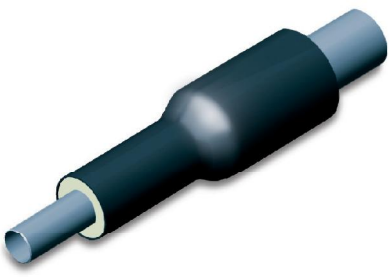
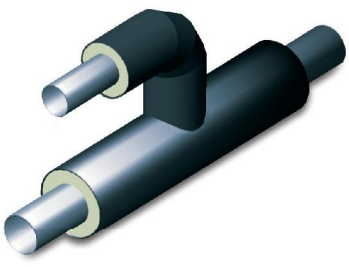
GERMANPIPE®

PRODUCT CATALOG DISTRICT HEATING





CONTENTS

INTRODUCTION TO THE COMPANY

Who are we?

German Pipe® is a young company with clear aims that are clearly defined by the staff members' motivation and expertise.

The team includes workers, master craftsmen, technicians, estimators, sales personnel and engineers with 15 years of experience in planning, manufacturing and selling preinsulated long-distance heating and industrial piping. The company has gathered its professional experience from contact with almost all the major long-distance heating and industrial customers.

This has involved manufacturing the following products:

- long-distance heating pipes and refrigeration pipes with dimensions ranging from ND 20 to ND 800,
- long-distance heating pipes and those needed for laying in tunnels (e.g. DREWAG, Munich Municipal Utilities, GEW Cologne, BEWAG and many more),
- refrigeration pipes for the food industry (e.g. Müller-Milch / Leppersdorf)
- process refrigeration pipes (e.g. AMD in Dresden)
- fire extinguishing pipes for tunnel projects (e.g. Rennsteig Tunnel / north-west bypass at Zurich)
- piping for transporting acids or other media (e.g. Degussa and Leuna)
- oil transport pipes (e.g. 172km ND 400 & ND 500 in Turkmenistan)

What are our goals?

One of our top company goals is to achieve the highest quality standards for our products and services. Our sense of environmental responsibility towards current and future generations is just as important, particularly in the way we handle natural resources.

- We act in a morally responsible way and ensure the sustainability of our company at the same time.
- People are the main priority: whether they are staff, customers or suppliers.
- We process contracts in a responsible manner and in a very short time.
- As a result of consistent process management, we achieve results, which can be fore cast and which meet our customers' requirements and expectations.
- Our future lies in good staff. We expect our staff to be ready to work and think as an entrepreneur would.
- Problems are resolved in a spirit of partnership and accommodation. The way that we deal with staff and customers is always personal and fair.
- We safeguard our competitive edge and our future by having innovative, first-class products and an above average level of commitment.
- All our products have the same high quality. Each individual member of staff is a vital part of our management system.
- We want to enter strategic partnerships with our suppliers to the benefit of both sides.

Where do we come from?

We are based in the state of Thuringia in Central Germany and have been manufacturing precision goods for Europe and Asia for years. As a result of circumstances in the development of our old company group, which we were unable to change, we were forced to set up a new business with real future prospects.

Who are your contact persons?

Company management			
Mr Weidinger	Telefon: - 41	m.weidinger@german-pipe.com	Fax: -78
Management representative			
Mr Herzer	Telefon: - 41	r.herzer@german-pipe.com	Fax: -78
Quality assurance manager			
Mr Schettler	Telefon: - 41	t.schettler@german-pipe.com	Fax: -78
Quotation preparation			
Mr Kaiser	Telefon: - 23	h.kaiser@german-pipe.com	Fax: -77
Mr Friede	Telefon: - 24	m.friede@german-pipe.com	Fax: -77
Technology			
Mr Komma	Telefon: - 21	j.komma@german-pipe.com	Fax: -77
Job processing			
Ms Eppler	Telefon: - 31	n.eppler@german-pipe.com	Fax: -79
Dispatch			
Mr Flehmig	Telefon: - 30	versand@german-pipe.com	Fax: -79

German Pipe®
Industrie- und Fernwärmetechnik GmbH

Darrweg 43
D- 99734 Nordhausen
Telephone: + 49 - 36 31 - 46267-0
Fax : + 49 - 36 31 - 46267-79

1. PREINSULATED JACKET PIPES (KMR) - DESCRIPTION OF THE SYSTEM AND INDIVIDUAL COMPONENTS

German Pipe® composite preinsulated jacket pipes, which are insulated at the factory, are suitable for use as long-distance heating pipes laid directly in the earth for a continuous max. operating temperature of 150°C or 155°C and they have a serviceable life of 30 years. As a result of manufacturing the piping and shaped parts with the latest computer-controlled highpressure dosing machines, a consistent degree of high quality is achieved.

The system components are manufactured in line with DIN EN 253, 448, 488 and 489 specifications. A quality management system certified by the Thuringian Technical Inspection Agency in line with DIN EN ISO 9001:2000, guarantees that standards, directives and quality assurance measures are followed in every department of the company.
The environmentally-friendly manufacturing approach incorporating an efficient use of all resources is guaranteed by the environmental management system certified as per DIN EN ISO 14001:2005.

HDPE Jacket Pipes

Seamless high-density polyethylene pipes are manufactured by extrusion as per DIN 8075 specifications; their properties and dimensions follow EN 253 or AGFW (Long Distance Heating Working Group) FW 401 with corona treatment to guarantee force-fit, permanent connections with the PUR rigid foam. Tensile strength is guaranteed down to -50°C. The material matches building material class B 2 (normally inflammable) as per DIN 4102-1 specifications.

Media Pipes

Welded P235 TR1 or P235 GH steel pipes, technical delivery terms as in DIN EN 10217-1 or 10217-2 with EN 10204 - 3.1 inspection certificate, welding seam factor V = 1.0

Heat Insulation (consisting of CFC free foam)

Polyurethane rigid foam consists of component A (polyol) and component B (isocyanate).
Thermal conductivity [λ] 0.0274 W/(m*K) or 0.0275 W/(m*K),
Foam density as per EN 253 is at least 60 kg/m^3,
Max. permanent operating temperature: 150°C or 155°C
The environmentally-friendly propellant cyclo-pentane does not do any damage to the ozone layer.

Pipe Network Monitoring System

The German Pipe® network monitoring system is based on the robust and reliable European Monitoring System (EMS).
It is easy to monitor moisture and any break in the wiring through two copper wires that run in parallel along the plastic jacket on the pipe. The sensor wires are non-insulated copper wires with a 1.5 mm^2 profile, while one wire is tin-coated to provide some differentiation in colour.

All the components listed below can be supplied with the German Pipe® network monitoring system laid in the foam. Other commercial monitoring systems, such as Brandes, HDW, AB-Isotronic, can also be supplied if a special order is placed.

1.1. HEATING AND SANITARY MEDIA PIPES

1.1.1. Welded Steel Pipes

Welded steel pipes with a lengthwise or spiral seam, < ND 100 steel quality P235 TR1* as per DIN EN 10217-1, from > ND 125, P235 GH* as per DIN EN 10217-2, welding seam factor V=1.0, with an EN 10204 - 3.1 inspection certificate, pipes with a wall thickness of > 3,2 mm with welding bevel as per DIN 2559/1, number 22;

*Other qualities of steel, supply standards and dimensions by arrangement

dimensions and weights, see Table 1

ND	Zoll	Outer diameter	Welded steel pipe		Seamless steel pipe		Lengths supplied [m]		
		d_a	s	Weight	s	Weight	6	12	16
		[mm]	[mm]	[kg/m]	[mm]	[kg/m]			
15	1/2"	21.3	2.3	1.03	2.3	1.03	•		
20	3/4"	26.9	2.6	1.56	2.6	1.56	•		
25	1"	33.7	2.6	1.99	2.6	1.99	•		
32	1 1/4"	42.4	2.6	2.55	2.6	2.55	•	•	
40	1 1/2"	48.3	2.6	2.93	2.6	2.93	•	•	
50	2"	60.3	2.9	4.11	2.9	4.11	•	•	
65	2 1/2"	76.1	2.9	5.24	2.9	5.24	•	•	
80	3"	88.9	3.2	6.76	3.2	6.76	•	•	
100	4"	114.3	3.6	9.83	3.6	9.83	•	•	•
125	5"	139.7	3.6	12.1	4	13.4	•	•	•
150	6"	168.3	4	16.2	4.5	18.2	•	•	•
200	8"	219.1	4.5	23.8	6.3	33.1	•	•	•
250	10"	273	5	33	6.3	33	•	•	•
300	12"	323.9	5.6	44	7.1	55.5	•	•	•
350	14"	355.6	5.6	48.3			•	•	•
400	16"	406.4	6.3	62.2			•	•	•
450	18"	457	6.3	70			•	•	•
500	20"	508	6.3	77.9			•	•	•
600	24"	610	7.1	93.8			•	•	•

1.1.2. Copper pipes

Seamless copper pipes as per DIN 1786 specifications, dimensions, weights, tolerances as per DIN 1754, material = Cu-DHP or SF-Cu, TLB and material properties as per DIN EN 1057 and DIN 17 671.

dimensions and weights see Table 2

Connection by soft or hard soldering with capillary soldering fittings.

ND	Outer diameter	Wall thickness	Piping weight	Lengths supplied
	d_a [mm]	s [mm]	[kg/m]	[m]
15	18	1	0.48	5
20	22	1	0.59	5
25	28	1.5	1.11	5
32	35	1.5	1.41	5
40	42	1.5	1.70	5
50	54	2	2.91	5
65	70	2	3.80	5

1.1.3. Stainless Steel System Pipes

Welded stainless steel pipes as per DIN 17457 specifications, material no. 1.4401, as per DIN EN 10088 with certification as per DVGW (German Technical Association for Gas and Water) Worksheet W 541, max. operating temperature 120 °C.

dimensions and weights see Table 3

The connections are provided by press fittings inserted by the pipe layer. The insertion and assembly guidelines of the system manufacturer must be followed to the letter.

ND	Outer diameter	Wall thickness	Piping weight	Lengths supplied
	d_a [mm]	s [mm]	[kg/m]	[m]
12	15	1	0.35	6
15	18	1	0.42	6
20	22	1.2	0.62	6
25	28	1.2	0.80	6
32	35	1.5	1.26	6
40	42	1.5	1.52	6
50	54	1.5	2.63	6
65	76.1	2	3.71	6
80	88.9	2	4.35	6
100	108	2	5.31	6

1.2. THERMAL INSULATION

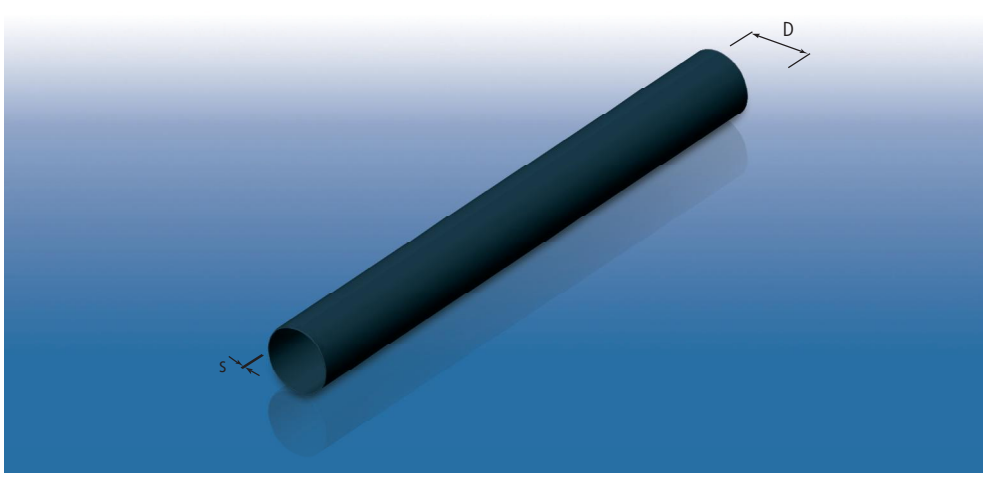
CFC-free polyurethane rigid foam consists of component A (polyol) and B (isocyanate). The manufacturing process with the latest high-pressure foam equipment guarantees a consistent high quality for the heat insulating materials.
Thermal conductivity [λ] 0.0274 W/(m*K) or 0.0275 W/(m*K),
The foam density as per EN 253 is at least 60 kg/m^3, the max. operating temperature 150°C or 155°C for a serviceable life of 30 years.

The environmentally-friendly propellant cyclo-pentane does not do any damage to the ozone layer. PUR rigid foam guarantees the necessary high degree of shear strength for the plastic jacket pipes as a result of its very good adhesive power both on the media pipes and the jacket pipes.

Properties of polyeurathene rigid foam as per DIN EN 253

Closed cells ≥ 88 %
max. cell size in radial direction ≥ 0,5 mm
Total pipe density ≥ 60 kg / m
Thermal conductivity 0,0274 W / mK bzw. 0,0275 W / mK
Building material class B 2

1.3. PE-HD JACKET PIPES



Outer diameter	Wall thickness	
d_a	s [mm]	
[mm]	Pipe	Sharped parts
90	3	4
110	3	4
125	3	4
140	3	4
160	3	4
180	3	4
200	3.2	4
225	3.5	4
250	3.9	5
280	4.4	5
315	4.9	6.3
355	5.6	6.3
400	6.3	
450	7	
500	7.8	
560	8.8	
630	9.8	
670	10.5	
710	11.1	
800	12.5	
900	12.9	
1000	13.3	

Seamless pipes made of HD polyethylene, PE 80, terms of delivery as per DIN 8075 specifications, dimensions at least as per EN 253 or AGFW FW 401; see Table 4, with corona treatment to guarantee a force-fit, permanent bond between the jacket pipes and the PUR rigid foam heat insulation, coloured black for high degree of UV resistance.

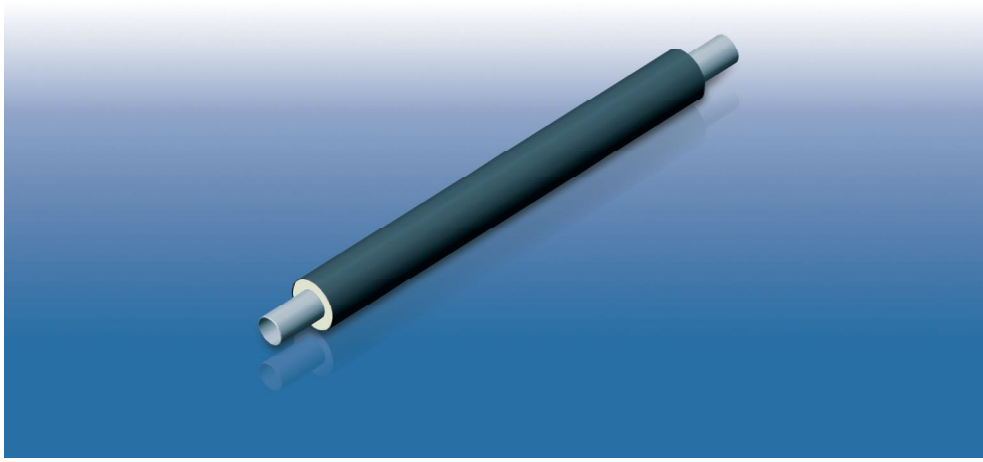
Polyethylene properties
Requirements according to DIN EN 253

Colour: black
Carbon black content: 2,5 + 0,5 %
Density: min. 944 kg/m^3
Expansion coefficient: 2 * 10^{-4} K^{-1}
Thermal conductivity: 0,43 W / mK
Surface tension: 41 - 56 mN/m
Building material class: DIN 4102 B 2

2. PARTS

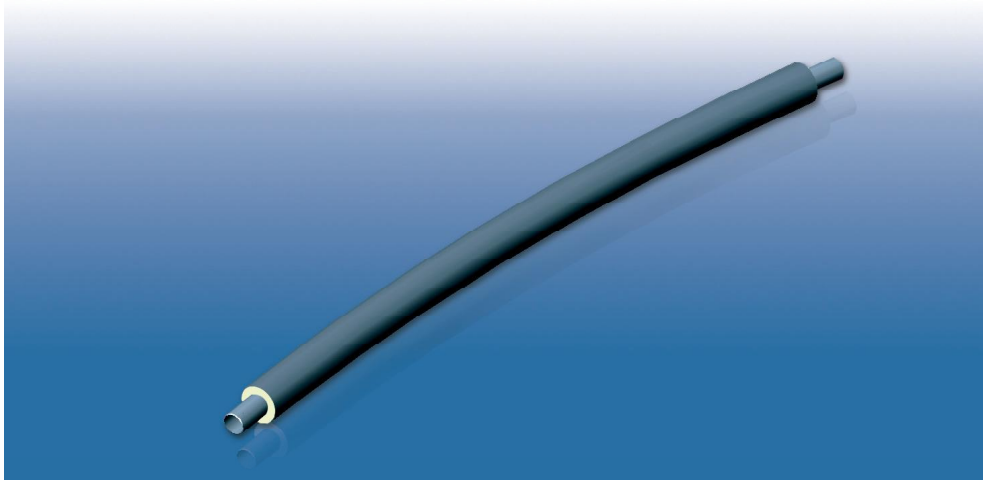
2.1. PREINSULATED JACKET PIPES

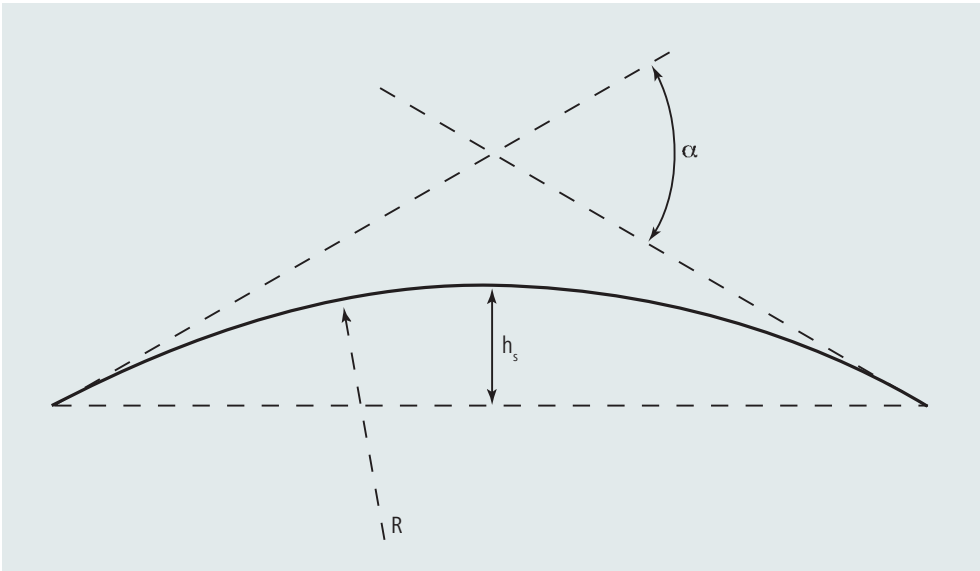
Media piping: welded steel piping as per DIN EN 253 in line with section 1.1.1.
Heat insulation: PUR rigid foam, in line with section 1.2.
Jacket pipes: PE HD in line with section 1.3.
Lengths supplied: 6m 12m 16m
Insulating strength: N Standard as per DIN EN 253, V1 1 x increased, V2 2 x increased



ND	Welded steel pipes		Insulating strength N			Insulating strength V 1			Insulating strength V 2			Possible lengths supplied L		
			PE jacket pipes		Insulating thickness	PE jacket pipes		Insulating thickness	PE jacket pipes		Insulating thickness			
	D1	Wall thickness	D2	Wall thickness		D2	Wall thickness		D2	Wall thickness				
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	6m	12m	16m
15	21.3	2.3	90	3	31	110	3	41	125	3	49	•		
20	26.9	2.6	90	3	29	110	3	39	125	3	46	•		
25	33.7	2.6	90	3	25	110	3	35	125	3	43	•		
32	42.4	2.6	110	3	31	125	3	38	140	3	46	•	•	
40	48.3	2.6	110	3	28	125	3	35	140	3	43	•	•	
50	60.3	2.9	125	3	29	140	3	37	160	3	47	•	•	
65	76.1	2.9	140	3	29	160	3	39	180	3	49	•	•	
80	88.9	3.2	160	3	33	180	3	43	200	3.2	52	•	•	•
100	114.3	3.6	200	3.2	40	225	3.4	52	250	3.9	64	•	•	•
125	139.7	3.6	225	3.4	39	250	3.9	51	280	4.4	66	•	•	•
150	168.3	4	250	3.9	37	280	4.4	51	315	4.9	68	•	•	•
200	219.1	4.5	315	4.9	43	355	5.6	62	400	6.3	84	•	•	•
250	273	5	400	6.3	57	450	7	82	500	7.8	106	•	•	•
300	323.9	5.6	450	7	56	500	7.8	80	560	8.8	109	•	•	•
350	355.6	5.6	500	7.8	64	560	8.8	93	630	9.8	127	•	•	•
400	406.4	6.3	560	8.8	68	630	9.8	102	670	10.5	121	•	•	•
450	457	6.3	630	9.8	77	710	11.1	115	710	11.1	115	•	•	•
500	508	6.3	710	11.1	90	800	12.5	134	900	12.9	183	•	•	•
600	610	7.1	800	12.5	83	900	12.9	132	1000	13.3	182	•	•	•

2.2. CURVED PIPES





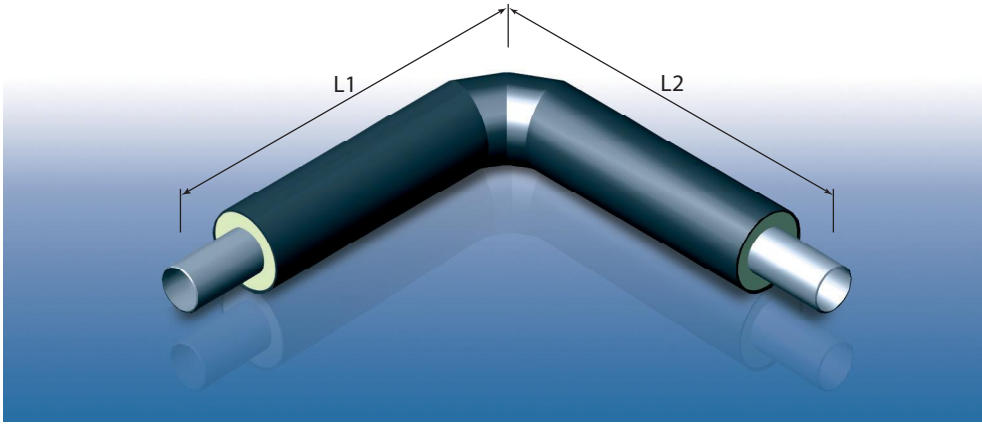
α angle of deflection
R bending radius

Curved Pipes are preinsulated at the factory as preinsulated jacket pipes, see Section 2.1. Pipes up to ND 150 are bent while cold, from > ND 200 the pipes are manufactured in a special warm bending process and are then pre-insulated at the factory.

Curved Pipes are manufactured as bent preinsulated jacket pipes with a large radius and are used to optimise the course of a section when the direction changes. The pipe bend behaves in the same way as straight pipes, i.e. no bending moments occur as a result of the heat expansion process. In order to manufacture pipe bends, the angle of deflection (α) of the course of the section must be specified and the minimum bending radius (R) must be followed.

2.3 PREINSULATED BENDS

2.3.1. 90° Bends



INSULATING STRENGTH

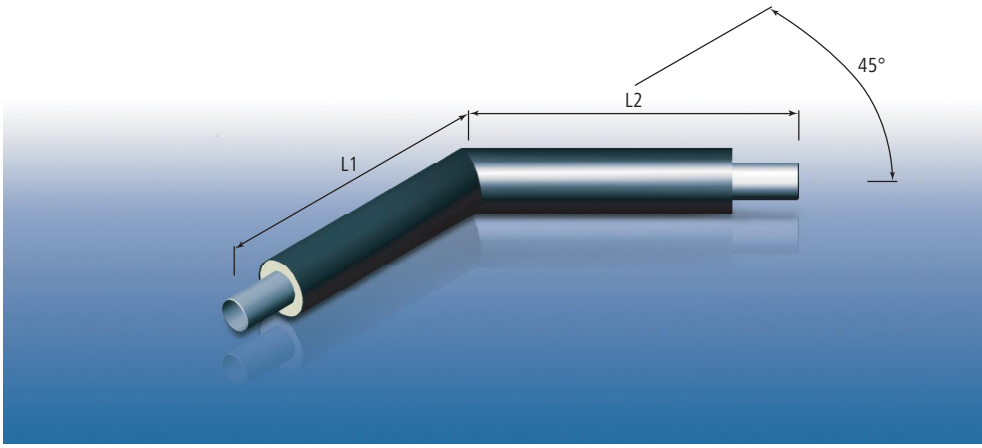
N Standard as per DIN EN 253
V 1 1 x increased
V 2 2 x increased

Preinsulated at the factory in the same way as preinsulated jacket pipes with a 90° angle, designed as per EN 448 specifications, dimensions < ND 80 bent cold; ND 100 to ND 150 with a pipe bend, DIN 2605-1 series 3 with a seamless design, from DN 200 welded, extension by pipe cylinders that are welded on, PE outer jacket manufactured as a segment bend welded with a heating element.

Other qualities of steel, dimensions and angles available on request

Steel pipes		N	V 1	N + V 1		V 2	V 2	
ND		PE	PE	Branch lengths		PE	Branch lengths	
	D 1	D 2	D 2	L 1	L 2	D "	L 1	L 2
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
15	21.3	90	110	1000	1000	125	1000	1000
20	26.9	90	110	1000	1000	125	1000	1000
25	33.7	90	110	1000	1000	125	1000	1000
32	42.4	110	125	1000	1000	140	1000	1000
40	48.3	110	125	1000	1000	140	1000	1000
50	60.3	125	140	1000	1000	160	1000	1000
65	76.1	140	160	1000	1000	180	1000	1000
80	88.9	160	180	1000	1000	200	1000	1000
100	114.3	200	225	1000	1000	250	1000	1000
125	139.7	225	250	1000	1000	280	1000	1000
150	168.3	250	280	1000	1000	315	1000	1000
200	219.1	315	355	1000	1000	400	1000	1000
250	273	400	450	1000	1000	500	1000	1000
300	323.9	450	500	1000	1000	560	1000	1000
350	355.6	500	560	1000	1000	630	1000	1000
400	406.4	560	630	1000	1000	670	1100	1100
450	457	630	670	1100	1100	710	1200	1200
500	508	710	800	1200	1200	900	1300	1300
600	610	800	900	1300	1300	1000	1400	1400

2.3.2. 45° Bends



INSULATING STRENGTH

N Standard as per DIN EN 253
V 1 1 x increased
V 2 2 x increased

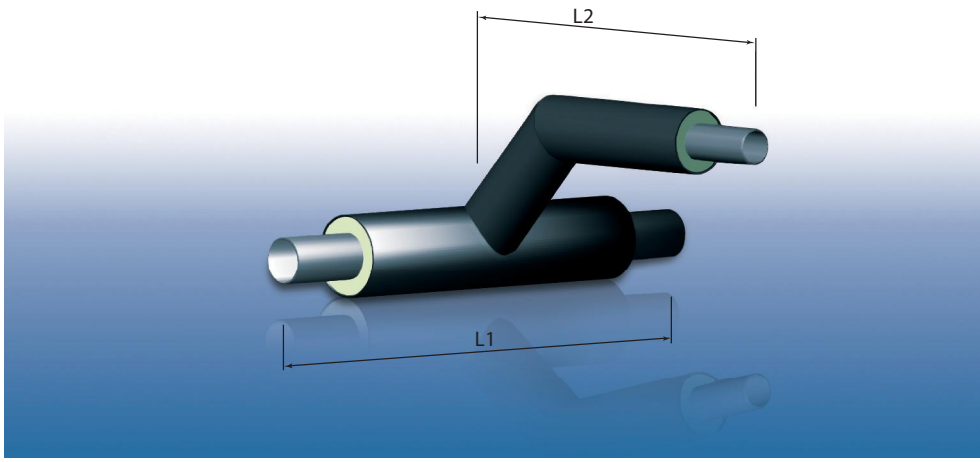
Preinsulated at the factory in the same way as preinsulated jacket pipes with a 45° angle, designed as per EN 448 specifications, dimensions < ND 80 bent cold; ND 100 to DN 150 with a pipe bend, DIN 2605-1 series 3 with a seamless design, from DN 200 welded, extension by welded pipe cylinders, PE outer jacket manufactured as a segment bend welded with a heating element.

Other qualities of steel, dimensions and angles available on request.

Steel pipes		PE	PE	PE	Branch lengths	
ND	D 1	D 2	D 2	D 2	L 1	L 2
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
		N	V 1	V 2	N - V 1 und V 2	
15	21.3	90	110	125	1000	1000
20	26.9	90	110	125	1000	1000
25	33.7	90	110	125	1000	1000
32	42.4	110	125	140	1000	1000
40	48.3	110	125	140	1000	1000
50	60.3	125	140	160	1000	1000
65	76.1	140	160	180	1000	1000
80	88.9	160	180	200	1000	1000
100	114.3	200	225	250	1000	1000
125	139.7	225	250	280	1000	1000
150	168.3	250	280	315	1000	1000
200	219.1	315	355	400	1000	1000
250	273	400	450	500	1000	1000
300	323.9	450	500	560	1000	1000
350	355.6	500	560	630	1000	1000
400	406.4	560	630	670	1000	1000
450	457	630	670	710	1000	1000
500	508	710	800	900	1000	1000
600	610	800	900	1000	1000	1000

2.4. PREINSULATED PIPE BRANCHES

2.4.1. 45° Branches

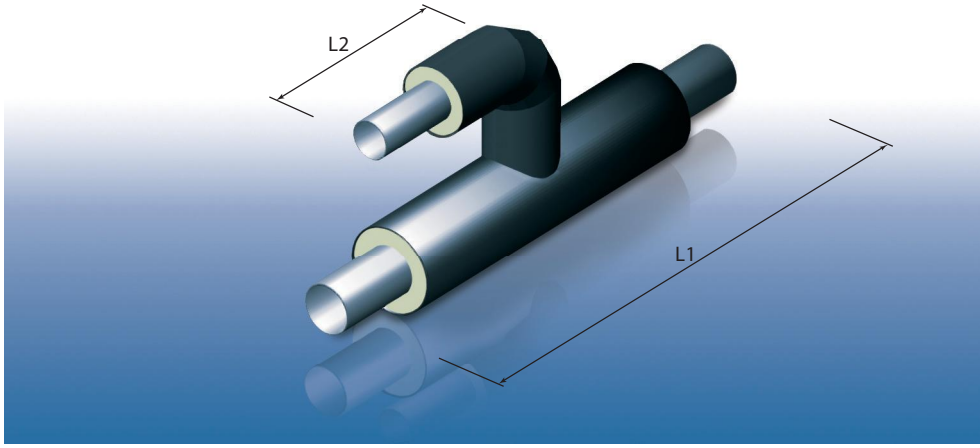


Preinsulated at the factory like preinsulated jacket piping; design as per EN 448 specifications. In the case of outlet pipes with the same nominal width or reduced by one dimension, the T-piece is manufactured as per DIN 2615-1. Outlet pipes with smaller dimensions are manufactured by extruding the basic pipes, the 45° bend is produced in the outlet pipe as described in Section 2.2.2.

Insulating strength N		Standard according to DIN EN 253					
Through pipe				Branch pipe			
Steel Pipe		PE	Length	Steel Pipe		PE	Length
ND	D 1	D 2	* L 1	ND	d 1	d 2	* L 2
	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]
15	21.3	90	1.000	15	21.3	90	660
20	26.9	90	1.000	20	26.9	90	660
25	33.7	90	1.000	25	33.7	90	660
32	42.4	110	1.000	32	42.4	110	680
40	48.3	110	1.000	40	48.3	110	680
50	60.3	125	1.000	50	60.3	125	695
65	76.1	140	1.000	65	76.1	140	710
80	88.9	160	1.000	80	88.9	160	730
100	114.3	200	1.000	100	114.3	200	770
125	139.7	225	1.200	125	139.7	225	795
150	168.3	250	1.200	150	168.3	250	870
200	219.1	315	1.200	200	219.1	315	935
250	273	400	1.400	250	273	400	1.070
300	323.9	450	1.500	300	323.9	450	1.120
350	355.6	500	1.600	350	355.6	500	1.220
400	406.4	560	1.600	400	406.4	560	1.330
450	457	630	1.800	450	457	630	1.400
500	508	710	1.800	500	508	710	1.490
600	610	800	1.900	600	610	800	1.670

* Length specifications relate to the same dimensions for the through and branch pipes.

2.4.2. Parallel Branches



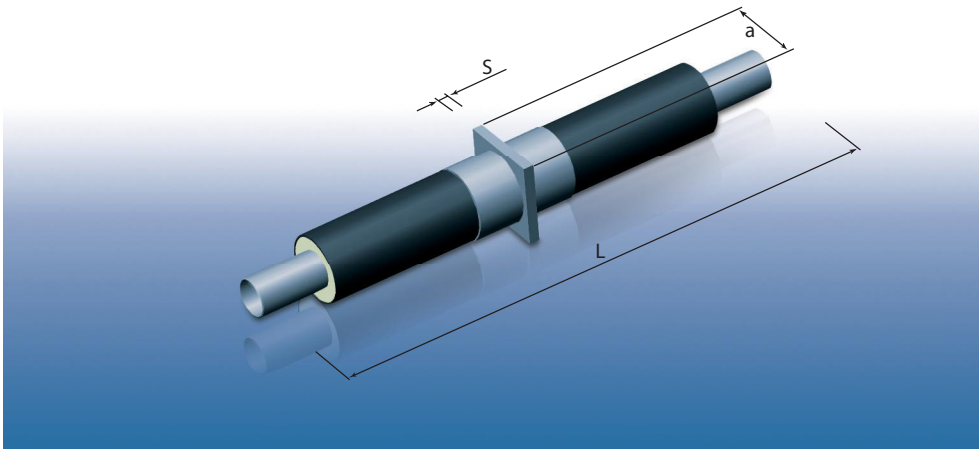
Pre-insulated at the factory like preinsulated jacket pipes; design as per EN 448 specifications. In the case of outlet pipes with the same nominal width or reduced by one dimension, the Tpiece is manufactured as per DIN 2615-1. Outlet pipes with smaller dimensions are manufactured by extruding the basic pipes, the 90° bend is produced in the outlet pipe as described in Section 2.2.2.

Insulating strength N (Standard)								
Through pipe				Branch pipe				Axel distance basic pipe to outlet pipe
Steel Pipe		PE	Length	Steel Pipe		PE	Length	
ND	D 1	D 2	* L 1	ND	d 1	d 2	* L 2	
	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[mm]
15	21.3	90	1.000	15	21.3	90	500	210
20	26.9	90	1.000	20	26.9	90	500	210
25	33.7	90	1.000	25	33.7	90	500	210
32	42.4	110	1.000	32	42.4	110	500	230
40	48.3	110	1.000	40	48.3	110	500	230
50	60.3	125	1.000	50	60.3	125	500	245
65	76.1	140	1.000	65	76.1	140	500	260
80	88.9	160	1.000	80	88.9	160	500	280
100	114.3	200	1.000	100	114.3	200	500	320
125	139.7	225	1.200	125	139.7	225	500	365
150	168.3	250	1.200	150	168.3	250	550	370
200	219.1	315	1.200	200	219.1	315	550	485
250	273	400	1.400	250	273	400	600	600
300	323.9	450	1.500	300	323.9	450	600	710
350	355.6	500	1.600	350	355.6	500	650	815
400	406.4	560	1.600	400	406.4	560	700	915
450	457	630	1.800	450	457	630	700	1.030
500	508	710	1.800	500	508	710	750	1.145
600	610	800	1.900	600	610	800	800	1.345

* Length specifications relate to the same dimensions for the through and outlet pipes.

2.5. FIXED POINT ELEMENTS

Preinsulated at the factory like preinsulated jacket straight pipes; design as per EN 448 specifications, steel quality and dimensions of the steel pipes like the PE outer jacket and match those of straight pipes (see Section 2.1.). The fixed point flange is like a square steel plate, which is designed to cope with the force to which it is subjected. The media pipe and anchor plate are separated from each other thermally and electrically.



Steel Pipe		N (Standard)		V 1 (1 x increased)		V 2 (2 x increased)		N + V 1 + V 2
ND	D 1	PE	Anchor plate	PE	Anchor plate	PE	Anchor plate	Total length
	[mm]	D 2	a x s	D 2	a x s	D 2	a x s	L
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
15	21.3	90	200 x 15	110	200 x 15	125	200 x 15	2000
20	26.9	90	200 x 15	110	200 x 15	125	200 x 15	2000
25	33.7	90	200 x 15	110	200 x 15	125	200 x 15	2000
32	42.4	110	200 x 15	125	200 x 15	140	200 x 15	2000
40	48.3	110	200 x 15	125	200 x 15	140	200 x 15	2000
50	60.3	125	250 x 20	140	250 x 20	160	250 x 20	2000
65	76.1	140	250 x 20	160	250 x 20	180	250 x 20	2000
80	88.9	160	250 x 20	180	250 x 20	200	250 x 20	2000
100	114.3	200	330 x 25	225	330 x 25	250	330 x 25	2000
125	139.7	225	330 x 25	250	330 x 25	280	330 x 25	2000
150	168.3	250	380 x 25	280	380 x 25	315	380 x 25	2000
200	219.1	315	500 x 25	355	500 x 25	400	500 x 25	2000
250	273	400	600 x 30	450	600 x 30	500	600 x 30	2000
300	323.9	450	700 x 30	500	700 x 30	560	700 x 30	2000
350	355.6	500	700 x 30	560	700 x 30	630	800 x 30	2000
400	406.4	560	800 x 30	630	900 x 30	670	900 x 30	2000
450	457	630	800 x 30	670	900 x 30	710	900 x 30	2000
500	508	710	900 x 30	800	1000 x 35	900	1100 x 35	2000
600	610	800	1000 x 35	900	1100 x 40	1000	1200 x 45	2000

(Other dimensions available on request)

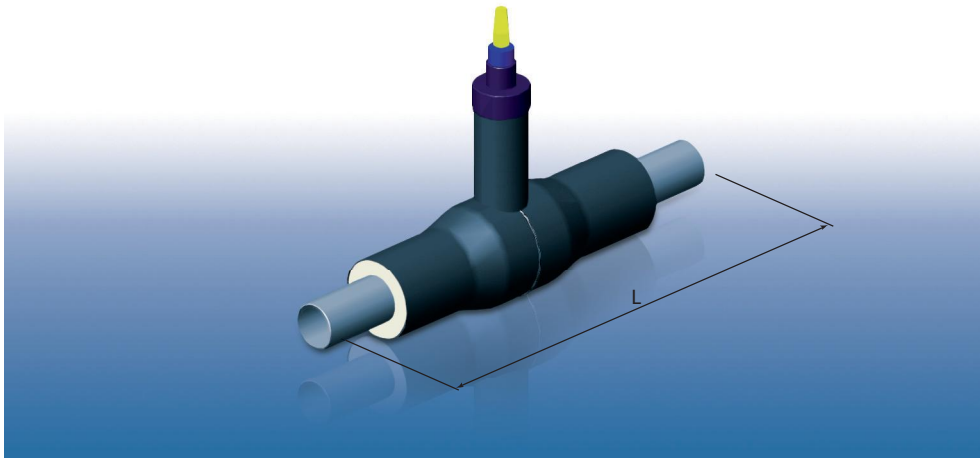
2.6. SPECIAL PARTS

Preinsulated at the factory like preinsulated jacket pipes.
These kinds of parts are used, for example:

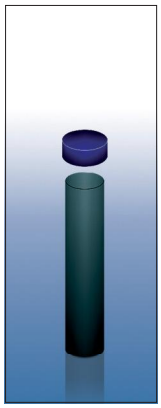
- when crossing existing supply or waste pipes,
- when crossing streams or rivers with an inverted siphon,
- when by-passing foundations or other constructions,
- special parts for expansion compensation (U-bender)

When planning specific parts of this type, it is essential to do so in close collaboration with German Pipe® experts. In a case like this, the direct contact persons are our qualified sales and engineering staff.

2.7. SHUT-OFF VALVES



Pre-insulated shut-off valves for laying directly in the earth, design as per EN 488 specifications; preinsulated at the factory like preinsulated jacket pipes, protection on the cap with heat-shrinking end cap, ball valve with fully welded housing, designed as a yield point fitting for max. axial stress up to 300 N/mm^2.
Ball valves can be supplied with either a reduced or full throughput. Operated with a socket key; in the case of dimensions > ND 200, the fitting should be activated by worm gears.

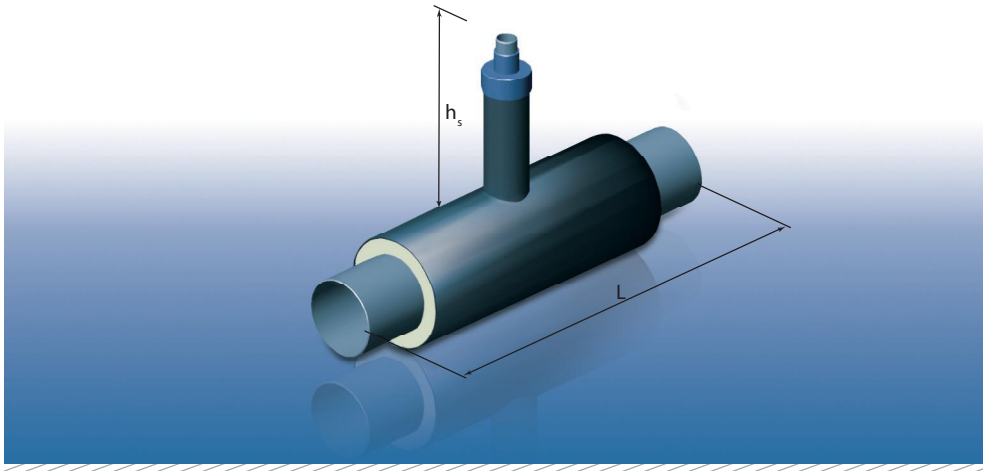


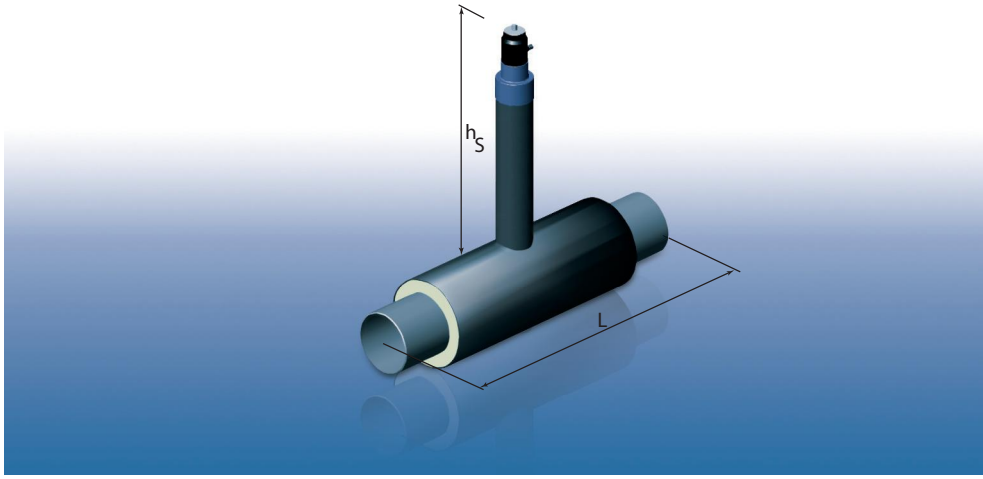
The following accessories can be supplied for pre-insulated shut-off fittings laid in the earth:

PE protective piping with safety cushion and protective cap, length supplied 1,50 m
The protective piping can be shorted to match the laying depth of the fitting at the building site. Various designs are possible depending on the nominal width and make of the fitting.

Spindle extension
When laying the shut-off valves fairly deeply, it is only possible to work them if a spindle extension is used.

2.8. VENTING BRANCHES





Preinsulated at the factory like preinsulated jacket pipes; design as per EN 448 specifications. The manufacturing process takes place using a T-piece as per DIN 2615-1 with a welded pipe cylinder or by extruding the basic pipe.
The top protection for the insulation on the venting connections is provided by using a heatshrinking end cap. The height of the connection (hs) is variable using this design and can be manufactured to match the building conditions.

Another option is to supply the venting branch with a ball valve welded on to one of the connections.

The standard design of the venting fitting is carried out as follows:

- non-insulated ball valve housing made of stainless steel with an inner thread and thread plug,
- reduced duct,
- operated using a key.

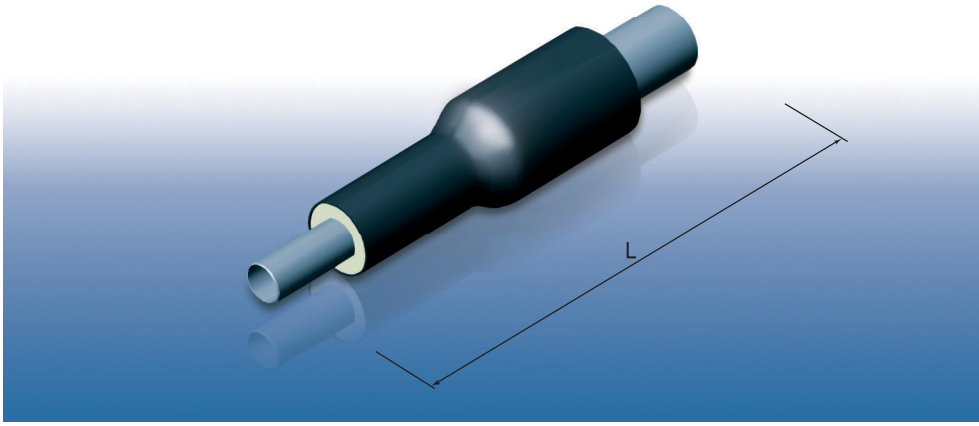
The top protection for the insulation on the venting connection is provided by using a heatshrinking end cap. The standard axis height (h_s) of this design is 1000 mm. Other heights can be supplied on request.

2.9. CONCENTRIC REDUCERS

Preinsulated at the factory like preinsulated jacket pipes; design as per EN 448 specifictions. Concentric reducer (DIN 2616-1 St35.8I), extended by a pipe cylinder that has been welded on. Pre-insulated reducers are designed with at most an increase of two dimensions for static reasons.

Insulation thickness

N: Standard, V 1: 1 x increased, V 2: 2 x increased

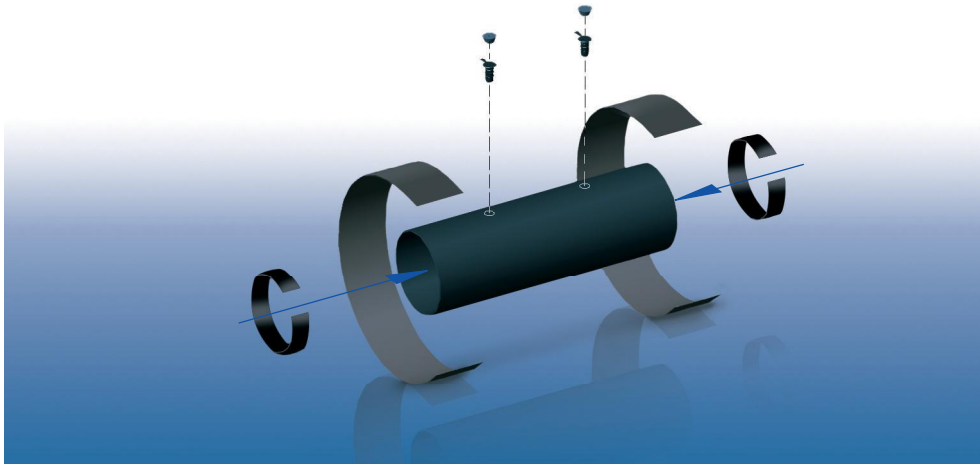


Dimension 1					Dimension 2					
Steel piping		PE insulated piping			Steel piping		PE insulated piping			Length
		Da [mm]					Da [mm]			
ND	D 2	Insulating thickness			ND	D 2	Insulating thickness			
	[mm]	N	V 1	V 2		[mm]	N	V 1	V 2	[mm]
32	42.4	110	125	140	20	26.9	90	110	125	1500
					25	33.7	90	110	125	
40	48.3	110	125	140	32	42.4	110	125	140	1500
					25	33.7	90	110	125	
50	60.3	125	140	160	40	48.3	110	125	140	1500
					32	42.4	110	125	140	
65	76.1	140	160	180	50	60.3	125	140	160	1500
					40	48.3	110	125	140	
80	88.9	160	180	200	65	76.1	140	160	180	1500
					50	60.3	125	140	160	
100	114.3	200	225	250	80	88.9	160	180	200	1500
					65	76.1	140	160	180	
125	139.7	225	250	280	100	114.3	200	225	250	1500
					80	88.9	160	180	200	
150	168.3	250	280	315	125	139.7	225	250	280	1500
					100	114.3	200	225	250	
200	219.1	315	355	400	150	168.3	250	280	315	1500
					125	139.7	225	250	280	
250	273	400	450	500	200	219.1	315	355	400	1500
					150	168.3	250	280	315	
300	323.9	450	500	560	250	273	400	450	500	1500
					200	219.1	315	355	400	
350	355.6	500	560	630	300	323.9	450	500	560	1500
					250	273	400	450	500	
400	406.4	560	630	670	350	355.6	500	560	630	1500
					300	323.9	450	500	560	
450	457	630	670	710	400	406.4	560	630	670	1500
					350	355.6	500	560	630	
500	508	710	800	900	450	457	630	670	710	1500
					400	406.4	560	630	670	
600	610	800	900	1000	500	508	710	800	900	1500
					450	457	630	670	710	

3. PE CONNECTING SLEEVES AND SHAPED PARTS FOR ASSEMBLY

Connecting sleeves are used by customers to provide jacket pipe connections on site.

3.1. NON-CROSS-LINKED PE SHRINK SLEEVES



Non-cross-linked shrink sleeves consist of a heat-shrinking PE sleeve pipe and the follwing accessories:

- shrink collars
- permanently elastic sealing strip made of butyl rubber
- venting plug
- PE welded plug

The shrink sleeves are slid on to the jacket pipes before the pipes are laid and before the media pipe weld seams have been completed. Then the insulation work on the connecting points is carried out by trained assembly personnel, who have been examined in line with AGFW Worksheet FW 603.
A water-proof, force-fit bond is made between the jacket pipe and the sleeve. By using sealing strip and shrink collars, the sleeve connection is doubly sealed.
The technical requirements follow EN 489, AGFW Worksheet FW401, parts 6, 14, 16 and 17.

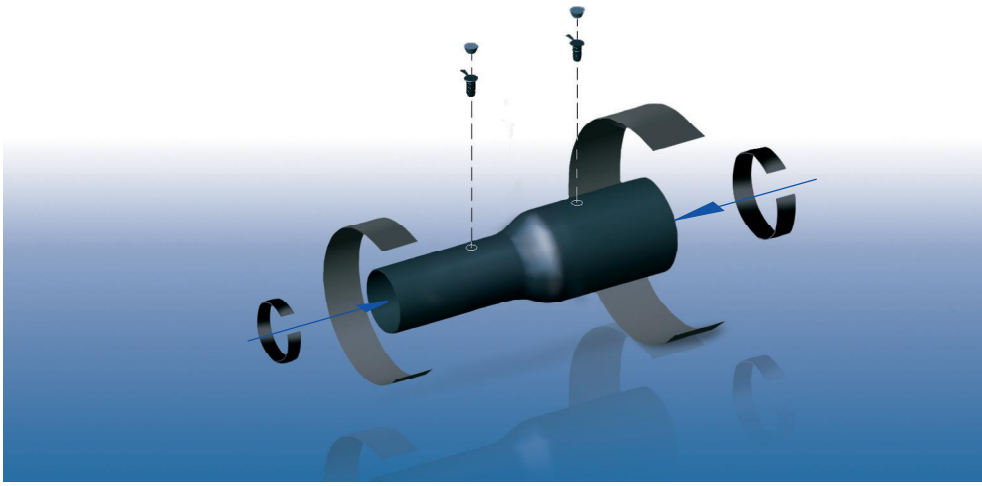
3.2. ASSEMBLY SLEEVES

Assembly sleeves made of non-networked PE are used if it is impossible to slide on the connecting sleeves for space reasons. The sleeve is separated in the axial direction and can be brought into position using the pipe connection points. This section point is welded to guarantee that the sleeve is leak-proof.

3.3. SHRINK END SLEEVES

Shrink end sleeves are used for insulating pipe work ends in the earth, buildings or shafts. They are designed like a non-networked PE shrink sleeve, but are closed on one side with a PE end cap.

3.4. SHRINK REDUCTION SLEEVES



Shrink reduction sleeves for insulating steel reducers welded on externally by the pipe layer are designed to provide at most an increase of two dimensions for static reasons.
Their design matches the non-cross-linked PE shrink sleeve and they have to be slipped on to the outer insulation before the media piping is welded.

Non-cross-linked shrink reduction sleeves consist of a heat-shrinking PE sleeve pipe and the following accessories:

- shrink sleeves
- permanently elastic sealing strip made of butyl rubber
- venting plug
- PE welding plug

3.5. CROSS-LINKED-PE SHRINK SLEEVES

Cross-Linked shrink sleeves consist of molecular, cross-linked polyethylene and can therefore only be welded to a certain degree. An extremely tight force-fit connection is created as a result of the very high shrink properties of this material in conjunction with the sealing strip laid between the jacket pipe and sleeve. This type of sleeve is particularly suitable for preinsulated jacket pipe sections because of its high mechanical resilience; sections like this are subject to higher levels of stress (e.g. frequent load changes, laid in ground water area).

3.6. ASSEMBLY BENDS

PE assembly bends are used to insulate media piping at a later stage, which have been welded by the pipe layer at the building site.

The engineering department of German Pipe® must first check that there are no static problems before assembly bends are used. The specifications of the installation point and the angle are required for this purpose.

The assembly bend consists of:

- a segment bend made of PE sleeve piping
- shrink collars

3.7. ASSEMBLY BRANCHES

PE assembly branches are used to insulate 90° or 45° media pipe branches for subsequent house connections or other section outlets to be laid at a later point.

The assembly bend consists of:

- a segment bend made of PE sleeve piping
- non-networked PE shrink sleeve
- shrink collars
- venting plug
- PE welded plug

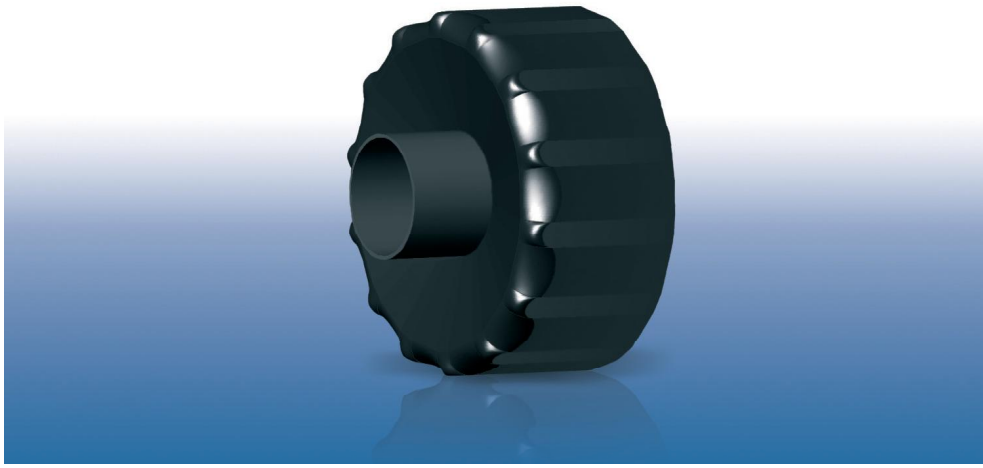
4. ACCESSORIES

4.1. WALL SEALING RINGS

Conically shaped sealing ring made of moulded neoprene rubber, suitable for sealing existing wall ducts in buildings, channels and shaft constructions.

If ground water accumulates or exerts any pressure, a sealing unit must be used, which can be tightened later and which is leak-proof even when subjected to water pressure.

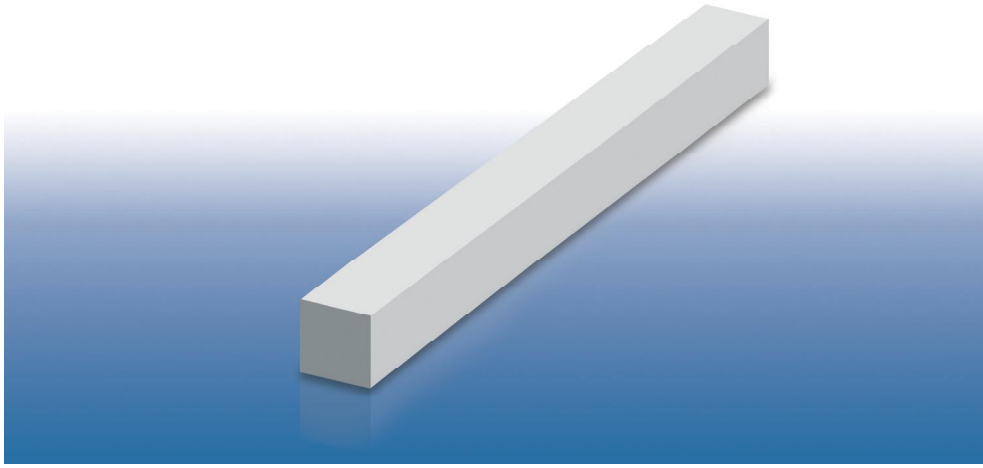
4.2. END CAPS



Pre-insulated pipes, which end in shafts or buildings, are protected against any damp penetrating into the PUR foam by an end cap on the face. This heat-shrinking end cap consists of molecular networked polyolefin and is coated on the inside with temperature-resistant sealing glue. The end cap must be slipped on by the pipe layer before the pipes are welded together.

If it is impossible to slip the cap on in advance as a result of particular building circumstances or for other reasons, it is possible to use a divided end cap. Divided end caps must be used for preinsulated jacket pipes with an outer insulation diameter of > 560 mm.

4.3. PU RIGID FOAM BEAMS



Dimensions:
100 x 100 x 1,000 mm

Rigid foam beams serve as a support for preinsulated jacket pipes in the pipe trench. PU rigid foam beams can be packed with sand in the pipe trench.

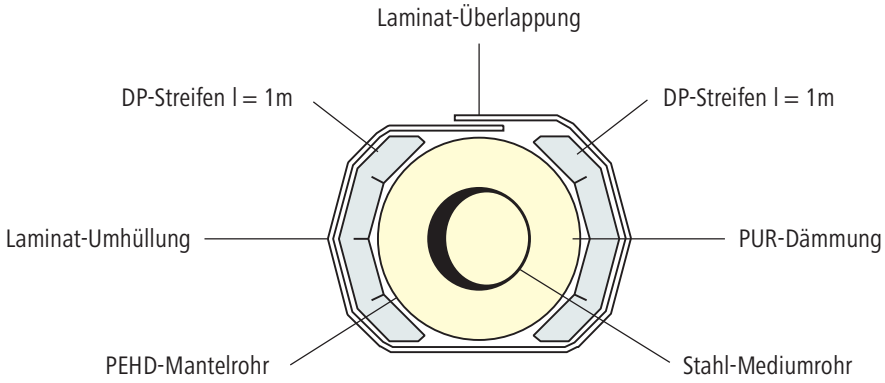
4.4. PIPELINE WARNING TAPE

For marking the feeder and return pipes for German Pipe® piping laid in sand. Material: PE plastic film, width 40 mm, thickness 0.1 mm, marking: "Beware long-distance heating pipes"; colour: blue; supplied in 250 metre rolls

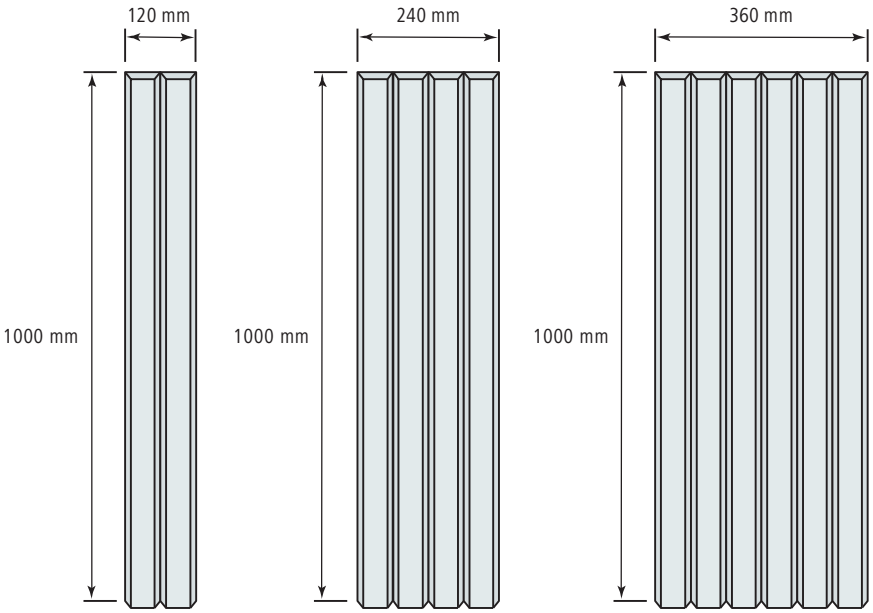
4.5. EXPANSION PADDING

Expansion padding needs to be attached to the PE outer insulation to accommodate expansion movement in the piping system in the earth at bends, branches and reducers. Expansion padding is manufactured from networked closed-cell polyethylene, is permanently elastic, does not rot and resists chemicals. The design of the expansion zone follows the static calculations for the piping carried out by the German Pipe® engineering deparment.

1 m of expansion padding comprises 2 pieces of expansion pad material strip, both 1,000 mm long. These are glued on to the outer insulation in the 3 and 9 o'clock positions. Laminate is also placed around the material completely to prevent any sand or earth particles from getting between the expansion material and the PE insulation.



Diameter of outer jacket in mm	Size
90 bis 160	I
180 bis 280	II
315 bis 355	III
400 bis 500	II + II
560	II + III
630 bis 670	III + III
710	III + II + II
800	III + III + II
900	III + III + III
1000	III + III + II + II



5. PIPE NETWORK MONITORING SYSTEMS

In order to ensure that preinsulated jacket pipes have a long serviceable life, both the jacket pipes and the media pipes must remain completely waterproof.
This means that the media pipe in its dry state cannot corrode because of external influences. Stable operation requires the use of a pipe network monitoring system, so that any dampness or damage caused by building work can be identified in good time.

The German Pipe® – EMS – Pipe Network Monitoring System is based on the robust and reliable "Nordic Measuring Principle".
By running two copper wires set in foam in parallel in the preinsulated jacket pipes, any moisture or break in the wires can be easily monitored. The sensor wires are non-insulated copper wires with a 1.5 mm^2 cross section and one wire is tin-coated to provide some colour differentiation.
The PUR foam serves as an insulator between the wire and steel pipes in normal operations. But if any moisture penetrates, an electrical level of conductivity is reached, which creates a change in the resistance in the pipe system. This can be monitored and signals can be sent using measuring equipment. The change in impedance in the wires as a result is used to locate the fault by means of an impulse reflection measurement.

When laying the sections of pipes, the wires are continuously connected by trained German Pipe® assembly personnel when insulating the sleeve connections. This means that any planned piping network monitoring system for a section of pipe work of up to 2,500 m can be monitored with one channel on a stationary unit. However, to guarantee definite fault location, position finding sections should be created every 500 m in the distribution network or in the supplier's sections

Measuring Processes to Locate Faults (Locating)

Impulse Delay Measuring Process
The fault location, short circuit or wire break can be located in this measuring process by using an impulse that is broadcast. Any change in the status in the system is partially or totally reflected by the impulse. The distance can be measured and analysed by its defined delay.

Resistance Location Measuring Process
The moisture in the foam system is measured and located with this measuring system by using a resistance wire. The place, where the change in status in the system has taken place, is determined with the help of a voltage divider, which does not carry any electrical load. A sensor wire made of a CrNi alloy (red perforated) and a return wire (green insulated) are used in this process as the monitoring wires.

The sensor wire has a resistance value of 5,7 Ω/m and is coated with Teflon insulation that is perforated at short distances. The Cu 1,5mm^2 return feed wire, on the other hand, is provided with continuous Teflon insulation.

Insulation Resistance Monitoring

The insulation resistance in the foam is lowered by any moisture that penetrates and signals this change.

Various options can be used to monitor this:
1. checks using manual testers,
2. permanent monitoring using stationary units,
3. monitoring and localizing the problem using digital measuring technology.

Permanent monitoring units check the pipe network system at regular intervals and signal any shortfall in the alarm thresholds that have to be set using voltage-free contacts. A check using personnel, e.g. with a manual tester, is then unnecessary.
In the case of fairly large branched pipe networks, it is possible to install signalling and localizing equipment using digital measuring technology. The fault and its distance are displayed with this unit technology and can therefore be localized based on a pipe network plan.

Planning the Pipe Network Monitoring System

The foundation for planning and design work involves drawing up a systematic plan of the network monitoring features. The section and wiring plan including the list of components is the basis for the alarm wiring during the building design work.
At the end of the project, these plans can be drawn up as revised plans as they are completed during the building phases and then they can be used for localising faults at a later stage.

The necessary basics for setting up the monitoring system are:

1. the pipe layer's welding seam plan,
2. the section plan with lengths, components and dimensions specifications,
3. data on the end wiring and local circumstances,
4. data on installing measuring load cells, units and cable equipment,
5. the wiring plan covering the wiring in branches.

Wiring when Insulating at a Later Stage

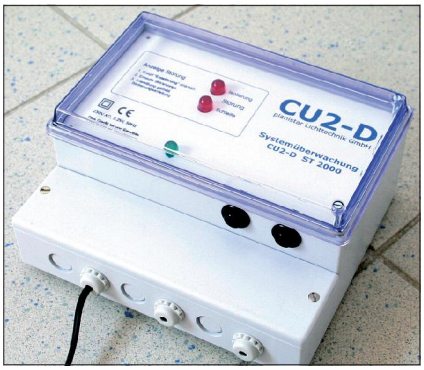
When laying and welding the pipe system, care should be taken to ensure that the sensor wires at both ends of the pipes always lie in the upper area. Any damage to wires should be avoided, particularly when making pieces to fit. After welding, the wires are straightened out, stretched and extended again, if necessary. Wire holders are attached at regular intervals using masking tape. Afterwards the cleaned ends of the wires are shortened to the suitable length and are pressed using a clamping connector. The pressed clamping joint must then be carefully soldered subsequently with a small gas burner and acid-free soldering tin. Care must be taken to ensure that the soldering tin enters the hollow area in the connector.

Before and after each connection, the pipe network monitoring system must be checked for continuity and moisture. After the sleeves have been foamed, this process is repeated; this ensures top quality during this building phase

End Seals in Buildings and Shafts

There is an extension to the monitoring wires at the end of each pipe to enable checks to be measured at a later stage. The wires are fed through the jacket pipes and are provided with an end piece or a wire end box. These are used to establish a continuous sensor loop for the complete network monitoring system.

Instrument Engineering



ST 3000 Stationary Monitoring Unit
This 2-channel unit enables a pipe system of up to 2,500 m in length to be monitored. Impulses of 0.3 seconds' duration are sent through the wire loop at intervals of approx. 8 minutes. If a fault is recognised, an alarm is triggered, if the next 8 signals register the same condition. This delay prevents an alarm from going off because of momentary faults in the network or voltage. Faults are displayed on the monitoring unit on each channel if the insulation has become damp or if the measuring loop has been broken through. This alarm signal can be relayed further by using a voltage-free switch contact (max. 24V / 1A).

ST 2000 Stationary Monitoring Unit
This 1-channel unit is also suitable for monitoring pipe systems with a maximum length of 2,500 m. The pipe receives a positive impulse with an impulse length of approx. 0.3 seconds from an impulse generator. Using an adjustable series resistor, the threshold value for signalling an insulation fault can be set. If the threshold voltage dips below the normal level during eight consecutive impulses, the insulation error message is displayed using a light-emitting diode. The alarm message can also be relayed from this unit by means of a voltage-free switch contact.

Wire Connecting Box

A wire connecting box is used as the end seal or for connecting stationary units. The monitoring wires extended at the end of the pipe are placed on a terminal block. Depending on the design of the monitoring system, the sensor wires can be connected or relayed elsewhere. The connecting box has to be mounted near the pipe work, as these points may possibly be used for fault locating purposes at a later stage.

Monitoring Systems (EMS, HDW, Isotronic, Brandes)

The previous sections described the EMS system used by German Pipe®. Of course, it is possible to use the wiring from other network monitoring manufacturers in all the manufactured components.

Other network monitoring systems:

1. HDW – T60/1
- hierarchically designed system;
- insulated twisted wires with indicators to monitor moisture in the sleeve area

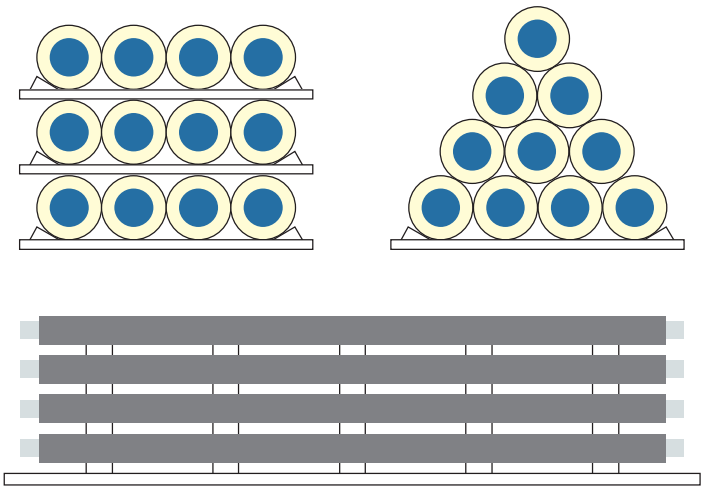
2. Brandes system
- continuous monitoring with perforated sensor wires (5,7 Ω/m)
- loops of up to 1000 m in length,
- resistance measuring processes.

3. Isotronic
- hierarchically designed system;
- twisted wires with a non-insulated and an insulated Cu wire
- monitoring in the sleeve area with localising switches

6. STORAGE, DISPATCH, UNLOADING

Storage

In general, finished pipes of the same dimension are stored on solid flat surfaces. It is possible to store the pipes either in a rectangular pile or in the form of a pyramid (see fig.). In both cases it is essential that the lowest layer of a pile is made safe by using wedges or supports to prevent them from rolling away or slipping. Timber planks should be used as the base surface for the pipes that are being stacked and these planks should have at least the following dimensions: 15 cm (width) x 2.5 cm (height).



The number of timber planks required to assure the quality of the pipes is different depending on the dimensions and lengths of the pipes. The planks must be laid in a straight line at equal intervals. The following data can be used as a rule of thumb:

Pipe lengths	Timber planks
6 m	mind. 3
12 m	mind. 5
16 m	mind. 7

Timber planks of the same type must be used for each stack of pipes in a rectangular or pyramid form. In order to safeguard the individual storage stacks, the pipes on the outside must also be prevented from rolling away to one side by attaching wedges. Nails must be hammered into the wedges to establish a secure connection between the planks and the wedges. At least two wedges per stack are required on each side to safeguard against any sideways movement.

When storing and transporting the pipes, care must be taken to ensure that the pipes are placed on the correct base. The stacks may not exceed 2.50 m in height.

Assuming that the finished pipes have to be stored in the open air for a long period, relevant measures must be taken to prevent any loss of quality because of the effect of various types of weather (e.g. rain, frost).

The materials to be assembled later in particular must be kept dry and protected from cold, heat and direct sunlight.

Dispatch

German Pipe® products are delivered to the agreed delivery address on a trailer or by train, if necessary.
In order to not impair the quality of the finished goods during transportation, the loading area on the trailer/railway wagon must be checked to ensure that it is clean and any dirt or sharpedged parts must be removed.
The media pipes are protected against external influences by pipe caps placed on the end of the pipes and shaped parts. These protective caps may not be removed until the parts are inserted.

Any materials for insertion in the finished goods are packed in cartons. They may not be opened or damaged until the beginning of the insulating work. The sleeves required for insertion are supplied in loose form or in cartons too. The liquids required fort he insulation work (isocyanate and polyol) are dispatched separately and are filled in canisters with the appropriate markings. The same storage conditions apply to them too.

If the serviceable life of the components has been exceeded or if they have crystallised because of the effects of cold weather, they can no longer be used for insulation work. Access for trailers up to 13.6 m long or even longer should be guaranteed at the site approach to guarantee that there are no problems with the delivery.

Unloading

During delivery the finished goods and fittings should be checked to determine that the correct quantity and quality is present. Any discrepancies or possible damage must be recorded on the delivery documentation.
The unloading process is carried out by the addressee or by third parties, if necessary. In each case, the pipes, shaped parts and assembly materials must be unloaded in an appropriate and careful manner and the relevant safety regulations must be taken into account. Small dimension fittings, shaped parts and pipes can be unloaded by hand. Larger sizes should preferably be unloaded using a crane or with the appropriate lifting gear. Chains and steel ropes are unsuitable for use so as not to jeopardise the quality of the products during the unloading process.
It is also not permissible to throw pipes and shaped parts down from the cargo area or roll them or pull them off. The jacket pipes could be so seriously damaged as a result of this that their range of functions is impaired.