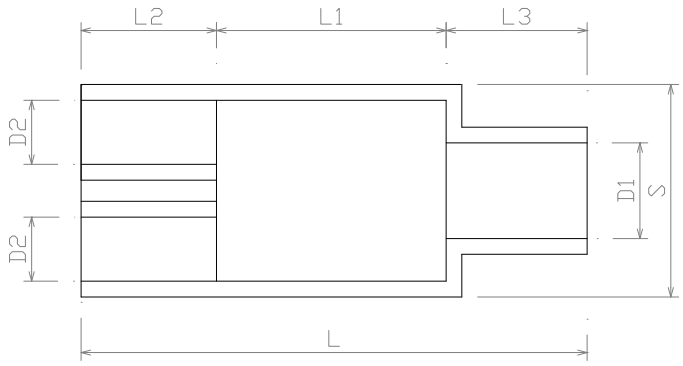


STAR PIPE can supply the following dimensions as standard – in both versions.

Outside diameter of steel pipe ø [mm]	DN	Wall thickness t [mm]	Casing dimension 1 [mm]	Casing dimension 2 [mm]	Spacing A [mm]	Length L [mm]
26,9+26,9	20	2,3	125	110	275	2000
33,7+33,7	25	2,6	140	110	290	2000
42,4+42,4	32	2,6	160	125	310	2000
48,3+48,3	40	2,6	160	125	310	2000
60,3+60,3	50	2,9	200	140	350	2000
76,1+76,1	65	2,9	225	160	375	2000
88,9+88,9	80	3,2	250	180	400	2200
114,3+114,3	100	3,6	315	225	465	2200
139,7+139,7	125	4,0	400	250	550	2400
168,3+168,3	150	4,0	450	280	600	2400

Other dimensions and wall thicknesses can be supplied to order.

d) Split steel Y joint



The split steel Y-joint can be used on pipes with a smooth casing and **is** suitable for use on Flex pipes provided that at least three seams in the sealing zone are filled with sealing strip. This is **not** necessary for Flex pipes with smooth casing.

The split steel joint is a single-seal joint that can be used on casing dimensions of ø90 to ø315. Because it is a single-seal joint, it cannot be recommended unreservedly for pipes that are exposed to frequent movements or are below the water table.

After installation the joint can be pressure-tested in accordance with EN 448.

The joint consists of two moulded metal half-shells, a complete set of hot-galvanised bolts, nuts and washers, one zinc sacrificial anode, sealing strip, two plugs and two Bitutene fobs.

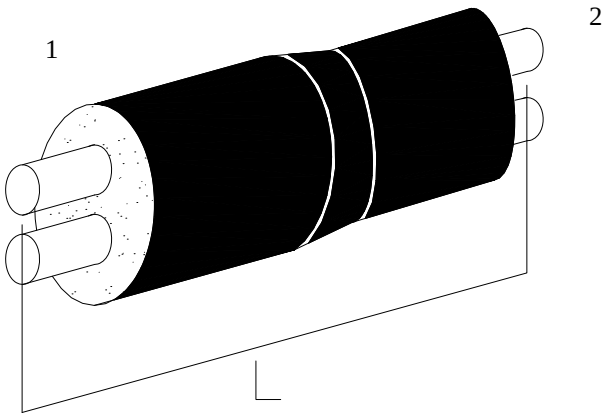
Sealing strip is used for ø90 – ø315 joints (ø10 mastic tape). **Sealing strip must be ordered separately.**

STAR PIPE can supply the following dimensions as standard.

dz [mm]	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
D1 [mm]	125	140	160	160	200	225	250	315
D2 [mm]	90	90	110	110	125	140	160	200
L [mm]	500	500	750	750	750	750	750	750
L1 [mm]	300	300	450	450	450	450	450	450
L2 [mm]	100	100	150	150	150	150	150	150
L3 [mm]	100	100	150	150	150	150	150	150

Other dimensions and wall thicknesses can be supplied to order.
Please note that the figures in the above table are based on free ends of 150 mm.

3.11. Reductions

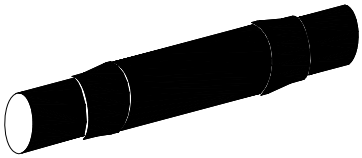


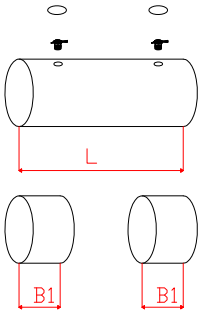
STAR PIPE can supply the following dimensions as standard.

Outside diameter of steel pipe 1 ø [mm]	DN 1	Casing dimension 1 D1 [mm]	Outside diameter of steel pipe 2 ø [mm]	DN 2	Casing dimension 2 D2 [mm]	Length L [mm]
33,7+33,7	25	140	26,9+26,9	20	125	1000
42,4+42,4	32	160	33,7+33,7	25	140	1000
48,3+48,3	40	160	42,4+42,4	32	160	1000
60,3+60,3	50	200	48,3+48,3	40	160	1000
76,1+76,1	65	225	60,3+60,3	50	200	1000
88,9+88,9	80	250	76,1+76,1	65	225	1000
114,3+114,3	100	315	88,9+88,9	80	250	1000
139,7+139,7	125	400	114,3+114,3	100	315	1500
168,3+168,3	150	450	139,7+139,7	125	400	1500

Other dimensions and wall thicknesses can be supplied to order.

3.12. Joints
a) Site joint





The site joint can be used on pipes with a smooth casing but is **not** suitable for use on Flex pipes.

The site joint is a single-seal joint that can be used on casing dimensions of ø90 to ø400. Because it is a single-seal joint, it cannot be recommended unreservedly for pipes that are exposed to frequent movements or are below the water table.

After installation and subsequent cooling the joint can be pressure-tested in accordance with EN 448.

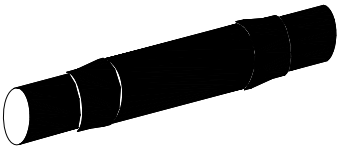
The joint consists of an HDPE pipe and two shrink sleeves (from ø ≥355 the sleeves consist of PE shrink sleeves with patch), two plugs and two Bitutene fobs. The joint can be furnished with welding plugs.

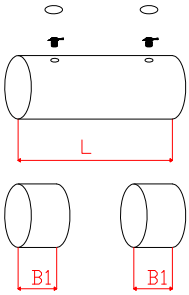
STAR PIPE can supply the following dimensions as standard.

Casing dimension D [mm]	Joint length L [mm]	Sleeve width B_1 [mm]
125	500	150
140	500	150
160	500	150
180	500	150
200	500	150
225	500	225
250	500	225
315	500	225
400	600	225

Other dimensions can be supplied to order.
Please note that the figures in the above table are based on free ends of 150 mm.

b) Shrink joint





The shrink joint can be used on pipes with a smooth casing and **is** suitable for use on Flex pipes provided that at least three seams in the sealing zone are filled with PIB500 sealing strip. This is **not** necessary for Flex pipes with smooth casing.

The shrink joint is a double-seal joint that can be used on casing dimensions of ø90 to ø560. Because it is a double-seal joint, it can be recommended for pipes that are exposed to frequent movements or are below the water table.

After installation and subsequent cooling the joint can be pressure-tested in accordance with EN 448.

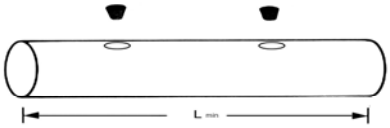
The joint consists of a broached PEH pipe with mastic on the inside at both ends and two shrink sleeves (from ø ≥355 the sleeves consist of PE shrink sleeves with patch), two plugs and two Bitutene fobs. The joint can be furnished with welding plugs.

STAR PIPE can supply the following dimensions as standard.

Casing dimension D [mm]	Joint length L [mm]	Sleeve width B_1 [mm]
125	500	150
140	500	150
160	500	150
180	500	150
200	500	150
225	500	225
250	500	225
315	500	225
400	600	225
450	600	225

Other dimensions can be supplied to order.
Please note that the figures in the above table are based on free ends of 150 mm.

c) Crosslinked shrink joint



The shrink joint can be used on pipes with a smooth casing and **is** suitable for use on Flex pipes provided that at least three seams in the sealing zone are filled with PIB500 sealing strip. This is **not** necessary for Flex pipes with smooth casing.

As standard, crosslinked shrink joint is delivered in plastic film with two airvent plugs (with venting holes) and two welding plugs. The joint is delivered with two foaming holes drilled in it and can be pressure tested. Right before welding plugs assemblage the holes must be extended.
The shape and size of the joint is matched with strictly specified pipe dimension. The use of sleeves at the end of the joint and additional cover of inlet holes after mounting the plugs is unnecessary. The shrink joint shrinks only on chalice area. Both ends of the joint are covered with hot-melt glue to avoid moisture penetration.

Radially crosslinked shrink joint perfectly match casing coat of preinsulated pipe what results in reduced friction in soil and increased joint resilience. The joint characterizes in high resistance to stress corrosion. It is immune to UV radiation, thereby no auto-shrink effect occurs in case of long sun exposure. Through high shrink force, ageing resistance, mechanical resistance to stress emerging during thermal expansion of the network, caused by variable temperature of the heating factor, the joint ensures long-lasting resilience of the heating network and preinsulated pipes joint safety.

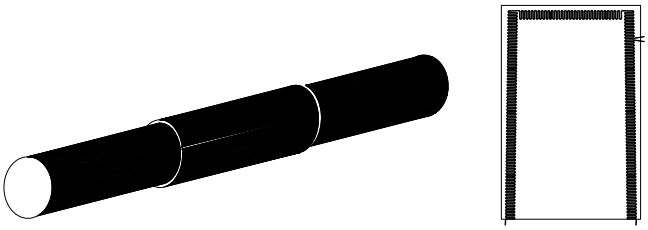
After installation and subsequent cooling the joint can be pressure-tested in accordance with EN 448

STAR PIPE can supply the following dimensions as standard.

Casing dimension D [mm]	Joint length L [mm]
125	680
140	680
160	680
180	680
200	680
225	680
250	680
315	680
400	680
450	680

Other dimensions can be supplied to order.
Please note that the figures in the above table are based on free ends of 150 mm.

d) welding joint



The welding joint can be used on pipes with a smooth casing but is **not** suitable for use on Flex pipes

The welding joint can be used on casing dimensions of ø90 to ø1200. Because the joint is welded to the main pipe casing, it can be recommended unreservedly for pipes that are exposed to frequent movements or are below the water table.

After installation and subsequent cooling the joint can be pressure-tested in accordance with EN 448.

The joint consists of an HDPE plate with integrated heating elements, a T-rail, two welding plugs and two bitutene fobs.

The t-rail and joint are fitted and furnished with clips. The joint is then welded with computer-controlled welding equipment. The joint must only be fitted and welded by trained personnel with a valid welder's certificate..

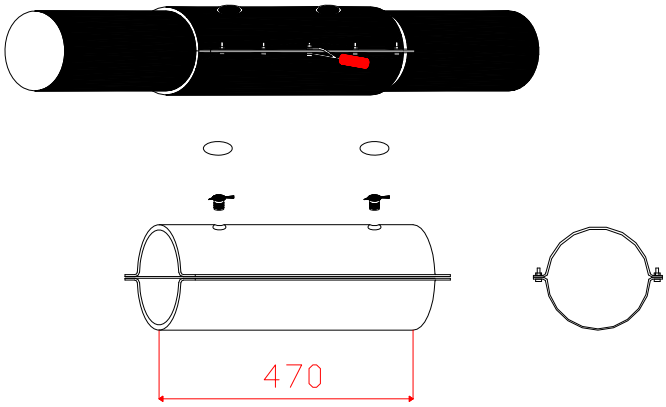
STAR PIPE can supply the following dimensions as standard.

Casing dimension D [mm]	Joint length L [mm]
250	670
315	670
400	670
450	670

Other dimensions can be supplied to order.

Please note that the figures in the above table are based on free ends of 150 mm.

e) Split steel joint



The split steel joint can be used on pipes with a smooth casing and **is** suitable for use on Flex pipes provided that at least three seams in the sealing zone are filled with sealing strip. This is **not** necessary for Flex pipes with smooth casing.

The split steel joint is a single-seal joint that can be used on casing dimensions of ø90 to ø315. Because it is a single-seal joint, it cannot be recommended unreservedly for pipes that are exposed to frequent movements or are below the water table.

After installation the joint can be pressure-tested in accordance with EN 448.

The joint consists of two moulded metal half-shells, a complete set of hot-galvanised bolts, nuts and washers, one zinc sacrificial anode, sealing strip, two plugs and two Bitutene fobs.

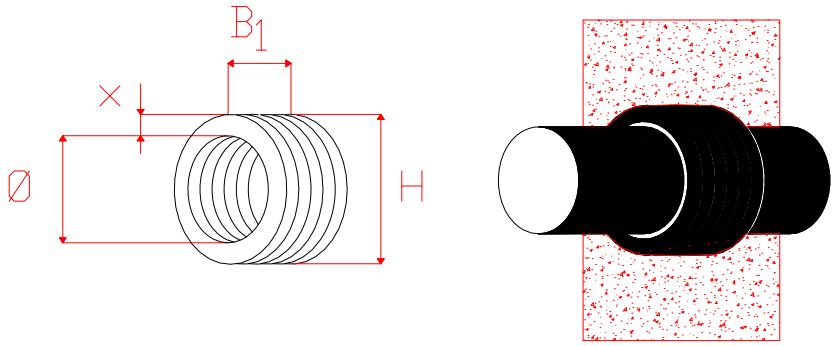
Sealing strip is used for ø90 – ø315 joints (ø10 mastic tape). **Sealing strip must be ordered separately.**

STAR PIPE can supply the following dimensions as standard.

Casing dimension D [mm]	Joint length L [mm]	Necessary sealing strip L [mm]
125	470	2000
140	470	2100
160	470	2200
180	470	2300
200	470	2400
225	470	2600
250	470	2800
315	470	3200

Other dimensions can be supplied to order if necessary. Please note that the figures in the above table are based on free ends of 150 mm. **Please note that the split steel joint range also includes split steel bends, split steel reduction joints and split steel T-pieces.**

3.13. Wall entry labyrinths



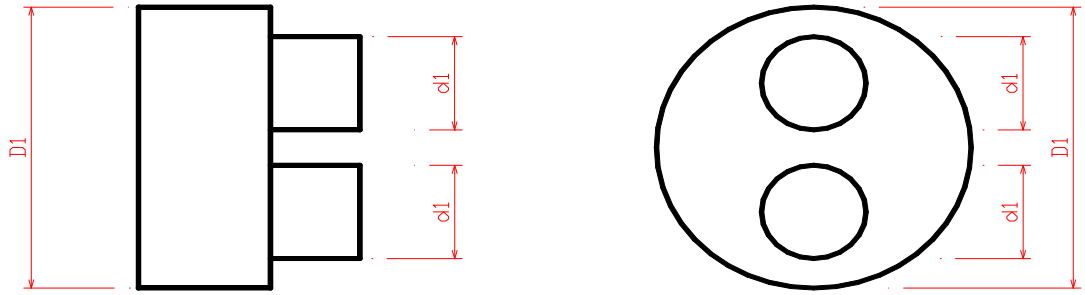
Wall entry labyrinths – or labyrinth sealing rings – are used for lead-ins to buildings, shafts, etc. The seal protects against water penetration. The wall entry labyrinth is made from highly resilient styrene butadiene rubber.
If necessary, several wall entry labyrinths can be used in series on each pipe as required.

STAR PIPE can supply the following dimensions as standard.

PEH casing pipe D mm	Wall entry labyrinth			
	Ø mm	H m	X mm	B mm
125	122	158	18	50
140	137	173	18	50
160	155	191	18	50
180	173	209	18	50
220	193	229	18	50
225	219	255	18	50
250	245	181	18	50
280	273	309	18	50
315	306	342	18	50
355	340	376	18	50
400	382	418	18	50
450	430	466	18	50
500	475	511	18	50

Other dimensions can be supplied to order.

3.14. End caps



Use wherever there is a risk of water penetration into the PU-insulation, e.g.:
- Transition to uninsulated valves in sump pits
- Connection to pipelines in traditional insulation
- At the ends of preinsulated pipes

STAR PIPE can supply the following dimensions as standard.

Outside diameter of steel pipe ø [mm]	DN	Casing dimension D [mm]	D1 [mm]	d1 [mm]
26,9+26,9	20	125	135	37
33,7+33,7	25	140	150	45
42,4+42,4	32	160	170	55
48,3+48,3	40	160	170	60
60,3+60,3	50	200	210	70
76,1+76,1	65	225	235	85
88,9+88,9	80	250	265	105
114,3+114,3	100	315	330	130
139,7+139,7	125	400	415	155
168,3+168,3	150	450	465	185

4. ENGINEERING

4.1. Expansion:

Heating to operating temperature will result in temperature-dependent expansion of the piping that will be restricted by the frictional forces acting on the casing as a result of the pipe being buried in the ground. Since it is a rigid-foam system, the resulting expansion of the pipe pair will be roughly equivalent to the mean temperature of the feed and return pipes.

Friction-restricted expansion of STAR PIPE TWIN PIPE under the following operating parameters:

Temperature, feed: 90°C
Temperature, return: 50°C
Temperature, ground: 8°C
Cover: 0,8m
Coefficient of friction: 0,4
Ground density: 1.800kg/m^3
Mean temperature rise: 62°C = $\Delta T_{średnia}$= (50°C+90°C)/2 - 8°C = 62°C

przedstawiono w poniższej tabeli

D	s	D	A_{st}	F_r	Length (m)														
Mm	mm	mm	mm^2	N/m	5	10	15	20	25	30	35	40	45	50	60	70	80	90	Max
					Expansion Δ L (mm)														
33,7	2,6	140	254	2485	3	6	9	10	11	12	12								**30**
42,4	2,6	160	325	2840	3	6	9	11	12	13	13								**30**
48,3	2,6	160	373	2840	3	7	9	12	12	14	15	15							**35**
60,3	2,9	200	523	3550	4	7	9	12	14	15	16	17	17						**40**
76,1	2,9	225	667	3994	4	7	10	12	14	16	17	18	19	19					**45**
88,9	3,2	250	862	4438	4	7	10	13	15	17	19	20	21	22	23	23			**60**
114,3	3,6	315	1252	5592	4	7	10	13	15	18	20	21	23	24	25	26	26		**70**
139,7	3,6	400	1539	7101	4	7	10	13	15	17	19	21	22	23	25	25			**60**
168,3	4,0	450	2065	7988	4	7	10	13	16	18	20	22	24	26	28	30	30		**70**

4.2. Heat loss

The actual heat loss is dependent on several factors, including the feed and return temperatures, the ground temperature and, of course, the insulating capacity of the PUR foam.

STAR PIPE's technical department will be happy to help calculate the heat loss in a specific pipe system for given operating parameters.

The values in the table below are based on the following operating parameters:

Cover	0,6 m	Temperature, ground	8°C
Thermal conductivity, PUR	0,030 W/mK[1)]	Temperature, feed	80°C
Thermal conductivity PEH	0,410 W/mK	Temperature, return	40°C
Thermal conductivity, ground	1,500 W/mK		

Outside diameter of steel pipe / casing pipe	DN service pipe / casing pipe	heat loss - feed q.z.	heat loss – return q.p.	Total heat loss q.tot
mm	mm	W/m	W/m	W/m
26,9 + 26,9/125	20 + 20/125	9,7	1,4	11,1
33,7 + 33,7/140	25 + 25/140	10,8	1,5	12,3
42,4 + 42,4/160	32 + 32/160	11,9	1,4	13,3
48,3 + 48,3/160	40 + 40/160	14,1	2,1	16,2
60,3 + 60,3/200	50 + 50/200	14,0	1,5	15,5
76,1 + 76,1/225	65 + 65/225	16,7	2,0	18,7
88,9 + 88,9/250	80 + 80/250	18,6	3,1	21,7
114,3 + 114,3/315	100 + 100/315	19,2	2,4	21,6
139,7 + 139,7/400	125 + 125/400	17,9	1,8	19,7
168,3 + 168,3/450	150 + 150/450	20,8	3,6	24,3

1) The specified lambda value for the cyclopentane foam used is an estimated long-term value. The lambda value normally specified is measured in accordance with EN253/DIN52613 after five weeks.
It is 0.027 W/mK for STAR PIPE's products

5. Assembly instructions – Foam dosage for all straight joints:

A: Polyol = light foam fluid
B: Isocyanate = dark foam fluid

a) Foam dosage for all straight joints – <u>160 mm free ends</u>

Density 100 kg/m^3, inc. waste

Outside diameter of steel pipe / casing pipe	DN service pipe / casing pipe	Weight (kg)			Volume (litres)			Mixing spray number
		A+B	A	B	A+B	A	B	
mm	mm	kg	kg	kg	l	l	l	
26,9 + 26,9/125	20 + 20/125	0,36	0,14	0,21	0,30	0,13	0,17	2
33,7 + 33,7/140	25 + 25/140	0,44	0,18	0,26	0,37	0,16	0,21	3
42,4 + 42,4/160	32 + 32/160	0,55	0,22	0,33	0,47	0,21	0,27	4
48,3 + 48,3/160	40 + 40/160	0,53	0,21	0,31	0,45	0,20	0,25	4
60,3 + 60,3/200	50 + 50/200	0,82	0,33	0,49	0,70	0,31	0,40	6
76,1 + 76,1/225	65 + 65/225	0,98	0,40	0,58	0,84	0,36	0,47	6
88,9 + 88,9/250	80 + 80/250	1,17	0,48	0,70	1,00	0,44	0,57	7
114,3 + 114,3/315	100 + 100/315	1,84	0,74	1,09	1,57	0,68	0,89	5 + 6
139,7 + 139,7/400	125 + 125/400	3,04	1,23	1,81	2,59	1,13	1,47	
168,3 + 168,3/450	150 + 150/450	3,67	1,48	2,18	3,13	1,36	1,77	

b) Foam dosage for all straight joints – <u>250 mm free ends</u>

Density 100 kg/m^3, inc. waste

Outside diameter of steel pipe / casing pipe	DN service pipe / casing pipe	Weight (kg)			Volume (litres)			Mixing spray number
		A+B	A	B	A+B	A	B	
mm	mm	kg	kg	kg	l	l	l	
26,9 + 26,9/125	20 + 20/125	0,56	0,23	0,33	0,48	0,21	0,27	4
33,7 + 33,7/140	25 + 25/140	0,68	0,28	0,40	0,58	0,25	0,33	5
42,4 + 42,4/160	32 + 32/160	0,86	0,35	0,51	0,74	0,32	0,42	6
48,3 + 48,3/160	40 + 40/160	0,82	0,33	0,49	0,70	0,31	0,40	6
60,3 + 60,3/200	50 + 50/200	1,29	0,52	0,76	1,10	0,48	0,62	3 + 5
76,1 + 76,1/225	65 + 65/225	1,53	0,62	0,91	1,31	0,57	0,74	3 + 6
88,9 + 88,9/250	80 + 80/250	1,83	0,74	1,09	1,56	0,68	0,88	5 + 6
114,3 + 114,3/315	100 + 100/315	2,87	1,16	1,71	2,45	1,06	1,38	
139,7 + 139,7/400	125 + 125/400	4,75	1,92	2,83	4,05	1,76	2,29	
168,3 + 168,3/450	150 + 150/450	5,73	2,32	3,41	4,89	2,12	2,76	