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CHAPTER 2.0

PRE-INSULATED SINGLE STEEL PIPES



SPECIFICATION

Pre-insulated single steel pipes are insulated with polyurethane foam (PUR) and covered with PE casing pipe. It is a rigid connection system, meaning a continuous connection between the steel pipe, PUR-foam and casing pipe. The pipes can be delivered in 6, 12 and 16 m lengths, dimensions from DN 20 – 800 in insulation series 1, series 2 and series 3. See chapter 2.9 for detailed descriptions of dimensions and sizes. Set Pipes can also offer insulation of other material not specified in the product catalogue. Please contact our technical department for other requirements. In addition, pre-insulated steel pipes in sizes from 20 – 28 mm produced in coils are available. All information about the flexible steel pipes can be found in chapter 4 under EliSteel.

APPLICATION RANGE

This specification is made for pre-insulated steel pipes for district heating. See table 1.4.1.

MATERIAL

Set Pipes requires that each of its suppliers meet the highest standards for all material. All suppliers have to be certified according to ISO 9001 and they are evaluated before further cooperation. The quality of incoming materials is tested and documented before commencing the production process.

PROPERTIES FOR 6, 12 AND 16 M STEEL PIPES ACCORDING TO EN 253

Set Pipes only obtains steel pipes from certified suppliers. Upon request we provide customers an inspection certificate regarding material.

Steel pipes and steel fittings are according to the following criteria:

TABLE 2.0.1
Steel pipe EN 253

TECHNICAL REQUIREMENTS:	P235GH TC1 according to EN 10217-2 and 5, > DN 100 P235TR1 according to EN 10217-1 DN 20 - 80
DIMENSIONS AND WALL THICKNESS:	EN 10220
BEVELING:	EN ISO 9692-1
INSPECTION CERTIFICATE:	EN 10204-3,1

Other steel pipe material with different specifications are available upon request. Please contact our technical department for other requirements.

TABLE 2.0.2

Steel fittings EN 448

TECHNICAL REQUIREMENTS:	P235GH TC1 according to EN 10217-2 and 5, > DN 100 P235TR1 according to EN 10217-1 DN 20 - 80
BENDS:	Cold-drawn DN 20 - DN 150 according to EN 10253-2 Hot-rolled DN 20 - DN 800 according to EN 14870-1
T-PIECE:	EN 10253-2
REDUCERS:	EN 10203-2

TABLE 2.0.3

 Main dimensions
for steel pipes

DN = Diameter Nominal

 d_o = Outer diameter

 t_1 = Wall thickness - AGFW 401

 t_2 = Wall thickness - EN 253

DN	d_o [mm]	t_1 [mm]	t_2 [mm]
20	26,9	2,6	2,0
25	33,7	2,6	2,3
32	42,4	3,2	2,6
40	48,3	3,2	2,6
50	60,3	3,2	2,9
65	76,1	3,2	2,9
80	88,9	3,2	3,2
100	114,3	3,6	3,6
125	139,7	3,6	3,6
150	168,3	4,0	4,0
200	219,1	4,5	4,5
250	273,0	5,0	5,0
300	323,9	5,6	5,6
350	355,6	5,6	5,6
400	406,4	6,3	6,3
450	457,0	6,3	6,3
500	508,0	6,3	6,3
600	610,0	7,1	7,1
700	711,0	8,0	8,0
800	813,0	8,8	8,8

PROPERTIES FOR 6, 12 AND 16M PUR INSULATION ACCORDING TO EN 253

The polyurethane material PUR has an excellent insulation value, high pressure resistance and is a long lasting insulation. The PUR-material is pentane-driven and has zero effect on the ozone layer. The PUR-foam has a binding effect between the PUR material, steel pipes and plastic casing which is the basis for the rigid district heating system. The below shows the minimum characteristics of PUR material from Set Pipes.

TABLE 2.0.4

 PUR material is according
to the following criteria:

CELL SIZE AND AMOUNT:	< 5% of the insulations cross section according to EN 253 Chapter 4.4.2
COMPRESSION STRENGTH:	> 0,30 MPa at 10% deflection according to EN 253 chapter 4.4.3
THERMAL CONDUCTIVITY:	For Set Pipes Pre - insulated steel pipes: 0,026 W/m·K Requirements from EN 253 chapter 4.5.6: < 0,029 W/m·K
HEAT RESISTANCE (CCOT):	161°C/30 years for PUR insulation 175°C/30 years for PIR insulation > 130°C/30 years, minimum requirements according to EN 253 chapter 4.5.5.1
SHEAR STRENGTH:	EN 253 chapter 4.5.5.2
INSULATION AXIAL SHEAR STRENGTH:	> 0,12 MPa at 23°C, chapter 5.4.1.4
RADIAL SHEAR STRENGTH:	> 0,20 MPa at 140°C, chapter 5.4.2
WATER ABSORPTION:	< 10% water absorption of sample mass according to EN 253 chapter 4.4.5

CASING PIPE ACCORDING TO EN 253

The PE casing pipe is resilient, has a high chemical resistance to sunlight and is therefore an optimal protection over PUR foam. The pipes are produced seamless and are coated with corona treated polyethylene for maximum adhesion to the PUR foam. Minimal requirements of wall thickness are according to EN 253. Casing pipe material is according to the following criteria:

TABLE 2.0.5

PE Casing pipe specifications

MATERIAL:	Polyethylene – PE100
COLOR:	Carbon black > 2,5 % of the mass according to EN 253 Chapter 4.3.1.1
MATERIAL PROPERTIES:	EN 253 Chapter 4.3.1.1
MINIMUM WALL THICKNESS:	EN 253 Chapter 4.3.2.2 Table 5
THERMAL CONDUCTIVITY:	0,40 W/m·K
MELT FLOW INDEX:	0,20 - 1,4 g/10 min. according to EN 253 Chapter 4.3.1.2

TABLE 2.0.6

Main dimensions for PE casing pipe according to EN 253

D_o = Outer diameter

t_{min} = Minimum wall thickness

D_o [mm]	t_{min} [mm]
75	3,0
90	3,0
110	3,0
125	3,0
140	3,0
160	3,0
180	3,0
200	3,2
225	3,4
250	3,6
280	3,9
315	4,1
355	4,5
400	4,8
450	5,2
500	5,6
560	6,0
630	6,6
710	7,2
800	7,9
900	8,7
1000	9,4
1100	10,2
1200	11,0

PRODUCTION CONTROL OF PRE-INSULATED SINGLE STEEL PIPE

To ensure a high product quality the entire production from Set Pipes goes through strict quality control. The quality control of pre-insulated steel carrier pipes is according to EN 253 standard for district heating pipes. Furthermore, additional tests are carried out and documented. Highly qualified employees and their awareness of quality is our strength in manufacturing.

PRODUCTION CONTROL OF STEEL FOR PRE-INSULATED FITTINGS

The quality control of steel for pre-insulated fittings is according to EN 448 standard. A pre-determine percentage of fittings go through radiographic examination. All fittings are visually inspected and pressure tested.

PRODUCTION CONTROL OF INSULATED FITTINGS

The control of pre-insulated fittings is according to EN 448 standard. Set Pipes uses up to 40% increased wall thickness in the casing pipe production to ensure greater strength in pre-insulated fittings.

TABLE 2.0.7

Casing pipe for fittings

D_o = Outer diameter of the Casing pipe

t = Casing pipe wall thickness
according to Set Pipes

t_{min} = Casing pipe wall thickness
according to E253

D_o [mm]	t [mm]	t_{min} [mm]
90	4,0	3,0
110	4,0	3,0
125	4,5	3,0
140	5,0	3,0
160	5,0	3,0
180	5,5	3,0
200	5,5	3,2
225	6,0	3,4
250	6,0	3,6
280	6,0	3,9
315	6,3	4,1

CHAPTER 2.1 APPLICATION RANGE

HEAT DEMAND

To define the pipe dimension of the district heating system the following must be taken into consideration, heating, drinking water, snow melting and other uses. The pipe diameter is determined by the sum of the previously mentioned usage. In the case of heating, the following equation can be used:

$$\dot{m} = \frac{Q}{\rho_w \cdot c_p \cdot \Delta T}$$

THUS:

$\dot{m}$ = Mass flow [m³/s]

Q = Thermal requirement [W]

ρ_w = Water density (978 kg/m³ at 70°C)

c_p = Specific heat for water (4191 J/kg·K at 70°C)

ΔT = Temperature change between flow and return pipelines ($T_{VL} - T_{RL}$) [K]

EXAMPLE: A house has the thermal requirement of 14 kW and temperature change between flow and return pipelines is 40°C. If we estimate the specific heat and density for 70°C water then we can find the water demand for the house:

$$\dot{m} = \frac{14000 \text{ W}}{978 \frac{\text{kg}}{\text{m}^3} \cdot 4191 \frac{\text{J}}{\text{kg} \cdot \text{K}} \cdot 40 \text{ K}} = 85,4 \times 10^{-6} \frac{\text{m}^3}{\text{s}} = \mathbf{0,0854 \frac{l}{s}}$$

CHAPTER 2.1.1 PRESSURE LOSS

TOTAL PRESSURE LOSS FOR PRE - INSULATED STEEL PIPES

After the water demand has been determined it is possible to calculate the pressure loss for a selected pipe dimension. Network length, height difference, the number of connections, and branches have an influence on the pressure loss. The pressure loss in pipes should be in the range of 100 – 200 Pa/m for DN < 150, and 100 – 150 Pa/m for DN ≥ 150. Pressure loss requirements can vary depending on the system, for example a system with a high pressure can lead to increased operating costs. To calculate the pressure loss for each pipe dimension the following equation can be used:

$$\Delta p_{\text{Pipe}} = f \cdot \frac{L}{d_i} \cdot \frac{V^2 \cdot \rho_w}{2} + H_m \cdot \rho_w \cdot g \left[\frac{\text{Pa}}{\text{m}} \right]$$

THUS:

f = Friction factor [-]

L = Length of the pipe [m]

d_i = Inner diameter of the steel pipe [m]

V = Average water velocity [m/s]

ρ_w = Water density (972 kg/m³ at 80°C)

H_m = Height difference [m]

g = Acceleration due to gravity

The friction factor is found with the following equation:

$$f = \frac{1,235}{\left[\ln \left(\frac{k}{3,7 \cdot d_i} + \frac{5,74}{Re^{0,9}} \right) \right]} [-]$$

THUS:

k = Resistance Coefficients for steel = 0,10 mm

Re = Reynolds number for flow in a circular pipe

The friction factor can also be found roughly with the Moody chart which can be seen in graph 2.1.1.1 However, to find this factor it is necessary to know what kind of flow is in the pipeline. The type of flow is determined with the Reynolds number (Re) equation:

$$Re = \frac{V \cdot d_i}{\nu} [-]$$

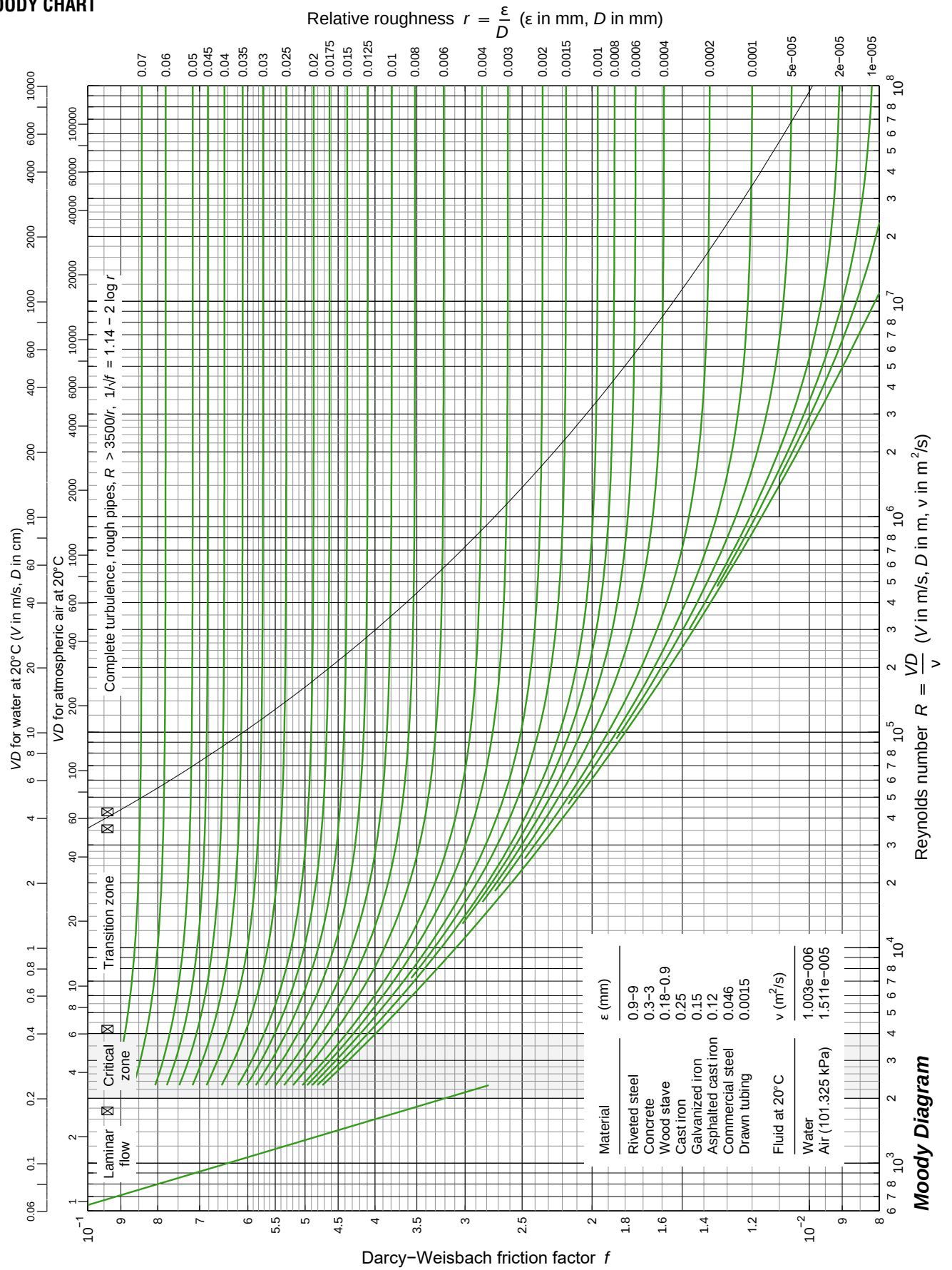
THUS:

ν = Kinematic viscosity for water: $0,366 \times 10^{-6} \text{ m}^2/\text{s}$ at 80°C

Reynolds number < 2300 forms a laminar flow which is smooth, steady and therefore low pressure loss in the pipe. If the Reynolds number is > 4000 then the flow will be turbulent which is fluctuating and agitated vortex that leads to increasing pressure loss in the pipe. Higher Reynolds number leads to stronger vortex, therefore greater pressure drop and more danger of cavitation forming in the pipe and fittings. Between $2300 - 4000$ forms a transition to turbulence flow.

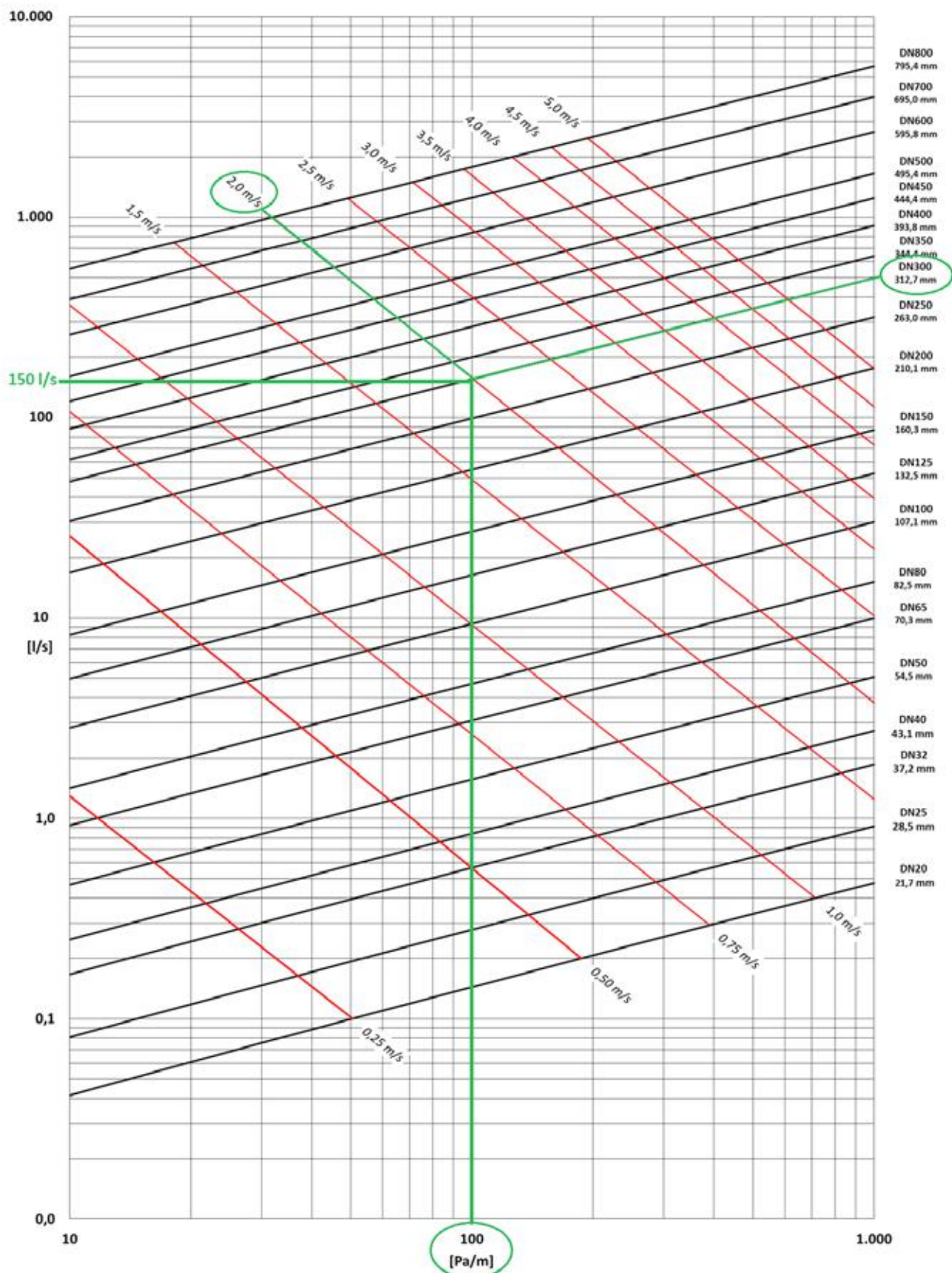
Graph 2.1.1.2 shows pressure loss in a single flow pipe taking into consideration water need, pipe dimension, and average water velocity. Also there is an example on how to use the graph.

GRAPH 2.1.1.1
MOODY CHART

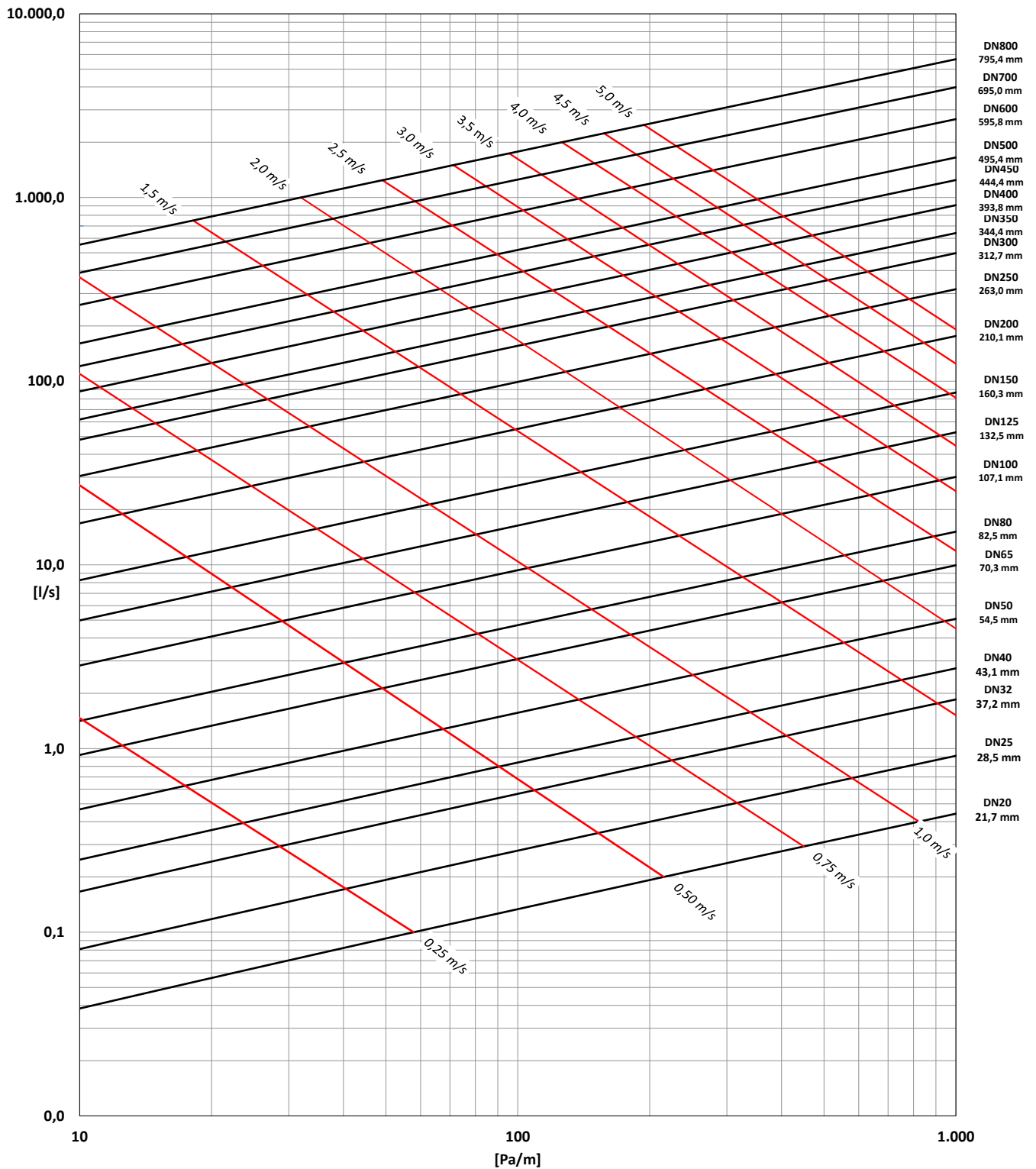


AN EXAMPLE HOW TO USE THE PRESSURE LOSS GRAPH

A residential area has a water demand of about 150 l/s. To determine what pipe dimension is suitable, the general rule for a suitable pressure loss in water pipes is between 100 – 150 Pa/m. In this example it is determined that 100 Pa/m results in an average water speed in the pipeline of about 2,0 m/s and the recommended pipe dimension would be DN 300, inner diameter 312,7 mm.



GRAPH 2.1.1.2 - PRESSURE LOSS GRAPH FOR STEEL PIPE



CHAPTER 2.1.2 EXPANSION

EXPANSION – PRE-INSULATED SINGLE STEEL PIPES

The pre-insulated material from Set Pipes is a rigid system consisting of medium pipe, PUR-foam and a casing pipe, meaning a continuous connection between the steel pipes, PUR-foam and casing pipe. All three components of the pipe expands or shortens evenly depending on cold or warm water running through the pipe. Forces working against expansion due to temperature changes F_a are soil weight force and weight of pipe with water. Together these friction forces form the F force. These calculations, as with other calculations in this book are based on EN 13941 standard.

FREE EXPANSION

Steel pipes have free expansion due to temperature difference without consideration of friction forces and resistance. This change of length can be found with the equation:

$$\Delta L = \alpha \cdot \Delta T \cdot L \text{ [mm]}$$

THUS:

L = Total length of the steel pipe [mm]

α = Expansion coefficient for steel = $12,6 \times 10^{-6} \text{ K}^{-1}$

ΔT = Temperature difference between Forward flow media and soil ($T_{VL} - T_E$) [K]

Table no. 2.1.2.1 shows calculations in regards to length of pipeline and temperature difference.

TABLE 2.1.2.1

Steel pipe free expansion [mm]

L = Total steel pipe length

ΔT = Temperature difference

L [m]	ΔT						
	40 K	50 K	60 K	70 K	80 K	90 K	100 K
10	5,0	6,3	7,6	8,8	10,1	11,3	12,6
20	10,1	12,6	15,1	17,6	20,2	22,7	25,2
30	15,1	18,9	22,7	26,5	30,2	34,0	37,8
40	20,2	25,2	30,2	35,3	40,3	45,4	50,4
50	25,2	31,5	37,8	44,1	50,4	56,7	63,0
60	30,2	37,8	45,4	52,9	60,5	68,0	75,6
70	35,3	44,1	52,9	61,7	70,6	79,4	88,2
80	40,3	50,4	60,5	70,6	80,6	90,7	100,8
90	45,4	56,7	68,0	79,4	90,7	102,1	113,4
100	50,4	63,0	75,6	88,2	100,8	113,4	126,0
110	55,4	69,3	83,2	97,0	110,9	124,7	138,6
120	60,5	75,6	90,7	105,8	121,0	136,1	151,2

CHAPTER 2.1.3 EXPANSION FORCE

FREE EXPANSION FORCE

When the steel pipe expands due to heat, compressive force F_a forms in the steel pipe. The free expansion force can be found with the equation:

$$F_a = \Delta T \cdot \alpha \cdot E_{St} \cdot A_i \text{ [N]}$$

THUS:

E_{St} = Modulus of elasticity = 210 GPa

A_i = Steel pipe cross section [mm²]

Table no. 2.1.3.1 shows calculations in regards to cross sectioning of the steel pipe and temperature difference.

TABLE 2.1.3.1

Free expansion force [kN]

DN = Diameter nominal

A_i = Steel pipe cross section

ΔT = Temperature difference

DN	A_i	ΔT						
	[mm ²]	40 K	50 K	60 K	70 K	80 K	90 K	100 K
20	198,5	21,0	26,3	31,5	36,8	42,0	47,3	52,5
25	254,0	26,9	33,6	40,3	47,1	53,8	60,5	67,2
32	325,1	34,4	43,0	51,6	60,2	68,8	77,4	86,0
40	373,3	39,5	49,4	59,3	69,1	79,0	88,9	98,8
50	522,9	55,3	69,2	83,0	96,9	110,7	124,5	138,4
65	666,9	70,6	88,2	105,9	123,5	141,2	158,8	176,5
80	861,6	91,2	114,0	136,8	159,6	182,4	205,2	228,0
100	1252,0	132,5	165,6	198,8	231,9	265,0	298,1	331,3
125	1539,3	162,9	203,6	244,4	285,1	325,8	366,6	407,3
150	2064,7	218,5	273,2	327,8	382,4	437,0	491,7	546,3
200	3033,8	321,1	401,4	481,7	561,9	642,2	722,5	802,8
250	4209,7	445,6	556,9	668,3	779,7	891,1	1002,5	1113,9
300	5599,8	592,7	740,9	889,0	1037,2	1185,4	1333,5	1481,7
350	6157,5	651,7	814,6	977,6	1140,5	1303,4	1466,4	1629,3
400	7918,8	838,1	1047,7	1257,2	1466,7	1676,3	1885,8	2095,3
450	8920,3	944,1	1180,2	1416,2	1652,2	1888,2	2124,3	2360,3
500	9929,7	1051,0	1313,7	1576,4	1839,2	2101,9	2364,7	2627,4
600	13447,9	1423,3	1779,2	2135,0	2490,8	2846,6	3202,5	3558,3
700	17668,3	1870,0	2337,5	2805,0	3272,5	3740,0	4207,5	4675,0
800	22232,9	2353,1	2941,4	3529,7	4118,0	4706,3	5294,5	5882,8

CHAPTER 2.1.4 DISTANCE BETWEEN EXPANSIONS

DISTANCE BETWEEN EXPANSIONS FOR SINGLE STEEL PIPE

Forces working against expansion are soil weight force and weight of pipe with water. Together these friction forces form a force that can be calculated with the following equation:

$$F = \mu \cdot \left(\frac{1 + K_0}{2} \cdot \rho_e \cdot D_o \cdot \pi \cdot H_{cc} + F_G \right) \left[\frac{N}{m} \right]$$

THUS:

K_0 = The quiescent pressure correction factor = 0,50

ρ_e = Specific soil weight = 19000 N/m³

μ = Friction coefficient between casing pipe and sand bed = 0,40

D_o = Outer diameter of the Casing pipe [m]

H_{cc} = Center line of pipe up to upper edge terrain [m]

F_G = Pipe weight force with water [N/m]

Admissible assembling length from NFP (Natural Fix-Point) to compensation spot is found out with the equation:

$$L_{zul} = \frac{A_i \cdot \sigma_{zul}}{F} [m]$$

THUS:

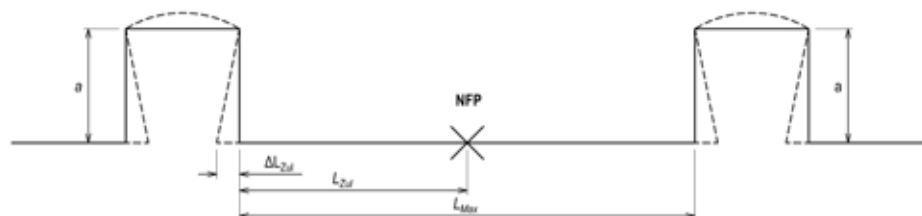
σ_{zul} = Maximum admissible axial tension for steel = 190 MPa

A_i = Steel pipe cross section [mm²]

Length between expansions for single steel pipe is then found out with the equation:

$$L_{Max} = 2 \cdot L_{zul} [m]$$

FIG 2.1.4.1
Maximum length
between expansion



The following table shows results for the maximum length between expansions in regards to dimension and depth of pipeline.

TABLE 2.1.4.1

Maximum length between expansions [m] series 1

DN = Diameter Nominal

d_o = Outer diameter of steel pipe

t_1 = Wall thickness of steel pipe

D_o = Outer diameter of Casing pipe

t_2 = Wall thickness of casing pipe

Steel pipes			Casing pipe		Depth			
DN	d_o [mm]	t_1 [mm]	D_o [mm]	t_2 [mm]	0,60 m	0,80 m	1,0 m	1,2 m
20	26,9	2,6	90	3,0	73,7	56,4	45,7	38,4
25	33,7	2,6	90	3,0	94,0	72,0	58,4	49,1
32	42,4	2,6	110	3,0	96,8	74,4	60,5	50,9
40	48,3	2,6	110	3,0	110,9	85,3	69,3	58,4
50	60,3	2,9	125	3,0	134,7	104,0	84,7	71,4
65	76,1	2,9	140	3,0	151,0	117,0	95,5	80,6
80	88,9	3,2	160	3,0	167,6	130,4	106,7	90,3
100	114,3	3,6	200	3,2	188,2	147,5	121,3	103,0
125	139,7	3,6	225	3,4	200,9	158,3	130,6	111,1
150	168,3	4,0	250	3,6	236,3	187,2	155,0	132,2
200	219,1	4,5	315	4,1	261,2	209,1	174,4	149,6
250	273	5,0	400	4,8	268,3	217,5	182,8	157,7
300	323,9	5,6	450	5,2	304,3	248,5	210,1	181,9
350	355,6	5,6	500	5,6	291,7	239,6	203,3	176,6
400	406,4	6,3	560	6,0	320,7	265,5	226,5	197,5
450	457	6,3	630	6,6	307,6	256,5	219,9	192,5
500	508	6,3	710	7,2	290,4	243,9	210,3	184,8
600	610	7,1	800	7,9	327,9	278,2	241,5	213,4
700	711	8,0	900	8,7	359,8	308,0	269,3	239,2
800	813	8,8	1000	9,4	384,2	331,7	291,7	260,4

TABLE 2.1.4.2

Maximum length between expansions [m] series 2

DN = Diameter Nominal

d_o = Outer diameter of steel pipe

t_1 = Wall thickness of steel pipe

D_o = Outer diameter of casing pipe

t_2 = Wall thickness of casing pipe

Steel pipes			Casing pipe		Depth			
DN	d_o [mm]	t_1 [mm]	D_o [mm]	t_2 [mm]	0,60 m	0,80 m	1,0 m	1,2 m
20	26,9	2,6	110	3,0	59,4	45,6	37,0	31,2
25	33,7	2,6	110	3,0	75,9	58,3	47,3	39,8
32	42,4	2,6	125	3,0	84,3	65,0	52,9	44,6
40	48,3	2,6	125	3,0	96,6	74,5	60,6	51,1
50	60,3	2,9	140	3,0	119,1	92,1	75,1	63,4
65	76,1	2,9	160	3,0	130,5	101,4	82,9	70,1
80	88,9	3,2	180	3,0	147,2	114,8	94,1	79,7
100	114,3	3,6	225	3,4	164,9	129,6	106,8	90,8
125	139,7	3,6	250	3,6	178,3	140,9	116,4	99,2
150	168,3	4,0	280	3,9	207,7	165,0	136,9	117,0
200	219,1	4,5	355	4,5	227,1	182,6	152,7	131,2
250	273,0	5,0	450	5,2	232,9	189,6	159,9	138,2
300	323,9	5,6	500	5,6	267,8	219,6	186,1	161,5
350	355,6	5,6	560	6,0	253,6	209,3	178,2	155,1
400	406,4	6,3	630	6,6	276,8	230,3	197,2	172,4
450	457,0	6,3	710	7,2	264,2	221,5	190,7	167,4
500	508,0	6,3	800	7,9	248,8	210,2	181,9	160,3
600	610,0	7,1	900	8,7	281,3	239,8	209,1	185,3
700	711,0	8,0	1000	9,4	313,4	269,5	236,4	210,6
800	813,0	8,8	1100	10,2	338,8	293,7	259,1	231,9

TABLE 2.1.4.3

Maximum length between
expansions [m] series 3

DN = Diameter Nominal

d_o = Outer diameter of steel pipe

t_1 = Wall thickness of steel pipe

D_o = Outer diameter of casing pipe

t_2 = Wall thickness of casing pipe

Steel pipes			Casing pipe		Depth			
DN	d_o [mm]	t_1 [mm]	D_o [mm]	t_2 [mm]	0,60 m	0,80 m	1,0 m	1,2 m
20	26,9	2,6	125	3,0	51,7	39,8	32,4	27,3
25	33,7	2,6	125	3,0	66,1	50,9	41,4	34,9
32	42,4	2,6	140	3,0	74,5	57,6	46,9	39,6
40	48,3	2,6	140	3,0	85,4	66,0	53,8	45,4
50	60,3	2,9	160	3,0	102,9	79,8	65,2	55,1
65	76,1	2,9	180	3,0	114,5	89,2	73,1	61,9
80	88,9	3,2	200	3,2	130,8	102,3	84,0	71,3
100	114,3	3,6	250	3,6	146,2	115,3	95,2	81,1
125	139,7	3,6	280	3,9	156,4	124,1	102,8	87,7
150	168,3	4,0	315	4,1	181,1	144,5	120,2	102,9
200	219,1	4,5	400	4,8	196,9	159,0	133,4	114,9
250	273,0	5,0	500	5,6	204,5	167,2	141,5	122,6
300	323,9	5,6	560	6,0	232,6	191,7	163,0	141,8
350	355,6	5,6	630	6,6	218,4	181,3	154,9	135,2
400	406,4	6,3	710	7,2	237,4	198,6	170,7	149,7
450	457,0	6,3	800	7,9	226,0	190,6	164,7	145,1
500	508,0	6,3	900	8,7	212,6	180,6	157,0	138,9
600	610,0	7,1	1000	9,4	244,1	209,3	183,1	162,8
700	711,0	8,0	1100	10,2	275,5	238,0	209,5	187,1
800	813,0	8,8	1200	11,0	301,1	262,0	231,9	208,0

CHAPTER 2.1.5 HEAT LOSS

HEAT LOSS - PRE INSULATED STEEL PIPES

One of the most important characteristics of district heating systems is their heat retention. As most district heating stations in Europe have to burn gas, oil, biomass or waste, good insulation and proper ground work is necessary. Set Pipes works continuously to improve foam insulation in close cooperation with its suppliers to help improve energy efficiency and reduce CO2 emission.

All results in the following tables are calculated according to EN 13941.

To calculate the total heat loss per meter of buried pipe it is necessary to know the average water temperature and the overall heat loss coefficient for the pipe line system.

The average temperature for the water is calculated with the following equation:

$$T_M = \frac{(T_{VL} + T_{RL})}{2} - T_E [K]$$

THUS:

T_{VL} = Forward flow media temperature [°C]

T_{RL} = Return flow media temperature [°C]

T_E = Soil temperature [°C]

EXAMPLE: We know the temperature for the forward flow media is 80°C and for the return it is 60°C. We estimate the soil temperature to be 10°C. Thus we can calculate the average temperature of the water:

$$T_M = \frac{(80 + 60)}{2} - 10$$

$$T_M = 60 K$$

The calculation shows an average temperature of T_M 60 K.

Pre-insulated steel pipes are made up of three components, steel pipe, PUR insulation foam and casing pipe. All of these materials have variable heat loss (q).

The following equation is used to calculate the thermal resistance (R) for each material which is then used to calculate overall heat loss coefficient ($U_{\text{pipe in ground}}$).

THERMAL RESISTANCE OF STEEL PIPE

$$R_{St} = \frac{1}{2 \cdot \pi \cdot \lambda_{St}} \cdot \ln\left(\frac{d_o}{d_i}\right) \left[\frac{m \cdot K}{W}\right]$$

THUS:

- λ_{St} = Coefficient of thermal conductivity for steel pipe = 50,0 W/m·K
- d_o = Steel pipe outer diameter [m]
- d_i = Inner diameter of steel pipe [m]

THERMAL RESISTANCE OF THE INSULATION MATERIAL

$$R_{PUR} = \frac{1}{2 \cdot \pi \cdot \lambda_{PUR}} \cdot \ln\left(\frac{D_{PUR}}{d_o}\right) \left[\frac{m \cdot K}{W}\right]$$

THUS:

- λ_{PUR} = Coefficient of thermal conductivity for PUR insulation = 0,0260 W/m·K
- D_{PUR} = Outer diameter of insulation material [m]
- d_i = Outer diameter of steel pipe [m]

THERMAL RESISTANCE OF THE CASING PIPE

$$R_{PE100} = \frac{1}{2 \cdot \pi \cdot \lambda_{PE100}} \cdot \ln\left(\frac{D_o}{D_i}\right) \left[\frac{m \cdot K}{W}\right]$$

THUS:

- λ_{PE100} = Coefficient of thermal conductivity for the casing pipe = 0,400 W/m·K
- D_o = Outer diameter of casing pipe [m]
- D_i = Inner diameter of casing pipe [m]

THERMAL RESISTANCE OF THE SOIL

The soil around the pipe line and its depth can also affect heat loss in the pipeline system. With the following equation the thermal resistance of the soil is found out:

$$R_s = \frac{1}{2 \cdot \pi \cdot \lambda_s} \cdot \ln\left(\frac{4 \cdot Z_c}{D_o}\right) \left[\frac{m \cdot K}{W}\right]$$

THUS:

- λ_s = Coefficient of thermal conductivity for soil = 1,20 W/m·K
- D_o = Outer diameter of casing pipe [m]
- Z_c = Is a corrected value of depth z, so that the surface transition insolation Ro at the soil surface is included:

$$Z_c = H_{cc} + R_0 \cdot \lambda_s [m]$$

THUS:

H_{cc} = Distance from the surface to the middle of the pipe plus radius of the outer diameter of the casing

R_0 = Thermal resistance surface material = 0,0685 m²·K/W

Another factor which affects the heat loss of the pipe system is when the flow and return pipe are laid in the same trench with little distance between them. With the following equation the thermal resistance of the heat exchange between flow and return pipe is found:

$$R_h = \frac{1}{2 \cdot \pi \cdot \lambda_s} \cdot \ln \left(1 + \left(\frac{2 \cdot Z_c}{C} \right)^2 \right) \left[\frac{m \cdot K}{W} \right]$$

THUS:

C = Distance between the center lines of the pipes [m]

All thermal resistance factors results can now be summed and used in the following equation to calculate overall heat loss coefficient:

$$U_{\text{Pipe in ground}} = \frac{1}{R_{St} + R_{PUR} + R_{PE100} + R_s + R_h} \left[\frac{W}{m \cdot K} \right]$$

Total heat loss per meter for buried pre-insulated steel pipe, is calculated with the equation:

$$q = U_{\text{Pipe in ground}} \cdot T_m \left[\frac{W}{m} \right]$$

TOTAL HEAT LOSS FOR BURIED PRE- INSULATED STEEL PIPES

In tables 2.1.5.1, 2.1.5.2 og 2.1.5.3 the results for total heat loss for buried single pipe, insulation series 1-3 in regards to overall heat loss coefficient and average water temperature T_M are shown.

TABLE 2.1.5.1

Heat loss for pre-insulated steel pipe [W/m] insulation series 1

DN = Diameter Nominal

D_o = Outer diameter of casing pipe [mm]

$U_{\text{Rör i jord}}$ = Overall heat loss coefficient

T_M = Average temperature [K]

DN	D_o [mm]	$U_{\text{PIPE IN GROUND}}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	90	0,126	2,52	5,04	6,30	7,56	8,82	10,1
25	90	0,152	3,05	6,10	7,62	9,14	10,7	12,2
32	110	0,156	3,12	6,23	7,79	9,35	10,9	12,5
40	110	0,178	3,56	7,12	8,90	10,7	12,5	14,2
50	125	0,198	3,96	7,91	9,89	11,9	13,8	15,8
65	140	0,231	4,62	9,24	11,5	13,9	16,2	18,5
80	160	0,238	4,76	9,53	11,9	14,3	16,7	19,1
100	200	0,250	4,99	9,98	12,5	15,0	17,5	20,0
125	225	0,287	5,74	11,5	14,4	17,2	20,1	23,0
150	250	0,336	6,73	13,5	16,8	20,2	23,5	26,9
200	315	0,366	7,31	14,6	18,3	21,9	25,6	29,2
250	400	0,356	7,12	14,2	17,8	21,4	24,9	28,5
300	450	0,406	8,12	16,2	20,3	24,4	28,4	32,5
350	500	0,397	7,94	15,9	19,9	23,8	27,8	31,8
400	560	0,421	8,42	16,8	21,0	25,3	29,5	33,7
450	630	0,424	8,5	17,0	21,2	25,5	29,7	33,9
500	710	0,413	8,3	16,5	20,7	24,8	28,9	33,0
600	800	0,497	9,9	19,9	24,9	29,8	34,8	39,8
700	900	0,563	11,3	22,5	28,2	33,8	39,4	45,1
800	1000	0,63	12,6	25,3	31,6	37,9	44,2	50,5

TABLE 2.1.5.2

Heat loss for pre-insulated
steel pipe [W/m] insulation
series 2

DN = Diameter Nominal

D_o = Outer diameter of casing pipe [m]

$U_{\text{Rör i jörð}}$ = Overall heat loss coefficient

T_M = Average temperature [K]

DN	D_o [mm]	$U_{\text{PIPE IN GROUND}}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	110	0,109	2,17	4,35	5,43	6,52	7,61	8,69
25	110	0,128	2,56	5,11	6,39	7,67	8,95	10,2
32	125	0,139	2,77	5,55	6,93	8,32	9,71	11,1
40	125	0,156	3,12	6,24	7,80	9,36	10,9	12,5
50	140	0,174	3,48	6,95	8,69	10,4	12,2	13,9
65	160	0,194	3,88	7,77	9,71	11,7	13,6	15,5
80	180	0,203	4,07	8,14	10,2	12,2	14,2	16,3
100	225	0,212	4,24	8,49	10,6	12,7	14,9	17,0
125	250	0,243	4,86	9,73	12,2	14,6	17,0	19,5
150	280	0,274	5,49	11,0	13,7	16,5	19,2	21,9
200	355	0,290	5,81	11,6	14,5	17,4	20,3	23,2
250	450	0,285	5,70	11,4	14,2	17,1	19,9	22,8
300	500	0,324	6,47	12,9	16,2	19,4	22,7	25,9
350	560	0,313	6,26	12,5	15,7	18,8	21,9	25,1
400	630	0,325	6,50	13,0	16,3	19,5	22,8	26,0
450	710	0,326	6,52	13,0	16,3	19,6	22,8	26,1
500	800	0,319	6,39	12,8	16,0	19,2	22,4	25,5
600	900	0,369	7,37	14,7	18,4	22,1	25,8	29,5
700	1000	0,416	8,3	16,6	20,8	25,0	29,1	33,3
800	1100	0,464	9,3	18,6	23,2	27,9	32,5	37,2

TABLE 2.1.5.3

Heat loss for pre-insulated
steel pipe [W/m] insulation
series 3

DN = Diameter Nominal

D_o = Outer diameter of casing pipe [m]

$U_{Rör i jord}$ = Overall heat loss coefficient

T_M = Average temperature [K]

DN	D_o [mm]	$U_{PIPE IN GROUND}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	125	0,100	2,00	4,00	5,00	6,00	7,00	8,00
25	125	0,116	2,32	4,64	5,80	6,96	8,12	9,28
32	140	0,126	2,53	5,06	6,32	7,59	8,85	10,1
40	140	0,141	2,81	5,62	7,03	8,44	9,84	11,2
50	160	0,152	3,04	6,08	7,61	9,13	10,6	12,2
65	180	0,170	3,41	6,82	8,52	10,2	11,9	13,6
80	200	0,180	3,61	7,21	9,02	10,8	12,6	14,4
100	250	0,187	3,74	7,49	9,36	11,2	13,1	15,0
125	280	0,209	4,18	8,36	10,4	12,5	14,6	16,7
150	315	0,230	4,60	9,19	11,5	13,8	16,1	18,4
200	400	0,241	4,81	9,62	12,0	14,4	16,8	19,2
250	500	0,242	4,84	9,67	12,1	14,5	16,9	19,3
300	560	0,266	5,31	10,6	13,3	15,9	18,6	21,3
350	630	0,257	5,14	10,3	12,8	15,4	18,0	20,6
400	710	0,264	5,28	10,6	13,2	15,8	18,5	21,1
450	800	0,265	5,29	10,6	13,2	15,9	18,5	21,2
500	900	0,261	5,22	10,4	13,0	15,7	18,3	20,9
600	1000	0,299	5,98	12,0	15,0	17,9	20,9	23,9
700	1100	0,336	6,73	13,5	16,8	20,2	23,5	26,9
800	1200	0,374	7,48	15,0	18,7	22,4	26,2	29,9

CHAPTER 2.2

TRANSPORT AND STORAGE

PRE-INSULATED SINGLE STEEL PIPES AND FITTINGS

Pre-insulated steel pipes and fittings are usually transported and delivered by truck. Make sure that the truck has good access to the destination with 12 m lengths or 16 m if applicable. Pipes and fittings are sealed with protective plastic end caps on the steel and must remain in place until assembly. All joint material as well as accessories are delivered in plastic packaging. Do not remove packaging before installation. The customer is responsible for the unloading of goods. Preparation of a flat and a dry unloading area is required for safe unloading, making sure nothing can damage the casing pipe. Pre-insulated steel pipes from Set Pipes are delivered in bundles up to 280 casing according to the table below or loose according to customer requests.

TABLE 2.2.1

Weight and number of pipes in bundle

CASING PIPE	LENGTHS			
OUTER DIAMETER [mm]	6 m [pc]	WEIGHT SERIES 1 [kg]	12 m [pc]	WEIGHT SERIES 1 [kg]
90	58	1298	58	2596
110	38	1223	38	2319
125	26	1107	26	2133
140	23	1208	23	2344
160	20	1248	20	2433
200	14	1212	14	2424
225	9	960	9	1920
250	7	1027	7	2054

FIG 2.2.1

LOADING WITH SLINGS

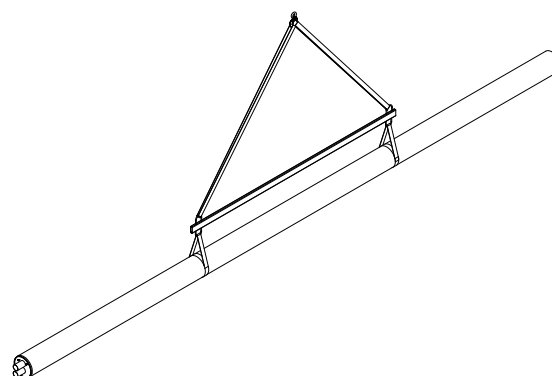
Use wide nylon web slings while loading and for further handling. Ropes, chains or other lifting equipment are prohibited

LOADING

During loading and unloading regulations must be followed to minimize the risk of accidents. Ensure no one is nearby and the loading operator should be located at a safe distance.

All equipment used for loading must be certificated, with a CE label and a specified maximum weight capacity. Use only flat nylon web sling wider than 100 mm during

loading. Do not use chains, ropes, wires or other lifting equipment. When loading of larger pipes, 12m and 16m it is necessary to use a support bar between belts (see photo 2.2.1). The support bar is to be at least 4m long. Do not allow pipes or fittings to drop down from the vehicle. Casing pipe is sensitive to sharp edges and heavy force. Ensure casing pipe is undamaged to avoid further damage to pipes once in use.



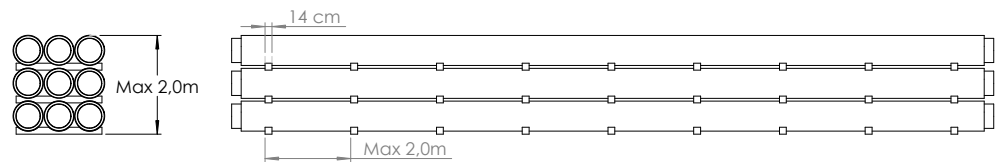
STACK

Pipes shall be stacked placing wooden strips with a minimum width of 140 mm between pipes or laid on a stone free, flat and dry sand surface. Space between wooden strips shall be no more than 2m. Stacking shall be done so the bottom layer is supported and free from water and the maximum stacking height is 2 m. Ensure the pressure does not exceed 0,3 N/mm² (3 kg/cm²).

FIG 2.2.2

STACKS WITH WOODEN SPACING STRIPS

Stack pipes so the maximum. pressure does not exceed <0,3 N/mm² or 3 kg/cm²



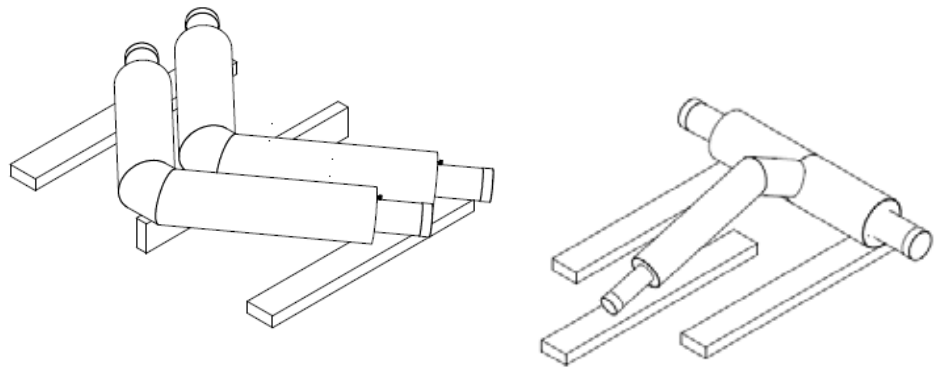
FITTINGS

Fittings shall be stored so the insulation surface leans downward and is free from any water.

FIG 2.2.3

BENDS AND T-PIECES

Allow insulation surface to lean downward



If pipes or fittings are stored outside for longer periods of time ensure protection against corrosion.

PUR INSULATION AND JOINT MATERIAL

Store shrink tubes, sleeves, expansion pads and other accessories where they are protected from cold weather and direct sunlight. Liquid insulation components in barrels, bottles or bags must be stored in a secured area at a temperature between +10 and +20°C. Insulation material Poly (light coloured) and Isocyanate (dark coloured) may under no circumstances freeze or reach a temperature below 0°C during use or storage. Otherwise the foam can crystallize and be no longer possible to use.

CHAPTER 2.3 FIELD WORK

PIPE-LAYING

The casing pipe and the insulation foam move axially with the expansion of the steel pipe. All occurring external forces coming from the surroundings transfers to the steel through the soil.

It is important to take these in account and follow correct procedures to avoid unnecessary pressure to the casing pipe, insulation and steel which can lead to a premature breakdown of the district heating system.

Points that impact the system's lifespan are how temperature change varies and the pipe laying in regards to expansion. The greatest strain is undoubtedly when water is set through a buried cold layed pipeline and is reaching the flow line temperature.

Different installation methods are possible to use for movement occurring due to temperature changes in the system. Below the most important are discussed. Each project must be separately considered and if other methods than recommended are to be used, please contact our technical department.

PROJECT PLANNING OF PRE-INSULATED PIPE SYSTEMS

During project planning, factors like safety and size need to be taken into account. The standard EN 13941 suggests the following classification:

TABLE 2.3.1
Project planning

Class A	- Small and medium diameter pipes with low axial stresses - Low risk of damage to external systems and surroundings - System with low risk of economic losses
Class B	- High axial stresses, small and medium diameter pipes
Class C	- Large diameters pipes and/or high pressures - Higher risk of damage to external systems and surroundings - Special or complex construction

EXPANSION FACTORS

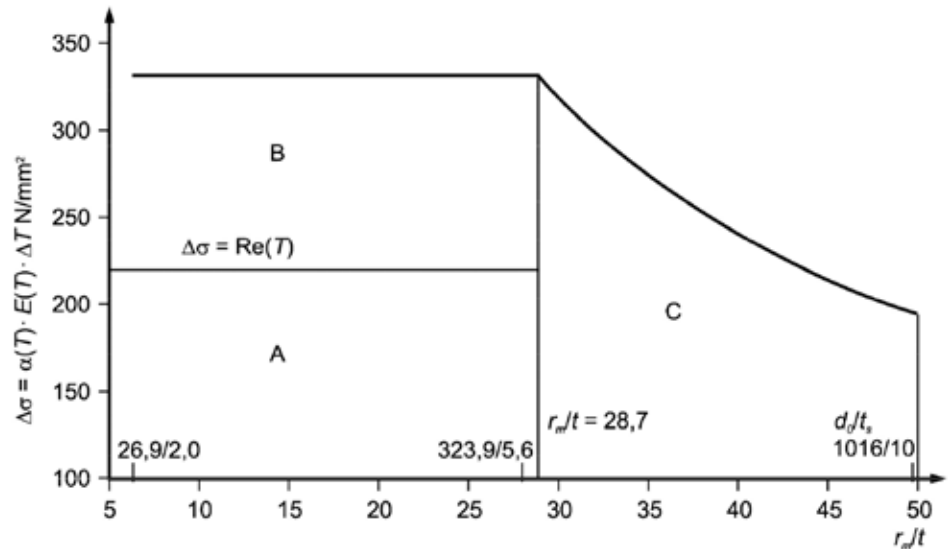
The standard recommends that calculated are four parameters to find an effective system. The parameters are:

1. Factors due to internal pressure.
2. Factors due to repetitive strain.
3. Factors that can lead to instability or deformation.
4. Deformation or settlements that may affect the piping system, external systems or structures.

More detailed description can be found in the EN 13941 standard.

GRAPH 2.3.1

Definition of project classes for steel



CHAPTER 2.3.1

COLD LAYING

WITHOUT EXPANSION

COLD LAYING, WITHOUT EXPANSION BENDS

With this installation technique it is possible to lay the pipeline directly in the trench and put it into operation. This technique may only be used if the forward flow media temperature, the difference between soil temperature and forward flow media temperature is $< 85^{\circ}\text{C}$ and is then classified in class A. In class B the axial stresses are high and temperature is between $85^{\circ} < T < 130^{\circ}\text{C}$. With this method all external factors have to be considered. For example height changes in landscape and small degree bends are not allowed due to risk of buckling. The stress that occurs at operation start up can be found with the equation:

$$\sigma_{St} = \alpha \cdot E_{St} \cdot \Delta T$$

THUS:

σ_{St} = Tensile and compressive stress [N/mm²]

E_{St} = Modulus of elasticity for steel = 210 GPa

α = Expansion coefficient for steel = $12,6 \times 10^{-6} \text{ K}^{-1}$

ΔT = Temperature difference between forward flow media and soil ($T_{VL} - T_E$)

Diagram 2.3.1 is explained in table 2.3.1.1.

*ÍST EN 13941+A1:2010; p. 21; Fig 3, published with permission from Staðlaráðs Íslands.

TAFLA 2.3.1.1

Definition of project classes
for steel according to
EN 13941

DN = Diameter Nominal

d_o = Outer diameter of steel pipe

t = Wall thickness of steel pipe

T_{VL} = Forward flow media temperature

ΔT = Temperature difference

σ = Inner tension of the steel

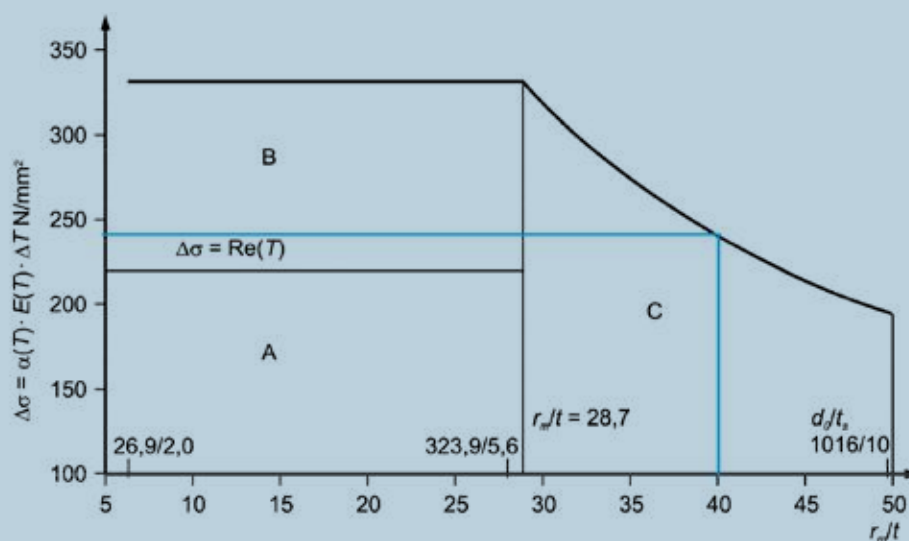
$r_{m/t}$ = Diameter and wall
thickness ratio

DN	d_o [mm]	t [mm]	T_{VL} [°C]	ΔT [K]	σ [N/mm ²]	$r_{m/t}$	Flokkur
20	26,9	2,6	50	40	106	5,2	A
25	33,7	2,6	55	45	119	6,5	A
32	42,4	2,6	60	50	132	8,2	A
40	48,3	2,6	65	55	146	9,3	A
50	60,3	2,9	70	60	159	10,4	A
65	76,1	2,9	75	65	172	13,1	A
80	88,9	3,2	80	70	185	13,9	A
100	114,3	3,6	85	75	198	15,9	A
125	139,7	3,6	90	80	212	19,4	A
150	168,3	4,0	95	85	225	21,0	A-B
200	219,1	4,5	100	90	238	24,3	B
250	273,0	5,0	105	95	251	27,3	B
300	323,9	5,6	110	100	265	28,9	B-C
350	355,6	5,6	115	105	278	31,8	C
400	406,4	6,3	120	110	291	32,3	C
450	457,0	6,3	125	115	304	36,3	C
500	508,0	6,3	130	120	318	40,3	C
600	610,0	7,1	135	125	331	43,0	C

EXAMPLE: A system with 1500m pipe in DN 500 without expansion bends. Forward flow media temperature is 130°C and the temperature during pipe laying is 10°C.

$$\sigma_{St} = 12,6 \times 10^{-6} K^{-1} \cdot 2,1 \times 10^5 N/mm^2 \cdot (130 - 10)K$$

$$\sigma_{St} = 318 N/mm^2$$



The table shows a **DN 500** with $r_{m/t} = 40,3$. This shows that class C doesn't allow such high expansions or maximum ca **245 N/mm²**. In this situation bends need to be added or the flow pipeline temperature must be lowered.

CHAPTER 2.3.2 COLD LAYING WITH U AND Z COMPENSATORS

COLD LAYING WITH U AND Z COMPENSATORS

With this installation technique it is possible to lay the pipeline directly in the trench and put into operation. This technique may only be used if the longest length $< L_{\max}$ is followed. If the laying length is longer than $L_{\max}$ a Z or U compensator for the expansion is necessary. This method can be used where the forward flow media temperature is $< 85^{\circ}\text{C}$. Expansion foam pads on bends are needed in order to absorb movement.

FIG 2.3.2.1
U and Z compensators

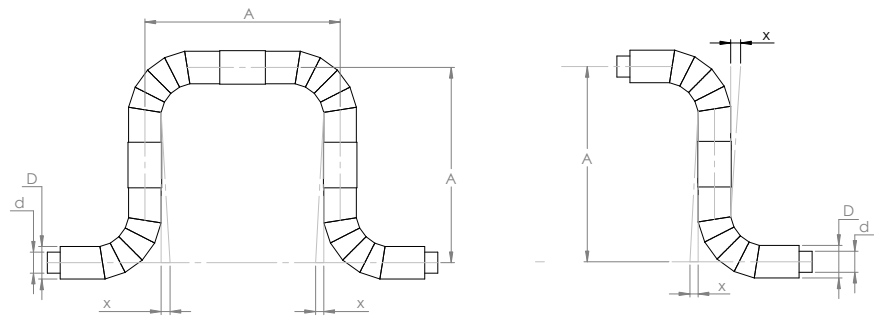


TABLE 2.3.2.1
Maximum length between
expansions for double pipe [m]
series 1

DN = Diameter Nominal

d_o = Outer diameter of the steel pipe

t_1 = Wall thickness of the steel pipe

D_o = Outer diameter of the Casing pipe

t_2 = Wall thickness of the casing pipe

Steel pipes			Casing pipe		Depth			
DN	d_o [mm]	t_1 [mm]	D_o [mm]	t_2 [mm]	0,60 m	0,80 m	1,0 m	1,2 m
20	26,9	2,6	90	3,0	73,7	56,4	45,7	38,4
25	33,7	2,6	90	3,0	94,0	72,0	58,4	49,1
32	42,4	2,6	110	3,0	96,8	74,4	60,5	50,9
40	48,3	2,6	110	3,0	110,9	85,3	69,3	58,4
50	60,3	2,9	125	3,0	134,7	104,0	84,7	71,4
65	76,1	2,9	140	3,0	151,0	117,0	95,5	80,6
80	88,9	3,2	160	3,0	167,6	130,4	106,7	90,3
100	114,3	3,6	200	3,2	188,2	147,5	121,3	103,0
125	139,7	3,6	225	3,4	200,9	158,3	130,6	111,1
150	168,3	4,0	250	3,6	236,3	187,2	155,0	132,2
200	219,1	4,5	315	4,1	261,2	209,1	174,4	149,6
250	273	5,0	400	4,8	268,3	217,5	182,8	157,7
300	323,9	5,6	450	5,2	304,3	248,5	210,1	181,9
350	355,6	5,6	500	5,6	291,7	239,6	203,3	176,6
400	406,4	6,3	560	6,0	320,7	265,5	226,5	197,5
450	457	6,3	630	6,6	307,6	256,5	219,9	192,5
500	508	6,3	710	7,2	290,4	243,9	210,3	184,8
600	610	7,1	800	7,9	327,9	278,2	241,5	213,4
700	711	8,0	900	8,7	359,8	308,0	269,3	239,2
800	813	8,8	1000	9,4	384,2	331,7	291,7	260,4

TAFLA 2.3.2.2

Maximum length between expansions for double pipe [m] series 2

DN = Diameter Nominal

d_o = Outer diameter of the steel pipe

t_1 = Wall thickness of the steel pipe

D_o = Outer diameter of the Casing pipe

t_2 = Wall thickness of the casing pipe

Steel pipes			Casing pipe		Depth			
DN	d_o [mm]	t_1 [mm]	D_o [mm]	t_2 [mm]	0,60 m	0,80 m	1,0 m	1,2 m
20	26,9	2,6	110	3,0	59,4	45,6	37,0	31,2
25	33,7	2,6	110	3,0	75,9	58,3	47,3	39,8
32	42,4	2,6	125	3,0	84,3	65,0	52,9	44,6
40	48,3	2,6	125	3,0	96,6	74,5	60,6	51,1
50	60,3	2,9	140	3,0	119,1	92,1	75,1	63,4
65	76,1	2,9	160	3,0	130,5	101,4	82,9	70,1
80	88,9	3,2	180	3,0	147,2	114,8	94,1	79,7
100	114,3	3,6	225	3,4	164,9	129,6	106,8	90,8
125	139,7	3,6	250	3,6	178,3	140,9	116,4	99,2
150	168,3	4,0	280	3,9	207,7	165,0	136,9	117,0
200	219,1	4,5	355	4,5	227,1	182,6	152,7	131,2
250	273,0	5,0	450	5,2	232,9	189,6	159,9	138,2
300	323,9	5,6	500	5,6	267,8	219,6	186,1	161,5
350	355,6	5,6	560	6,0	253,6	209,3	178,2	155,1
400	406,4	6,3	630	6,6	276,8	230,3	197,2	172,4
450	457,0	6,3	710	7,2	264,2	221,5	190,7	167,4
500	508,0	6,3	800	7,9	248,8	210,2	181,9	160,3
600	610,0	7,1	900	8,7	281,3	239,8	209,1	185,3
700	711,0	8,0	1000	9,4	313,4	269,5	236,4	210,6
800	813,0	8,8	1100	10,2	338,8	293,7	259,1	231,9

TAFLA 2.3.2.3

Maximum length between expansions for double pipe [m] series 3

DN = Diameter Nominal

d_o = Outer diameter of the steel pipe

t_1 = Wall thickness of the steel pipe

D_o = Outer diameter of the Casing pipe

t_2 = Wall thickness of the casing pipe

Steel pipes			Casing pipe		Depth			
DN	d_o [mm]	t_1 [mm]	D_o [mm]	t_2 [mm]	0,60 m	0,80 m	1,0 m	1,2 m
20	26,9	2,6	125	3,0	51,7	39,8	32,4	27,3
25	33,7	2,6	125	3,0	66,1	50,9	41,4	34,9
32	42,4	2,6	140	3,0	74,5	57,6	46,9	39,6
40	48,3	2,6	140	3,0	85,4	66,0	53,8	45,4
50	60,3	2,9	160	3,0	102,9	79,8	65,2	55,1
65	76,1	2,9	180	3,0	114,5	89,2	73,1	61,9
80	88,9	3,2	200	3,2	130,8	102,3	84,0	71,3
100	114,3	3,6	250	3,6	146,2	115,3	95,2	81,1
125	139,7	3,6	280	3,9	156,4	124,1	102,8	87,7
150	168,3	4,0	315	4,1	181,1	144,5	120,2	102,9
200	219,1	4,5	400	4,8	196,9	159,0	133,4	114,9
250	273,0	5,0	500	5,6	204,5	167,2	141,5	122,6
300	323,9	5,6	560	6,0	232,6	191,7	163,0	141,8
350	355,6	5,6	630	6,6	218,4	181,3	154,9	135,2
400	406,4	6,3	710	7,2	237,4	198,6	170,7	149,7
450	457,0	6,3	800	7,9	226,0	190,6	164,7	145,1
500	508,0	6,3	900	8,7	212,6	180,6	157,0	138,9
600	610,0	7,1	1000	9,4	244,1	209,3	183,1	162,8
700	711,0	8,0	1100	10,2	275,5	238,0	209,5	187,1
800	813,0	8,8	1200	11,0	301,1	262,0	231,9	208,0

CHAPTER 2.3.3 EXPANSION FOAM PADS

EXPANSION FOAM PADS

In order to absorb expansion movements of the pipe system in bends, branches or compensators, the right size of expansion pads must be used around the casing pipe. Set Pipes expansion pads are manufactured from cross-linked closed-cell polyethylene and have no water or chemical absorption. The pads are corrugated. Once the pads are placed around the pipe a thin laminated wrap around is placed over to protect from sand and soil.

The expansion foam pads are delivered in dimension 1000 x 2000 x 40 mm. The foam pad thickness tells how much movement can be absorbed. Each pad is 40 mm thick and can absorb 35 mm, it is possible to put together up to three pads which can absorb up to 105 mm.

Cutting size of expansion foam pad is according to table 2.3.3.1.

TABLE 2.3.3.1

Cutting size of expansion
foam pad

D_o = Outer diameter of casing pipe [mm]

Y = Number of strips pcs.

b = Width [mm]

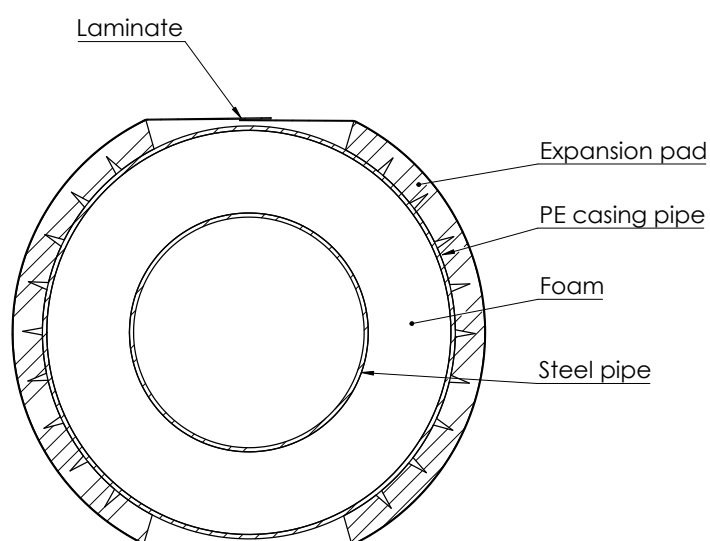
S = Size no.

D_o [mm]	Y pc.	b [mm]	S nr.
90	2	120	1
110	2	120	1
125	2	120	1
140	2	120	1
160	2	120	1
180	4	240	2
200	4	240	2
225	4	240	2
250	4	240	2
280	4	240	2
315	6	360	3
355	6	360	3
400	8	480	4
450	8	480	4
500	8	480	4
560	10	600	5
630	12	720	6
710	14	840	7

Please contact Set Pipes technical department to determine the necessary width of the foam pad needed.

FIG 2.3.3.1

Installation of expansion
foam pads



To determine the thickness of the expansion foam pad needed it is necessary to know how much extension ΔL is occurring by using the following equation:

$$\Delta L_{zul} = \alpha \cdot \Delta T \cdot L - \left(\frac{F_N \cdot L^2}{2 \cdot A_i \cdot E_{St}} \right)$$

THUS:

ΔL_{zul} = Extension of the steel pipe [m]

α = Expansion coefficient for steel = $12,6 \times 10^{-6} \text{ K}^{-1}$

ΔT = Starting temperature – finishing temperature [$^{\circ}\text{C}$]

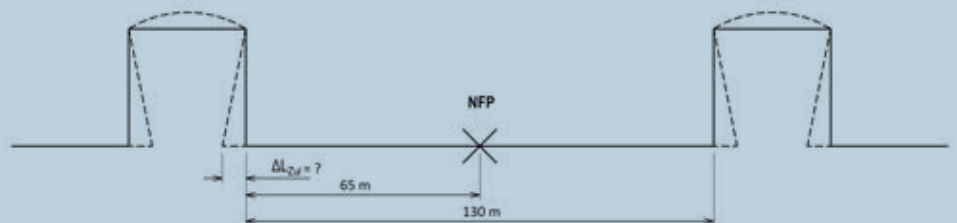
L = Pipe length < L_{zul} [m]

F_N = Resistance force of the pipe (see table 2.3.4) [kN/m]

A_i = Steel pipe cross section [m^2]

E_{St} = Modulus of elasticity for steel = 210 GPa

EXAMPLE: A DN 150 (Series 2) pipe line which is 130 m long between compensators. How many layers of expansion foam pad is needed to take the expansion of the pipe if the starting temperature is 10° and ends at 100°C ? We estimate the depth from the surface down to the casing pipe to be 1,0 m.



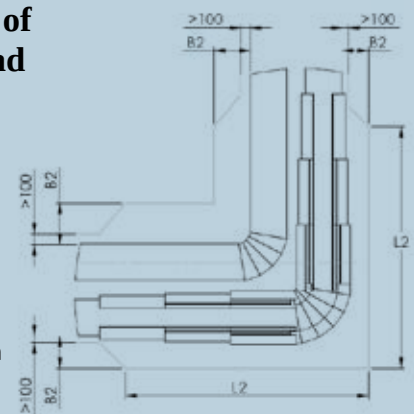
Using the following equation:

$$\Delta L_{zul} = 12,6 \times 10^{-6} \text{ K}^{-1} \cdot (105 - 10)^{\circ}\text{C} \cdot 65 \text{ m} - \left(\frac{5730 \text{ N} \cdot (65 \text{ m})^2}{2 \cdot 2,0647 \times 10^{-3} \text{ m}^2 \cdot 2,1 \times 10^{12} \frac{\text{N}}{\text{m}^2}} \right)$$

$$\Delta L_{zul} = 0,075 \text{ m} \approx 75 \text{ mm}$$

We know a one expansion foam pad can take max 35 mm pipe expansion. In this example we need to find how many layers of foam pad are needed to take 75 mm expansion. With the following equation we would need:

$$n = \frac{75 \text{ mm}}{35 \text{ mm}} = 2,14 \approx \text{3 layers of foam pad}$$



The figure on the side shows the installation of the expansion foam pads on a pipe line system. For 130 m it would need foam pads on both bends.

TABLE 2.3.3.2

Friction force [kN/m]

Diameter Nominal		SERIES 1			SERIES 2			SERIES 3		
		Depth 0,6m	Depth 1,0m	Depth 1,2m	Depth 0,6m	Depth 1,0m	Depth 1,2m	Depth 0,6m	Depth 1,0m	Depth 1,2m
DN	A _i [mm ²]	[kN/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]
20	198,5	1,02	1,65	1,97	1,27	2,04	2,42	1,46	2,33	2,77
25	254,0	1,03	1,65	1,97	1,27	2,04	2,42	1,46	2,33	2,77
32	325,1	1,28	2,04	2,43	1,47	2,34	2,77	1,66	2,63	3,12
40	373,3	1,28	2,05	2,43	1,47	2,34	2,78	1,66	2,64	3,12
50	522,9	1,48	2,35	2,78	1,67	2,64	3,13	1,93	3,05	3,61
65	666,9	1,68	2,65	3,14	1,94	3,06	3,62	2,21	3,47	4,10
80	861,6	1,95	3,07	3,63	2,22	3,48	4,11	2,50	3,90	4,59
100	1252,0	2,53	3,92	4,62	2,89	4,45	5,24	3,25	5,00	5,87
125	1539,3	2,91	4,48	5,26	3,28	5,02	5,90	3,74	5,69	6,67
150	2064,7	3,32	5,06	5,93	3,78	5,73	6,71	4,33	6,53	7,63
200	3033,8	4,41	6,61	7,71	5,08	7,55	8,79	5,85	8,64	10,04
250	4209,7	5,96	8,75	10,14	6,87	10,01	11,58	7,82	11,31	13,05
300	5599,8	6,99	10,13	11,70	7,95	11,43	13,18	9,15	13,05	15,01
350	6157,5	8,02	11,51	13,25	9,23	13,13	15,08	10,71	15,11	17,30
400	7918,8	9,38	13,29	15,24	10,87	15,26	17,46	12,68	17,63	20,10
450	8920,3	11,02	15,41	17,61	12,83	17,78	20,25	15,00	20,58	23,37
500	9929,7	12,99	17,94	20,42	15,17	20,74	23,53	17,75	24,03	27,16
600	13447,9	15,58	21,16	23,95	18,17	24,44	27,58	20,93	27,91	31,39
700	17668,3	18,66	24,93	28,07	21,42	28,40	31,88	24,37	32,04	35,88
800	22232,9	21,99	28,96	32,45	24,93	32,60	36,44	28,06	36,43	40,61

PRE HEATING

It is possible to pre-heat the pipeline in an open trench to avoid U- and Z compensators. This can be done by filling the pipe with water to the correct temperature. It is also possible to achieve with induction or steam heating. For pre-heating the following points must be considered:

- Careful supervision of pipeline temperature is required during preheating.
- The pipeline must move freely and ensure an axially expansion.
- keep a constant temperature during backfilling.
- In case of considerable height differences between pipeline ends gravity must be taken into account.
- Specialized engineers or technician to supervise and approve all procedures

CHAPTER 2.3.4 PRE HEATING

When a pipeline is preheated the heating temperature must be determined. Generally the average soil temperature (TE) and the maximum forward flow media temperature (TVL) is used. The advantage of this method is that when the pipeline is heated up to an average temperature it leads to only half the tensile and compressive stress compared to cold laying. Do not exceed the permissible tensile and compressive stress. To determine the temperature difference and $\pm$ strain the following equations are used:

$$\Delta T = \frac{T_{VL} - T_E}{2} \quad \text{and for compressive stress} \quad \Delta T = \frac{T_E - T_{VL}}{2}$$

THUS:

- ΔT = Temperature difference [K]
- T_{VL} = Forward flow media temperature [°C]
- T_E = Soil temperature [°C]

$$\sigma_{st} = \alpha \cdot E_{st} \cdot \Delta T$$

THUS:

- σ_{st} = Tensile and compressive stress [N/mm²]
- E_{st} = Modulus of elasticity for steel = 210 GPa
- α = Expansion coefficient for steel = $12,6 \times 10^{-6} \text{ K}^{-1}$

EXAMPLE: 2.100m DN 250 is to be used with a maximum temperature of 125°C and soil temperature of 10°C. The length changes of the pipeline during pre-heating as well as the tensile and compressive stress of the material has to be calculated.

$$\Delta T = \frac{(125 - 10)}{2}$$

$$\Delta T = 57,5 \text{ K}$$

$$\Delta L = 12,6 \times 10^{-6} \text{ K}^{-1} \cdot 57,5 \text{ K} \cdot 2100 \text{ m}$$

$$\Delta L = 1,5 \text{ m}$$

$$\sigma_{st} = 2,1 \times 10^5 \frac{\text{N}}{\text{mm}^2} \cdot 12,6 \times 10^{-6} \text{ K}^{-1} \cdot 57,5 \text{ K}$$

$$\sigma_{st} = 152 \frac{\text{N}}{\text{mm}^2}$$

Degree of 57,5 K causes stress and length change. The total length of the 2.100 m will be 1,5 m on each end of the pipeline. The steel stress is $\pm 152 \text{ N/mm}^2$.

CHAPTER 2.3.5

COMPENSATORS

COMPENSATORS

For higher temperatures it is harder to compensate movements with expansion pads. Then it may be necessary to preheat the pipe before it is covered. This process is not fault free, and it may not be possible to keep the pipe trench open for the duration of the project. When pre-heating is not possible, continuous compensators or one-step compensators can be used instead for similar results as pre-heating with an open trench. The difference between the continuous compensator and one-step compensator is that the one-step compensator is welded in its fixed position when the preheating has expanded with the required elongation. The continuous compensator is installed in the pipe and compensates movements continuously, the use of axial expansion joints has become less common.

For further information about compensators please contact Set Pipes sales department.

INSTALLATION OF BURIED SINGLE PIPES

These specifications are in accordance to the EN 13941 standard.

CHAPTER 2.3.6

CONDITIONS

WEATHER CONDITIONS

If the temperature drops below freezing the casing pipe gets sensitive to heavy impact. The plastic material becomes brittle and can break. Set Pipes recommends if the temperature goes below 5°C to preheat the casing pipe with a soft flame to a temperature of about 20 – 30°C before work with bending, sawing, drilling or welding starts. After a cold night, even once temperature reach 5°C it is still necessary to use the above heating method as steel preserves the nights cold.

Transport in freezing temperatures must be carried out with caution due to the pipe sensitivity to heavy impact and avoid sharp edges or stones.

CHAPTER 2.3.7 TRENCH

TRENCH

Figures 2.3.7.1 og 2.3.7.2 3 shows assembling of pipe and dimensions of the pipe trench. The distance between the pipe and surface (H) should be between 0,60 – 1,2 m. Under special installation circumstances, like for a shallower trench or when the trench lays under a road, please contact Set Pipe's technical department for further information.

The following tables show the minimum trench width (B) and the minimum distance between pipes needed (C) according to casing pipe diameter.

FIG 2.3.7.1

Trench cross section with vertical parallel pipes [mm]

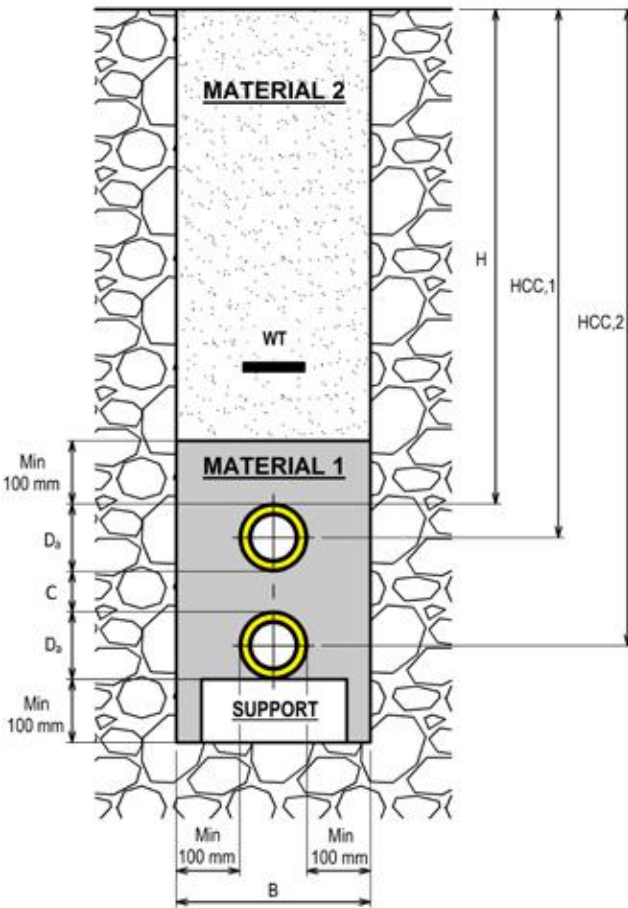


TABLE 2.3.7.1

Minimum trench width with vertical parallel pipes [mm]

Da = Casing pipe

Da	90	110	125	140	160	180	200	225	250	280	315	355	400	450	500	560	630	710	800	900	1000	1100
C	200	200	200	200	200	200	200	250	250	250	250	250	350	350	350	350	350	350	350	350	350	350
B	290	310	325	340	360	380	400	425	450	500	515	555	600	650	700	760	830	910	1000	1100	1200	1300

FIG 2.3.7.2
Trench cross section with
horizontal parallel pipes

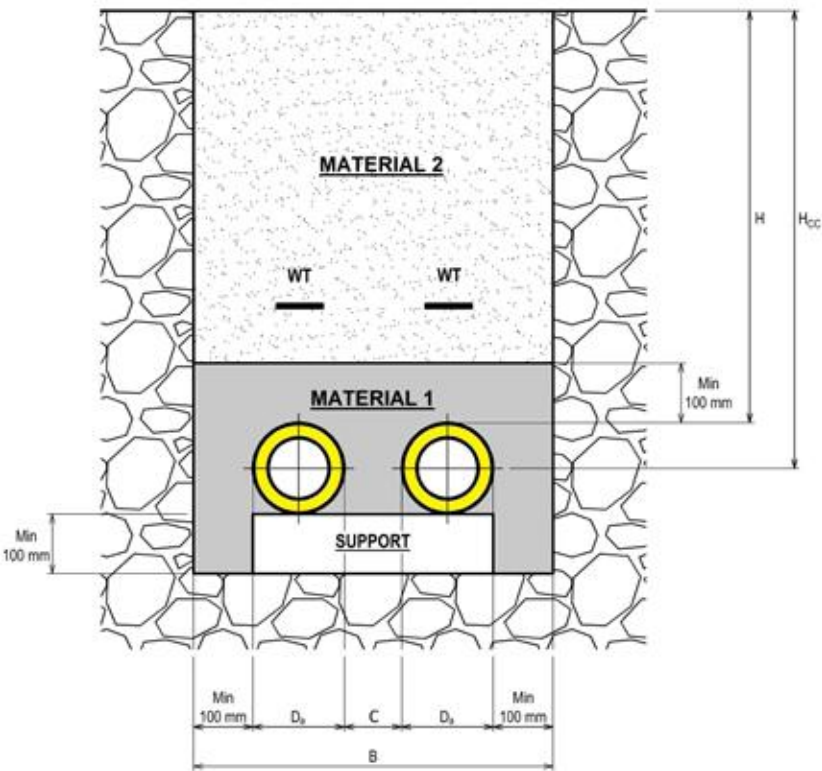


TABLE 2.3.7.2
Minimum trench width with
horizontal parallel pipes [mm]

Da = Casing pipe

Da	90	110	125	140	160	180	200	225	250	280	315	355	400	450	500	560	630	710	800	900	1000	1100
C	200	200	200	200	200	200	200	250	250	250	250	250	350	350	350	350	350	350	350	400	450	450
B	800	850	850	900	950	1000	1000	1050	1100	1160	1250	1800	1850	1950	2050	2150	2300	2500	2650	2800	3100	3200

If the pipe assembly or Z- and U-Bends assembly has to be done in the trench it is necessary to ensure enough trench width to meet all working requirements.

CHAPTER 2.3.8 BACKFILLING

BACKFILLING 1

Before backfilling of the trench the following points must be reviewed:

- Pipe-laying guidelines are followed according to expansion design
- Verification of leak detection system
- Verification jointing is secure
- Stones and foreign objects which may have fallen from trench bank during assembly are removed
- During preheating, expansion and temperature must be within predetermined limits and documented.

To minimize heat loss from the ground surface use stone free fine sand that is free from plant residues, humus, clay and silt lumps.

The sand must comply with following grain sizes to be classified as backfilling material 1:

TABLE 2.3.8.1
Backfilling material 1
description

MEDIUM GRAINED SAND	0-4 mm
FINE GRAINED SAND	Max 8%
MAXIMUM GRAIN SIZE	≤ 32 mm
MAXIMUM GRAIN SIZE 10% OF WEIGHT	≤ 0,075 mm
MAXIMUM GRAIN SIZE 3% OF WEIGHT	≤ 0,020 mm
COEFFICIENT OF UNIFORMITY	$d_{60}/d_{10} > 1,8$

Begin trench filling with compacted sand ensuring the layer is at least 0,10 m after compacting. The pipes are layed in the trench with the correct distance between (B) and the minimum distance from the outer casing and trench side is 0,10 m.

It is necessary to compact the sand well around the pipes. Ensure the sand is compacted simultaneously on both sides to avoid pipes moving out of place. The backfill shall be made up in a way that neither its properties nor the compaction causes damage to pipe and joints.

The sand layer above the district heating pipe should be minimum 0,10 m after compaction.

BACKFILLING 2

Before using backfilling material 2 place a warning type at a distance of approx. 0,20 – 0,50 m above the pipeline. Make sure that the backfilling material 2 doesn't damage the pipe or the fittings. In some cases the material from the trench can be reused, but only if it contains a very small amount of organic material (e.g. humus and clay). Remove bigger stones/rocks and other undesirable material. The backfilling should follow in layers and compacted with necessary equipment which reaches 20 N/cm². The first backfilling layer must be fine-grained and the following layer can be coarse, but each layer must always be at least 0,20 m after compaction.

CHAPTER 2.3.9 ANCHOR INSTALLATION

ANCHOR INSTALLATION

Table 2.3.9.1 og figure 2.3.9.1 shows how concrete anchor blocks should be embedded in a compacted, dry soil. Use KS 410 ribbed steel bars for the reinforcement. Once cementing and other anchor work is complete follow instructions from backfilling 1. It is important to finish compacting around the anchor before water is put into the system. The compressive strength has to be 150 kN/m² after compacting. Please contact Set Pipe's technical department if further information regarding anchoring is needed.

TABLE 2.3.9.1
Anchor dimensions

STEEL DN	Hc [mm]	Dc [mm]	Bc [mm]	REBAR		
				NUMBER horizontal	NUMBER vertical	DIAMETER [mm]
25	500	800	1000	2	2	10
32	500	800	1200	2	2	10
40	500	800	1200	2	2	10
50	500	800	1200	2	2	10
65	800	800	1200	2	2	10
80	800	800	1300	2	2	10
100	800	800	2000	2	2	10
125	1100	800	2000	2	4	12
150	1100	800	2500	2	4	12
200	1400	800	3000	2	4	12
250	1400	1200	4000	4	4	14
300	1800	1200	4500	4	4	16
350	1800	1200	4500	4	4	20
400	2100	1500	5500	4	6	20
450	2100	1500	6000	4	6	20
500	2500	1800	6000	4	6	20
600	2500	2000	7000	6	8	20
700	2800	2500	8000	8	10	20
800	3000	2500	10000	10	12	20

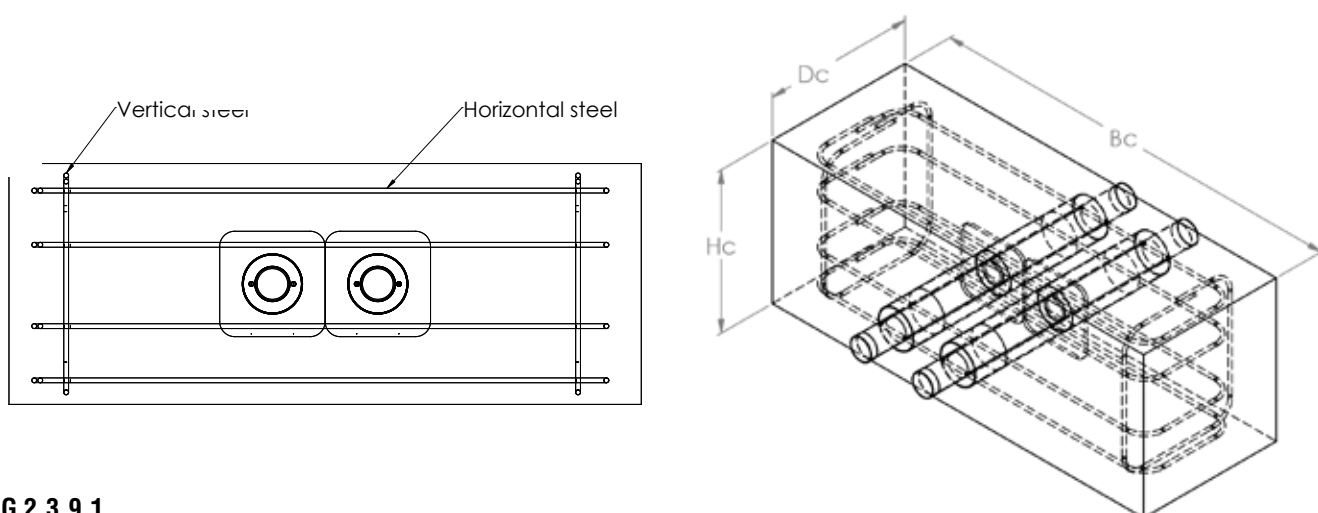


FIG 2.3.9.1

Anchor

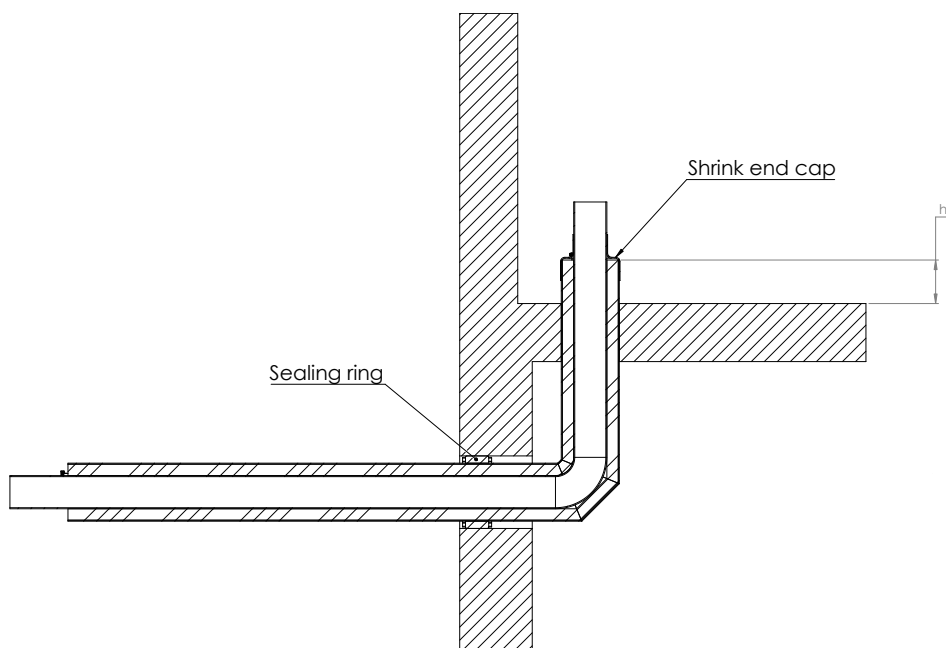
CHAPTER 2.3.10 HOUSE CONNECTIONS

HOUSE CONNECTIONS

House connections through the house concrete foundation or directly through the wall. To ensure no expansion force enters the house, use fix points or bends that can be installed outside the wall to compensate movements. The wall sealing ring is available as a sealing for 0,5 – 5,0 Bar and must be chosen according to circumstances. Set Pipes offers customized intake bends in different lengths if required. Inside the house an endcap must be placed on the pipe end to protect the foam. The pipe end closure (h) should be at least 100 mm from the floor/wall.

FIG 2.3.10.1

House connection



CHAPTER 2.3.11

STEEL WELDING

STEEL WELDING

Welders for welding district heating pipes must carry a valid welding certificate according to EN 287-1. Qualification of welding procedure specifications (WPS) must be used during the steel welding process and Set Pipes recommends the use of certified welding procedure (WPQR) during the welding of pre-insulated district heating pipes. Set Pipes recommends gas welding for pipes < DN 80 and electric welding for pipes > DN 80. Use welding electrodes of similar material as the welded steel pipe. Under bad weather conditions place a tent over the welding area. Clean rust and other dirt from pipe ends surface both inside and outside of the pipe. Rust and dirt affect the welding quality.

It is recommended to weld joints on wooden plank supports above or beside the trench. If welding is done after the pipes are in the trench ensure a wide and deep enough trench. If necessary to shorten a pipe system Set Pipes recommends the pipes rather than the fittings be shortened.

CHAPTER 2.3.12 CURVED PIPES

CURVED PIPES

Set Pipes supplies insulated curved pipes ($R_{2,min}$). The pipes are available in dimensions DN 20 – DN 500. Upon request, it is possible to bend DN 20 – DN 50 more than $R_{2,min}$ if required. It is possible to curve straight pipe on site after they have been welded together to the radius $R_{1,min}$.

$$R_{1,min} = \frac{E_{St} \cdot d_o}{1,33 \cdot \sigma_y} [m]$$

$$R_{2,min} = \frac{E_{St} \cdot d_o}{4 \cdot \sigma_y} [m]$$

THUS:

$R_{1,min}$ = Minimum bending radius for pipeline on site [m]

$R_{2,min}$ = Minimum bending radius for one pipe [m]

σ_y = Yield strength for steel = 235 MPa

E_{St} = Modulus of elasticity for steel = 210 Gpa

TABLE 2.3.12.1

Pre-insulated steel pipes

d_o = Outer diameter of the steel pipe

R_{1min} = Minimum bending radius for
pipeline on site

R_{2min} = Minimum bending radius for
one pipe

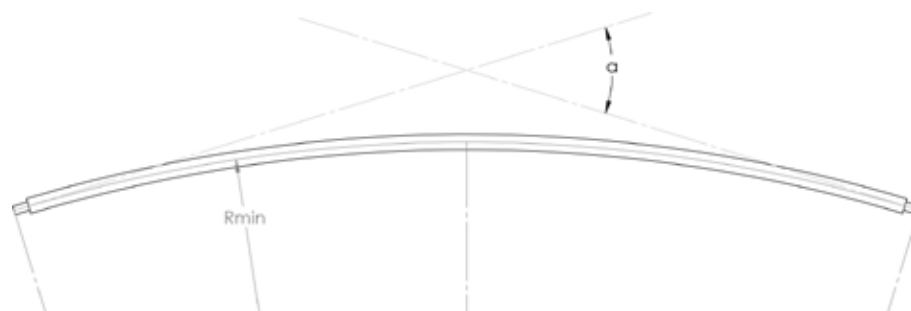
α_1 = Curve angle R_1

α_2 = Curve angle R_2

STEEL DN	D_o [mm]	$R_{1,MIN}$ [m]	$R_{2,MIN}$ [m]	6 m pipes		12 m pipes	
				α_1 [°]	α_2 [°]	α_1 [°]	α_2 [°]
20	26,9	18,1	6,0	19,0	57,2	38,0	114,4
25	33,7	22,6	7,5	15,2	45,7	30,4	91,3
32	42,4	28,5	9,5	12,1	36,3	24,1	72,6
40	48,3	32,5	10,8	10,6	31,9	21,2	63,7
50	60,3	40,5	13,5	8,5	25,5	17,0	51,0
65	76,1	51,1	17,0	6,7	20,2	13,5	40,4
80	88,9	59,7	19,9	5,8	17,3	11,5	34,6
100	114,3	76,8	25,5	4,5	13,5	9,0	26,9
125	139,7	93,9	31,2	3,7	11,0	7,3	22,0
150	168,3	113,1	37,6	3,0	9,1	6,1	18,3
200	219,1	147,2	48,9	2,3	7,0	4,7	14,0
250	273,0	183,4	61,0	1,9	5,6	3,7	11,3
300	323,9	217,6	72,4	1,6	4,8	3,2	9,5
350	355,6	238,9	79,4	1,4	4,3	2,9	8,7
400	406,4	273,1	90,8	1,3	3,8	2,5	7,6
450	457,0	307,1	102,1	1,1	3,4	2,2	6,7
500	508,0	341,3	113,5	1,0	3,0	2,0	6,1
600	610,0	409,9	136,3	0,8	2,5	1,7	5,0
700	711,0	477,7	158,8	0,7	2,2	1,4	4,3
800	813,0	546,2	181,6	0,6	1,9	1,3	3,8

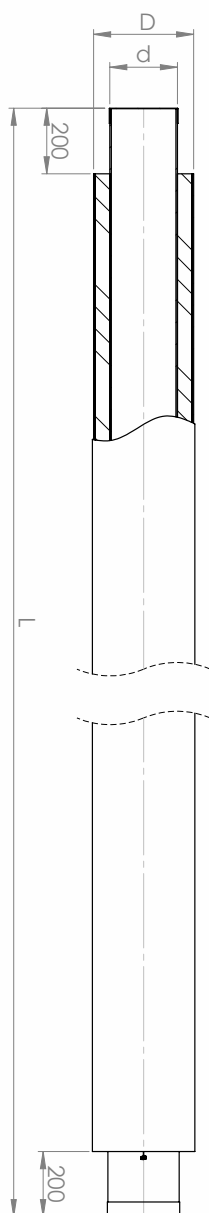
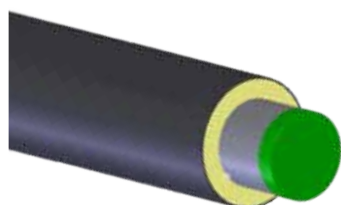
FIG 2.3.12.1

Curved pipe



CHAPTER 2.9 PRODUCT CATALOGUE

CHAPTER 2.9.1 PRE-INSULATED STEEL PIPES INSULATION SERIES 1

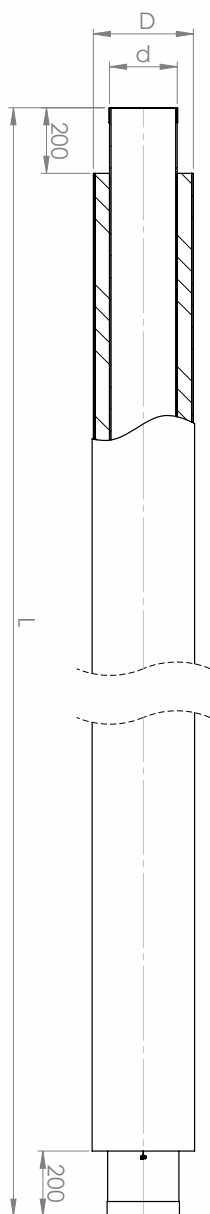
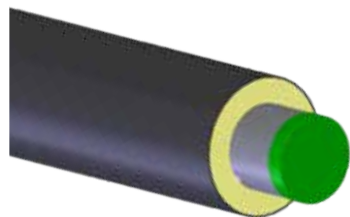


6 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.101.020	20	26,9	2,6	90	3,0	28,6	16,4
1.101.025	25	33,7	2,6	90	3,0	25,2	18,9
1.101.032	32	42,4	2,6	110	3,0	30,8	24,5
1.101.040	40	48,3	2,6	110	3,0	27,9	26,6
1.101.050	50	60,3	2,9	125	3,0	29,4	35,2
1.101.065	65	76,1	2,9	140	3,0	29,0	43,4
1.101.080	80	88,9	3,2	160	3,0	32,6	55,0
1.101.100	100	114,3	3,6	200	3,2	39,7	79,5
1.101.125	125	139,7	3,6	225	3,4	39,3	96,7
1.101.150	150	168,3	4,0	250	3,6	37,3	124,8
1.101.200	200	219,1	4,5	315	4,1	43,9	183,3

12 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.102.020	20	26,9	2,6	90	3,0	28,6	32,9
1.102.025	25	33,7	2,6	90	3,0	25,2	37,8
1.102.032	32	42,4	2,6	110	3,0	30,8	49,0
1.102.040	40	48,3	2,6	110	3,0	27,9	53,1
1.102.050	50	60,3	2,9	125	3,0	29,4	70,4
1.102.065	65	76,1	2,9	140	3,0	29,0	86,8
1.102.080	80	88,9	3,2	160	3,0	32,6	110,1
1.102.100	100	114,3	3,6	200	3,2	39,7	159,0
1.102.125	125	139,7	3,6	225	3,4	39,3	193,3
1.102.150	150	168,3	4,0	250	3,6	37,3	249,6
1.102.200	200	219,1	4,5	315	4,1	43,9	366,5
1.102.250	250	273,0	5,0	400	4,8	58,7	523,6
1.102.300	300	323,9	5,6	450	5,2	57,9	677,5
1.102.350	350	355,6	5,6	500	5,6	66,6	764,6
1.102.400	400	406,4	6,3	560	6,0	70,8	967,6
1.102.450	450	457,0	6,3	630	6,6	83,2	1118,0
1.102.500	500	508,0	6,3	710	7,2	97,4	1288,0
1.102.600	600	610,0	7,1	800	7,9	91,1	1675,4
1.102.700	700	711,0	8,0	900	8,7	90,2	2150,0
1.102.800	800	813,0	8,8	1000	9,4	88,8	2657,5

16 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.103.100	100	114,3	3,6	200	3,2	39,7	212,1
1.103.125	125	139,7	3,6	225	3,4	39,3	257,8
1.103.150	150	168,3	4,0	250	3,6	37,3	332,7
1.103.200	200	219,1	4,5	315	4,1	43,9	488,7
1.103.250	250	273,0	5,0	400	4,8	58,7	698,2
1.103.300	300	323,9	5,6	450	5,2	57,9	903,3
1.103.350	350	355,6	5,6	500	5,6	66,6	1019,5
1.103.400	400	406,4	6,3	560	6,0	70,8	1290,2
1.103.450	450	457,0	6,3	630	6,6	83,2	1490,6
1.103.500	500	508,0	6,3	710	7,2	97,4	1717,3
1.103.600	600	610,0	7,1	800	7,9	91,1	2233,9
1.103.700	700	711,0	8,0	900	8,7	90,2	2866,7
1.103.800	800	813,0	8,8	1000	9,4	88,8	3543,3

PRE-INSULATED STEEL PIPES INSULATION SERIES 2

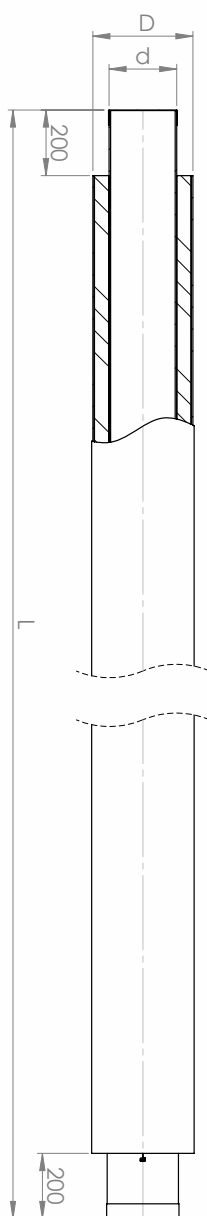
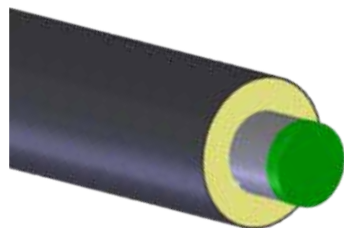


6 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.201.020	20	26,9	2,6	110	3,0	38,6	18,9
1.201.025	25	33,7	2,6	110	3,0	35,2	21,4
1.201.032	32	42,4	2,6	125	3,0	38,3	26,6
1.201.040	40	48,3	2,6	125	3,0	35,4	28,6
1.201.050	50	60,3	2,9	140	3,0	36,9	37,4
1.201.065	65	76,1	2,9	160	3,0	39,0	46,7
1.201.080	80	88,9	3,2	180	3,0	42,6	58,6
1.201.100	100	114,3	3,6	225	3,4	52,0	85,6
1.201.125	125	139,7	3,6	250	3,6	51,6	103,4
1.201.150	150	168,3	4,0	280	3,9	52,0	133,9
1.201.200	200	219,1	4,5	355	4,5	63,5	198,4

12 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.202.020	20	26,9	2,6	110	3,0	38,6	37,9
1.202.025	25	33,7	2,6	110	3,0	35,2	42,8
1.202.032	32	42,4	2,6	125	3,0	38,3	53,1
1.202.040	40	48,3	2,6	125	3,0	35,4	57,3
1.202.050	50	60,3	2,9	140	3,0	36,9	74,9
1.202.065	65	76,1	2,9	160	3,0	39,0	93,3
1.202.080	80	88,9	3,2	180	3,0	42,6	117,2
1.202.100	100	114,3	3,6	225	3,4	52,0	171,1
1.202.125	125	139,7	3,6	250	3,6	51,6	206,7
1.202.150	150	168,3	4,0	280	3,9	52,0	267,8
1.202.200	200	219,1	4,5	355	4,5	63,5	396,7
1.202.250	250	273,0	5,0	450	5,2	83,3	569,4
1.202.300	300	323,9	5,6	500	5,6	82,5	728,3
1.202.350	350	355,6	5,6	560	6,0	96,2	830,9
1.202.400	400	406,4	6,3	630	6,6	105,2	1056,6
1.202.450	450	457,0	6,3	710	7,2	122,9	1230,0
1.202.500	500	508,0	6,3	800	7,9	142,1	1430,0
1.202.600	600	610,0	7,1	900	8,7	140,7	1853,0
1.202.700	700	711,0	7,1	1000	9,4	139,8	2344,7
1.202.800	800	813,0	7,1	1100	10,2	138,4	2875,4

16 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.203.100	100	114,3	3,6	225	3,4	52,0	228,2
1.203.125	125	139,7	3,6	250	3,6	51,6	275,6
1.203.150	150	168,3	4,0	280	3,9	52,0	357,1
1.203.200	200	219,1	4,5	355	4,5	63,5	528,9
1.203.250	250	273,0	5,0	450	5,2	83,3	759,2
1.203.300	300	323,9	5,6	500	5,6	82,5	971,1
1.203.350	350	355,6	5,6	560	6,0	96,2	1107,9
1.203.400	400	406,4	6,3	630	6,6	105,2	1408,7
1.203.450	450	457,0	6,3	710	7,2	122,9	1640,0
1.203.500	500	508,0	6,3	800	7,9	142,1	1906,7
1.203.600	600	610,0	7,1	900	8,7	140,7	2470,7
1.203.700	700	711,0	7,1	1000	9,4	139,8	3126,3
1.203.800	800	813,0	7,1	1100	10,2	138,4	3833,9

PRE-INSULATED STEEL PIPES INSULATION SERIES 3



6 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.301.020	20	26,9	2,6	125	3,0	46,1	21,0
1.301.025	25	33,7	2,6	125	3,0	42,7	23,5
1.301.032	32	42,4	2,6	140	3,0	45,8	28,8
1.301.040	40	48,3	2,6	140	3,0	42,9	30,9
1.301.050	50	60,3	2,9	160	3,0	46,9	40,7
1.301.065	65	76,1	2,9	180	3,0	49,0	50,2
1.301.080	80	88,9	3,2	200	3,2	52,4	63,1
1.301.100	100	114,3	3,6	250	3,6	64,3	92,3
1.301.125	125	139,7	3,6	280	3,9	66,3	112,5
1.301.150	150	168,3	4,0	315	4,1	69,3	145,0
1.301.200	200	219,1	4,5	400	4,8	85,7	216,4

12 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.302.020	20	26,9	2,6	125	3,0	46,1	42,0
1.302.025	25	33,7	2,6	125	3,0	42,7	46,9
1.302.032	32	42,4	2,6	140	3,0	45,8	57,6
1.302.040	40	48,3	2,6	140	3,0	42,9	61,8
1.302.050	50	60,3	2,9	160	3,0	46,9	81,4
1.302.065	65	76,1	2,9	180	3,0	49,0	100,4
1.302.080	80	88,9	3,2	200	3,2	52,4	126,2
1.302.100	100	114,3	3,6	250	3,6	64,3	184,5
1.302.125	125	139,7	3,6	280	3,9	66,3	225,0
1.302.150	150	168,3	4,0	315	4,1	69,3	290,0
1.302.200	200	219,1	4,5	400	4,8	85,7	432,9
1.302.250	250	273,0	5,0	500	5,6	107,9	620,3
1.302.300	300	323,9	5,6	560	6,0	112,1	794,6
1.302.350	350	355,6	5,6	630	6,6	130,6	919,8
1.302.400	400	406,4	6,3	710	7,2	144,6	1168,6
1.302.450	450	457,0	6,3	800	7,9	167,6	1372,0
1.302.500	500	508,0	6,3	900	8,7	191,7	1607,6
1.302.600	600	610,0	7,1	1000	9,4	190,3	2047,7
1.302.700	700	711,0	8,0	1100	10,2	189,4	2562,6
1.302.800	800	813,0	8,8	1200	11,0	188,0	3113,6

16 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.303.100	100	114,3	3,6	250	3,6	64,3	184,5
1.303.125	125	139,7	3,6	280	3,9	66,3	225,0
1.303.150	150	168,3	4,0	315	4,1	69,3	290,0
1.303.200	200	219,1	4,5	400	4,8	85,7	432,9
1.303.250	250	273,0	5,0	500	5,6	107,9	620,3
1.303.300	300	323,9	5,6	560	6,0	112,1	794,6
1.303.350	350	355,6	5,6	630	6,6	130,6	919,8
1.303.400	400	406,4	6,3	710	7,2	144,6	1168,6
1.303.450	450	457,0	6,3	800	7,9	167,6	1372,0
1.303.500	500	508,0	6,3	900	8,7	191,7	1607,6
1.303.600	600	610,0	7,1	1000	9,4	190,3	2047,7
1.303.700	700	711,0	8,0	1100	10,2	189,4	2562,6
1.303.800	800	813,0	8,8	1200	11,0	188,0	3113,6

CHAPTER 2.9.2

BEND 90°

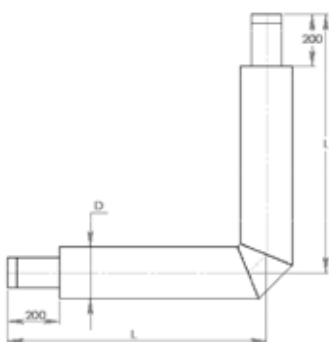
INSULATION SERIES 1



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.110.020	20	90	1000	5,9
1.110.025	25	90	1000	6,8
1.110.032	32	110	1000	8,8
1.110.040	40	110	1000	9,6
1.110.050	50	125	1000	12,7
1.110.065	65	140	1000	15,6
1.110.080	80	160	1000	19,8
1.110.100	100	200	1000	28,6
1.110.125	125	225	1000	34,8
1.110.150	150	250	1000	44,9
1.110.200	200	315	1000	66,0
1.110.250	250	400	1000	94,3
1.110.300	300	450	1200	146,3
1.110.350	350	500	1200	165,2
1.110.400	400	560	1300	226,4
1.110.450	450	630	1400	259,3
1.110.500	500	710	1500	317,5
1.110.600	600	800	1500	414,0
1.110.700	700	900	1700	603,6
1.110.800	800	1000	1800	797,9

BEND 30°, 45° & 60°

INSULATION SERIES 1

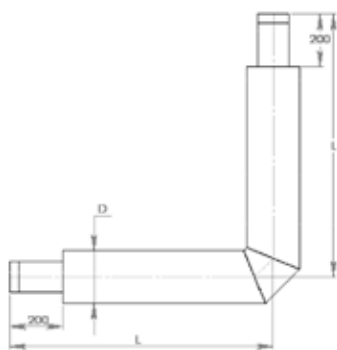


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.114.020	20	90	1000	5,5
1.114.025	25	90	1000	6,3
1.114.032	32	110	1000	8,2
1.114.040	40	110	1000	8,9
1.114.050	50	125	1000	11,7
1.114.065	65	140	1000	14,5
1.114.080	80	160	1000	18,3
1.114.100	100	200	1000	26,5
1.114.125	125	225	1000	32,2
1.114.150	150	250	1000	41,6
1.114.200	200	315	1000	61,1
1.114.250	250	400	1000	87,3
1.114.300	300	450	1200	135,5
1.114.350	350	500	1200	152,9
1.114.400	400	560	1300	209,7
1.114.450	450	630	1400	240,1
1.114.500	500	710	1500	294,0
1.114.600	600	800	1500	383,4
1.114.700	700	900	1700	558,8
1.114.800	800	1000	1800	738,8

**BEND 90° SHORT
INSULATION SERIES 1**



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.111.020	20	90	500	3,0
1.111.025	25	90	500	3,4
1.111.032	32	110	500	4,4
1.111.040	40	110	500	4,8
1.111.050	50	125	500	6,3
1.111.065	65	140	500	7,8
1.111.080	80	160	500	9,9
1.111.100	100	200	500	14,3

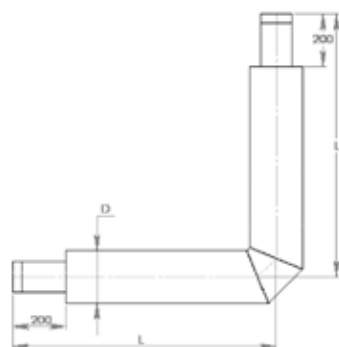


BEND 90° INSULATION SERIES 2



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.210.020	20	110	1000	6,8
1.210.025	25	110	1000	7,7
1.210.032	32	125	1000	9,6
1.210.040	40	125	1000	10,3
1.210.050	50	140	1000	13,5
1.210.065	65	160	1000	16,8
1.210.080	80	180	1000	21,1
1.210.100	100	225	1000	30,8
1.210.125	125	250	1000	37,2
1.210.150	150	280	1000	48,2
1.210.200	200	355	1000	71,4
1.210.250	250	450	1200	123,0
1.210.300	300	500	1200	157,3
1.210.350	350	560	1300	194,4
1.210.400	400	630	1400	266,3
1.210.450	450	710	1500	301,8
1.210.500	500	800	1500	347,8
1.210.600	600	900	1700	512,7
1.210.700	700	1000	1800	696,6
1.210.800	800	1100	2000	956,7

BEND 30°, 45° & 60° INSULATION SERIES 2

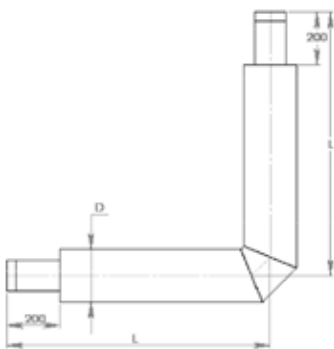


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.214.020	20	110	1000	6,3
1.214.025	25	110	1000	7,1
1.214.032	32	125	1000	8,9
1.214.040	40	125	1000	9,5
1.214.050	50	140	1000	12,5
1.214.065	65	160	1000	15,6
1.214.080	80	180	1000	19,5
1.214.100	100	225	1000	28,5
1.214.125	125	250	1000	34,5
1.214.150	150	280	1000	44,6
1.214.200	200	355	1000	66,1
1.214.250	250	450	1200	113,9
1.214.300	300	500	1200	145,7
1.214.350	350	560	1300	180,0
1.214.400	400	630	1400	246,5
1.214.450	450	710	1500	279,5
1.214.500	500	800	1500	322,0
1.214.600	600	900	1700	474,7
1.214.700	700	1000	1800	645,0
1.214.800	800	1100	2000	885,8

**BEND 90° SHORT
INSULATION SERIES 2**



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.211.020	20	110	500	3,2
1.211.025	25	110	500	3,6
1.211.032	32	125	500	4,4
1.211.040	40	125	500	4,8
1.211.050	50	140	500	6,2
1.211.065	65	160	500	7,8
1.211.080	80	180	500	9,8
1.211.100	100	225	500	14,3

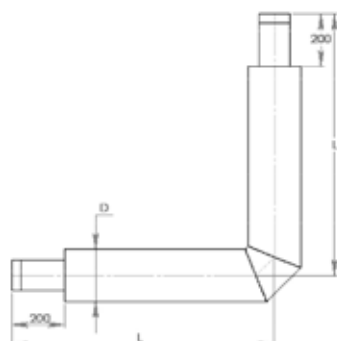
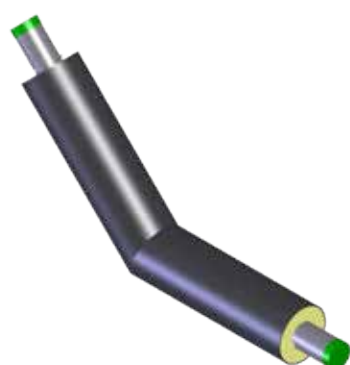


BEND 90° INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.310.020	20	125	1000	7,6
1.310.025	25	125	1000	8,4
1.310.032	32	140	1000	10,4
1.310.040	40	140	1000	11,1
1.310.050	50	160	1000	14,6
1.310.065	65	180	1000	18,1
1.310.080	80	200	1000	22,7
1.310.100	100	250	1000	33,2
1.310.125	125	280	1000	40,5
1.310.150	150	315	1000	52,2
1.310.200	200	400	1000	77,9
1.310.250	250	500	1200	134,0
1.310.300	300	560	1200	171,6
1.310.350	350	630	1300	215,2
1.310.400	400	710	1400	294,5
1.310.450	450	800	1500	332,1
1.310.500	500	900	1500	386,1
1.310.600	600	1000	1700	567,0
1.310.700	700	1100	1900	801,9
1.310.800	800	1200	2100	1086,9

BEND 30°, 45° & 60° INSULATION SERIES 3

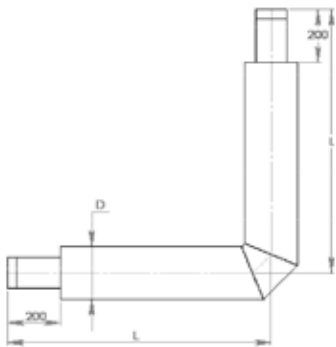


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.314.020	20	125	1000	7,0
1.314.025	25	125	1000	7,8
1.314.032	32	140	1000	9,6
1.314.040	40	140	1000	10,3
1.314.050	50	160	1000	13,6
1.314.065	65	180	1000	16,7
1.314.080	80	200	1000	21,0
1.314.100	100	250	1000	30,8
1.314.125	125	280	1000	37,5
1.314.150	150	315	1000	48,3
1.314.200	200	400	1000	72,1
1.314.250	250	500	1200	124,1
1.314.300	300	560	1200	158,9
1.314.350	350	630	1300	199,3
1.314.400	400	710	1400	272,7
1.314.450	450	800	1500	307,5
1.314.500	500	900	1500	357,5
1.314.600	600	1000	1700	525,0
1.314.700	700	1100	1900	742,5
1.314.800	800	1200	2100	879,1

**BEND 90° SHORT
INSULATION SERIES 3**



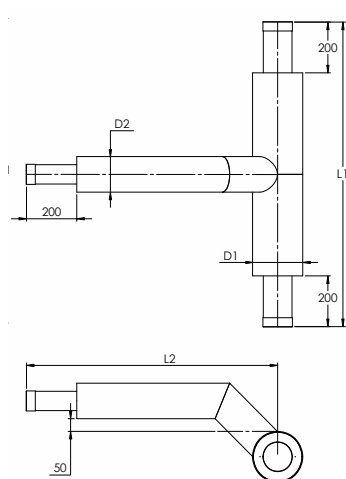
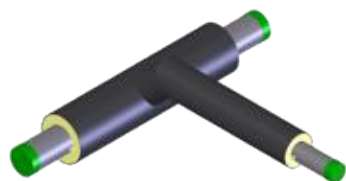
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.311.020	20	125	500	2,8
1.311.025	25	125	500	3,2
1.311.032	32	140	500	4,0
1.311.040	40	140	500	4,3
1.311.050	50	160	500	5,5
1.311.065	65	180	500	6,7
1.311.080	80	200	500	8,3



CHAPTER 2.9.3

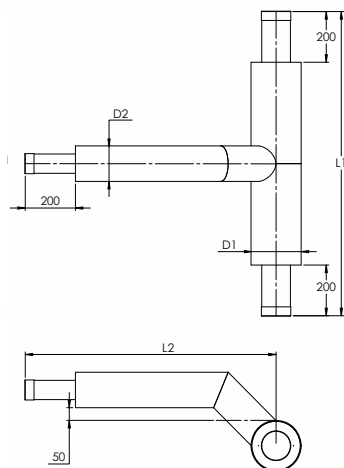
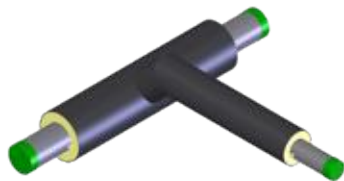
BRANCH 45°

INSULATION SERIES 1



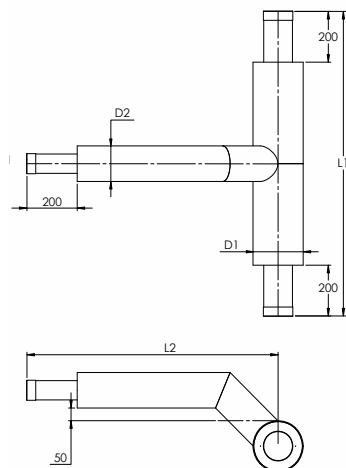
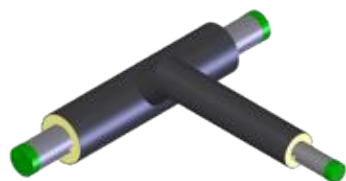
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.020.020	20	90	20	90	1000/1000	4,7
1.124.025.020	25	90	20	90	1000/1000	5,1
1.124.025.025	25	90	25	90	1000/1000	5,6
1.124.032.020	32	110	20	90	1000/1000	5,8
1.124.032.025	32	110	25	90	1000/1000	6,3
1.124.032.032	32	110	32	110	1000/1000	7,2
1.124.040.020	40	110	20	90	1000/1000	6,3
1.124.040.025	40	110	25	90	1000/1000	6,7
1.124.040.032	40	110	32	110	1000/1000	7,6
1.124.040.040	40	110	40	110	1000/1000	7,9
1.124.050.020	50	125	20	90	1000/1000	7,7
1.124.050.025	50	125	25	90	1000/1000	8,1
1.124.050.032	50	125	32	110	1000/1000	9,0
1.124.050.040	50	125	40	110	1000/1000	9,3
1.124.050.050	50	125	50	125	1000/1000	10,9
1.124.065.020	65	140	20	90	1000/1000	9,0
1.124.065.025	65	140	25	90	1000/1000	9,4
1.124.065.032	65	140	32	110	1000/1000	10,3
1.124.065.040	65	140	40	110	1000/1000	10,6
1.124.065.050	65	140	50	125	1000/1000	12,2
1.124.065.065	65	140	65	140	1000/1000	13,6
1.124.080.020	80	160	20	90	1000/1000	10,6
1.124.080.025	80	160	25	90	1000/1000	11,2
1.124.080.032	80	160	32	110	1000/1000	12,0
1.124.080.040	80	160	40	110	1000/1000	12,4
1.124.080.050	80	160	50	125	1000/1000	13,9
1.124.080.065	80	160	65	140	1000/1000	15,3
1.124.080.080	80	160	80	160	1000/1000	17,3
1.124.100.025	100	200	25	90	1000/1000	14,9
1.124.100.032	100	200	32	110	1000/1000	15,7
1.124.100.040	100	200	40	110	1000/1000	16,1
1.124.100.050	100	200	50	125	1000/1000	17,6
1.124.100.065	100	200	65	140	1000/1000	19,0
1.124.100.080	100	200	80	160	1000/1000	21,0
1.124.100.100	100	200	100	200	1200/1000	27,8
1.124.125.025	125	225	25	90	1000/1000	17,5
1.124.125.032	125	225	32	110	1000/1000	18,4
1.124.125.040	125	225	40	110	1000/1000	18,8
1.124.125.050	125	225	50	125	1000/1000	20,3
1.124.125.065	125	225	65	140	1000/1000	21,7
1.124.125.080	125	225	80	160	1000/1000	23,6
1.124.125.100	125	225	100	200	1200/1000	31,0
1.124.125.125	125	225	125	225	1200/1000	33,9
1.124.150.025	150	250	25	90	1000/1000	22,1
1.124.150.032	150	250	32	110	1000/1000	22,9
1.124.150.040	150	250	40	110	1000/1000	23,3
1.124.150.050	150	250	50	125	1000/1000	24,8
1.124.150.065	150	250	65	140	1000/1000	26,2

BRANCH 45° INSULATION SERIES 1



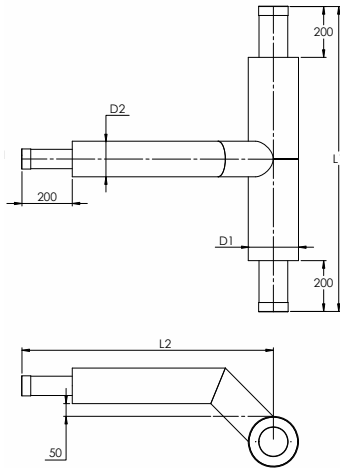
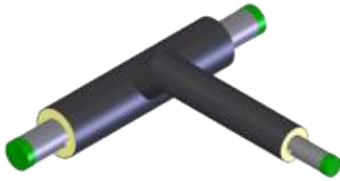
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.150.080	150	250	80	160	1000/1000	28,1
1.124.150.100	150	250	100	200	1200/1000	36,4
1.124.150.125	150	250	125	225	1200/1000	39,3
1.124.150.150	150	250	150	250	1200/1000	44,1
1.124.200.025	200	315	25	90	1000/1000	31,3
1.124.200.032	200	315	32	110	1000/1000	32,1
1.124.200.040	200	315	40	110	1000/1000	32,5
1.124.200.050	200	315	50	125	1000/1000	34,0
1.124.200.065	200	315	65	140	1000/1000	35,3
1.124.200.080	200	315	80	160	1000/1000	37,2
1.124.200.100	200	315	100	200	1200/1000	47,5
1.124.200.125	200	315	125	225	1200/1000	50,4
1.124.200.150	200	315	150	250	1200/1000	55,3
1.124.200.200	200	315	200	315	1400/1000	71,8
1.124.250.025	250	400	25	90	1200/1000	52,4
1.124.250.032	250	400	32	110	1200/1000	53,2
1.124.250.040	250	400	40	110	1200/1000	53,5
1.124.250.050	250	400	50	125	1200/1000	54,8
1.124.250.065	250	400	65	140	1200/1000	56,0
1.124.250.080	250	400	80	160	1200/1000	57,7
1.124.250.100	250	400	100	200	1200/1000	62,6
1.124.250.125	250	400	125	225	1200/1000	65,4
1.124.250.150	250	400	150	250	1200/1000	70,2
1.124.250.200	250	400	200	315	1400/1000	89,5
1.124.250.250	250	400	250	315	1400/1000	103,6
1.124.300.025	300	450	25	90	1200/1000	67,8
1.124.300.032	300	450	32	110	1200/1000	68,5
1.124.300.040	300	450	40	110	1200/1000	68,9
1.124.300.050	300	450	50	125	1200/1000	70,4
1.124.300.065	300	450	65	140	1200/1000	71,8
1.124.300.080	300	450	80	160	1200/1000	73,6
1.124.300.100	300	450	100	200	1400/1200	92,1
1.124.300.125	300	450	125	225	1400/1200	95,5
1.124.300.150	300	450	150	250	1400/1200	101,2
1.124.300.200	300	450	200	315	1400/1200	113,3
1.124.300.250	300	450	250	400	1400/1200	130,1
1.124.300.300	300	450	300	450	1600/1200	158,9
1.124.350.025	350	500	25	90	1200/1000	76,5
1.124.350.032	350	500	32	110	1200/1000	76,8
1.124.350.040	350	500	40	110	1200/1000	77,2
1.124.350.050	350	500	50	125	1200/1000	78,7
1.124.350.065	350	500	65	140	1200/1000	80,0
1.124.350.080	350	500	80	160	1200/1000	81,9
1.124.350.100	350	500	100	200	1400/1200	102,0
1.124.350.125	350	500	125	225	1400/1200	105,4
1.124.350.150	350	500	150	250	1400/1200	111,1
1.124.350.200	350	500	200	315	1400/1200	123,1

BRANCH 45° INSULATION SERIES 1



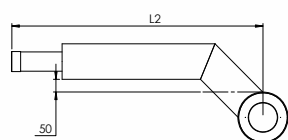
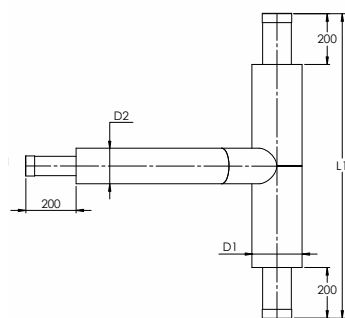
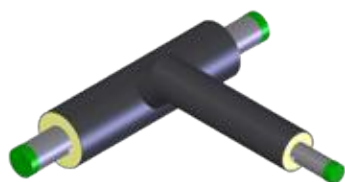
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.350.250	350	500	250	400	1400/1200	139,9
1.124.350.300	350	500	300	450	1600/1300	168,2
1.124.350.350	350	500	350	500	1600/1300	179,7
1.124.400.040	400	560	40	110	1200/1000	97,4
1.124.400.050	400	560	50	125	1200/1000	98,8
1.124.400.065	400	560	65	140	1200/1000	100,2
1.124.400.080	400	560	80	160	1200/1000	102,0
1.124.400.100	400	560	100	200	1400/1200	125,7
1.124.400.125	400	560	125	225	1400/1200	129,1
1.124.400.150	400	560	150	250	1400/1200	134,7
1.124.400.200	400	560	200	315	1400/1200	146,7
1.124.400.250	400	560	250	400	1400/1200	163,3
1.124.400.300	400	560	300	450	1600/1300	194,0
1.124.400.350	400	560	350	500	1600/1300	203,7
1.124.400.400	400	560	400	560	1800/1300	254,2
1.124.450.050	450	630	40	110	1200/1000	104,3
1.124.450.065	450	630	50	125	1200/1000	105,8
1.124.450.080	450	630	65	140	1200/1000	107,0
1.124.450.100	450	630	80	160	1200/1000	108,8
1.124.450.125	450	630	100	200	1400/1200	133,4
1.124.450.150	450	630	125	225	1400/1200	136,8
1.124.450.200	450	630	150	250	1400/1200	142,3
1.124.450.250	450	630	200	315	1400/1200	154,1
1.124.450.300	450	630	250	400	1400/1200	170,4
1.124.450.350	450	630	300	450	1600/1300	210,2
1.124.450.400	450	630	350	500	1600/1300	249,0
1.124.450.450	450	630	450	560	1800/1300	269,6
1.124.500.040	500	710	40	110	1200/1000	118,4
1.124.500.050	500	710	50	125	1200/1000	119,8
1.124.500.065	500	710	65	140	1200/1000	121,0
1.124.500.080	500	710	80	160	1200/1000	122,8
1.124.500.100	500	710	100	200	1400/1200	150,1
1.124.500.125	500	710	125	225	1400/1200	153,4
1.124.500.150	500	710	150	250	1400/1200	158,9
1.124.500.200	500	710	200	315	1400/1200	170,6
1.124.500.250	500	710	250	400	1400/1200	186,8
1.124.500.300	500	710	300	450	1600/1300	218,7
1.124.500.350	500	710	350	500	1600/1300	227,9
1.124.500.400	500	710	400	560	1800/1300	284,1
1.124.500.450	500	710	450	630	1800/1300	291,0
1.124.500.500	500	710	500	710	1800/1300	308,7
1.124.600.065	600	800	65	140	1200/1200	159,3
1.124.600.080	600	800	80	160	1200/1200	161,4
1.124.600.100	600	800	100	200	1400/1200	193,3
1.124.600.125	600	800	125	225	1400/1200	196,6
1.124.600.150	600	800	150	250	1400/1200	201,9
1.124.600.200	600	800	200	315	1600/1400	247,0

**BRANCH 45°
INSULATION SERIES 1**



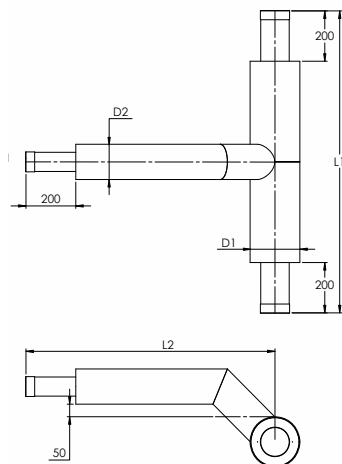
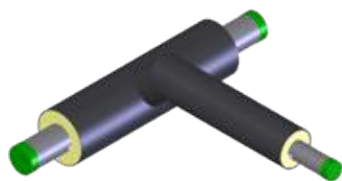
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.600.250	600	800	250	400	1600/1400	265,8
1.124.600.300	600	800	300	450	1600/1500	276,9
1.124.600.350	600	800	350	500	1600/1500	287,4
1.124.600.400	600	800	400	560	1800/1500	355,8
1.124.600.450	600	800	450	630	1800/1500	363,4
1.124.600.500	600	800	500	710	1800/1500	383,6
1.124.600.600	600	800	600	800	2000/1500	460,3

BRANCH 45° INSULATION SERIES 2



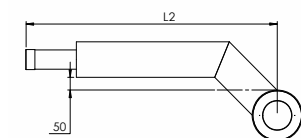
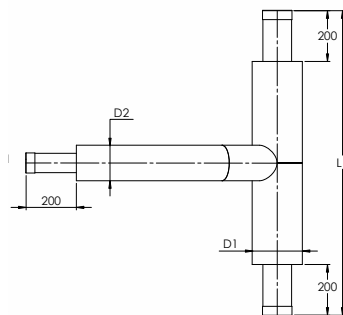
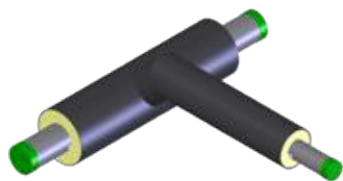
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.020.020	20	110	20	110	1000/1000	5,3
1.224.025.020	25	110	20	110	1000/1000	5,7
1.224.025.025	25	110	25	110	1000/1000	6,1
1.224.032.020	32	125	20	110	1000/1000	6,4
1.224.032.025	32	125	25	110	1000/1000	7,0
1.224.032.032	32	125	32	125	1000/1000	7,9
1.224.040.020	40	125	20	110	1000/1000	6,4
1.224.040.025	40	125	25	110	1000/1000	7,3
1.224.040.032	40	125	32	125	1000/1000	8,3
1.224.040.040	40	125	40	125	1000/1000	8,6
1.224.050.020	50	140	20	110	1000/1000	8,3
1.224.050.025	50	140	25	110	1000/1000	8,7
1.224.050.032	50	140	32	125	1000/1000	9,6
1.224.050.040	50	140	40	125	1000/1000	10,0
1.224.050.050	50	140	50	140	1000/1000	11,5
1.224.065.020	65	160	20	110	1000/1000	9,7
1.224.065.025	65	160	25	110	1000/1000	10,1
1.224.065.032	65	160	32	125	1000/1000	11,0
1.224.065.040	65	160	40	125	1000/1000	11,4
1.224.065.050	65	160	50	140	1000/1000	12,9
1.224.065.065	65	160	65	160	1000/1000	14,4
1.224.080.020	80	180	20	110	1000/1000	11,4
1.224.080.025	80	180	25	110	1000/1000	12,0
1.224.080.032	80	180	32	125	1000/1000	12,9
1.224.080.040	80	180	40	125	1000/1000	13,3
1.224.080.050	80	180	50	140	1000/1000	14,8
1.224.080.065	80	180	65	160	1000/1000	16,3
1.224.080.080	80	180	80	180	1200/1000	19,8
1.224.100.025	100	225	25	110	1000/1000	15,9
1.224.100.032	100	225	32	125	1000/1000	16,8
1.224.100.040	100	225	40	125	1000/1000	17,2
1.224.100.050	100	225	50	140	1000/1000	18,7
1.224.100.065	100	225	65	160	1000/1000	20,2
1.224.100.080	100	225	80	180	1200/1000	23,9
1.224.100.100	100	225	100	225	1200/1000	29,7
1.224.125.025	125	250	25	110	1000/1000	18,7
1.224.125.032	125	250	32	125	1000/1000	19,6
1.224.125.040	125	250	40	125	1000/1000	20,0
1.224.125.050	125	250	50	140	1000/1000	21,5
1.224.125.065	125	250	65	160	1000/1000	23,0
1.224.125.080	125	250	80	180	1200/1000	27,2
1.224.125.100	125	250	100	225	1200/1000	33,0
1.224.125.125	125	250	125	225	1200/1000	36,2
1.224.150.025	150	280	25	110	1000/1000	23,5
1.224.150.032	150	280	32	125	1000/1000	24,4
1.224.150.040	150	280	40	125	1000/1000	24,8
1.224.150.050	150	280	50	140	1000/1000	26,3

BRANCH 45° INSULATION SERIES 2



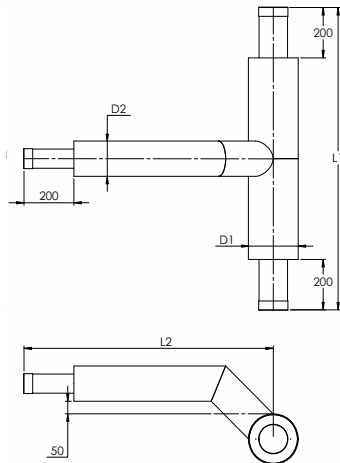
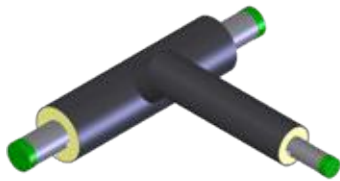
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.150.065	150	280	65	160	1000/1000	27,8
1.224.150.080	150	280	80	180	1200/1000	32,7
1.224.150.100	150	280	100	225	1200/1000	38,8
1.224.150.125	150	280	125	250	1200/1000	41,9
1.224.150.150	150	280	150	280	1200/1000	47,2
1.224.200.025	200	355	25	110	1000/1000	33,4
1.224.200.032	200	355	32	125	1000/1000	34,3
1.224.200.040	200	355	40	125	1000/1000	34,7
1.224.200.050	200	355	50	140	1000/1000	36,2
1.224.200.065	200	355	65	160	1000/1000	37,7
1.224.200.080	200	355	80	180	1200/1000	44,2
1.224.200.100	200	355	100	225	1200/1000	51,0
1.224.200.125	200	355	125	630	1200/1000	54,1
1.224.200.150	200	355	150	280	1200/1000	59,4
1.224.200.200	200	355	200	355	1400/1000	77,7
1.224.250.025	250	450	25	110	1200/1000	54,1
1.224.250.032	250	450	32	125	1200/1000	54,9
1.224.250.040	250	450	40	125	1200/1000	55,2
1.224.250.050	250	450	50	140	1200/1000	56,5
1.224.250.065	250	450	65	160	1200/1000	57,8
1.224.250.080	250	450	80	180	1200/1000	59,5
1.224.250.100	250	450	100	225	1200/1000	67,4
1.224.250.125	250	450	125	250	1200/1000	70,5
1.224.250.150	250	450	150	280	1200/1000	75,7
1.224.250.200	250	450	200	355	1400/1000	97,1
1.224.250.250	250	450	250	630	1400/1000	112,7
1.224.300.025	300	500	25	110	1200/1000	72,4
1.224.300.032	300	500	32	125	1200/1000	73,3
1.224.300.040	300	500	40	125	1200/1000	73,7
1.224.300.050	300	500	50	140	1200/1000	75,1
1.224.300.065	300	500	65	160	1200/1000	76,6
1.224.300.080	300	500	80	180	1200/1000	78,6
1.224.300.100	300	500	100	225	1400/1200	98,7
1.224.300.125	300	500	125	250	1400/1200	102,4
1.224.300.150	300	500	150	280	1400/1200	108,6
1.224.300.200	300	500	200	355	1400/1200	122,2
1.224.300.250	300	500	250	450	1600/1200	142,1
1.224.300.300	300	500	300	500	1600/1200	165,0
1.224.350.025	350	560	25	110	1200/1000	82,1
1.224.350.032	350	560	32	125	1200/1000	83,1
1.224.350.040	350	560	40	125	1200/1000	83,5
1.224.350.050	350	560	50	140	1200/1000	84,9
1.224.350.065	350	560	65	160	1200/1000	86,4
1.224.350.080	350	560	80	180	1200/1000	88,4
1.224.350.100	350	560	100	225	1400/1200	110,6
1.224.350.125	350	560	125	250	1400/1200	114,2
1.224.350.150	350	560	150	280	1400/1200	120,4

BRANCH 45° INSULATION SERIES 2



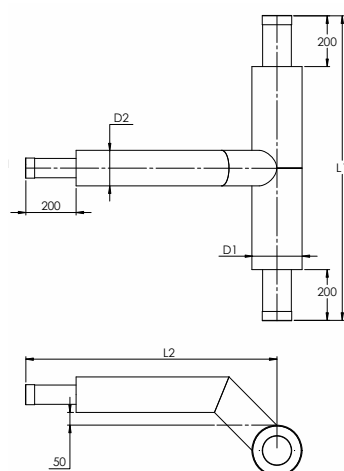
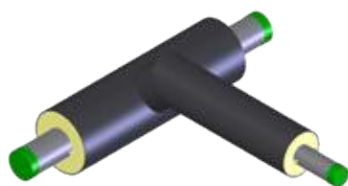
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.350.200	350	560	200	355	1400/1200	133,9
1.224.350.250	350	560	250	450	1600/1200	154,1
1.224.350.300	350	560	300	500	1600/1300	175,3
1.224.350.350	350	560	350	560	1800/1300	218,9
1.224.400.040	400	630	40	125	1200/1000	105,2
1.224.400.050	400	630	50	140	1200/1000	106,6
1.224.400.065	400	630	65	160	1200/1000	108,1
1.224.400.080	400	630	80	180	1200/1000	110,1
1.224.400.100	400	630	100	225	1400/1200	136,3
1.224.400.125	400	630	125	250	1400/1200	139,9
1.224.400.150	400	630	150	280	1400/1200	146,1
1.224.400.200	400	630	200	355	1400/1200	159,5
1.224.400.250	400	630	250	450	1600/1200	181,2
1.224.400.300	400	630	300	500	1600/1300	202,0
1.224.400.350	400	630	350	560	1800/1300	252,3
1.224.400.400	400	630	400	630	1800/1300	279,1
1.224.450.050	450	710	40	125	1200/1000	112,2
1.224.450.065	450	710	50	140	1200/1000	113,5
1.224.450.080	450	710	65	160	1200/1000	115,0
1.224.450.100	450	710	80	180	1200/1000	116,9
1.224.450.125	450	710	100	225	1400/1200	144,0
1.224.450.150	450	710	125	250	1400/1200	147,6
1.224.450.200	450	710	150	280	1400/1200	153,6
1.224.450.250	450	710	200	355	1400/1200	166,9
1.224.450.300	450	710	250	450	1600/1200	188,4
1.224.450.350	450	710	300	500	1600/1300	208,7
1.224.450.400	450	710	350	560	1800/1300	261,0
1.224.450.450	450	710	400	630	1800/1300	287,4
1.224.450.450	450	710	450	710	1800/1300	294,6
1.224.500.040	500	800	40	125	1200/1000	130,0
1.224.500.050	500	800	50	140	1200/1000	131,4
1.224.500.065	500	800	65	160	1200/1000	132,8
1.224.500.080	500	800	80	180	1200/1000	134,7
1.224.500.100	500	800	100	225	1400/1200	165,5
1.224.500.125	500	800	125	250	1400/1200	169,0
1.224.500.150	500	800	150	280	1400/1200	175,0
1.224.500.200	500	800	200	355	1400/1200	188,2
1.224.500.250	500	800	250	450	1600/1200	210,9
1.224.500.300	500	800	300	500	1600/1300	230,8
1.224.500.350	500	800	350	560	1800/1300	289,5
1.224.500.400	500	800	400	630	1800/1300	315,7
1.224.500.450	500	800	450	710	1800/1300	322,9
1.224.500.500	500	800	500	800	1800/1300	346,3
1.224.600.065	600	900	65	160	1200/1200	170,7
1.224.600.080	600	900	80	180	1200/1200	173,0
1.224.600.100	600	900	100	225	1400/1200	208,1
1.224.600.125	600	900	125	250	1400/1200	211,6

**BRANCH 45°
INSULATION SERIES 2**



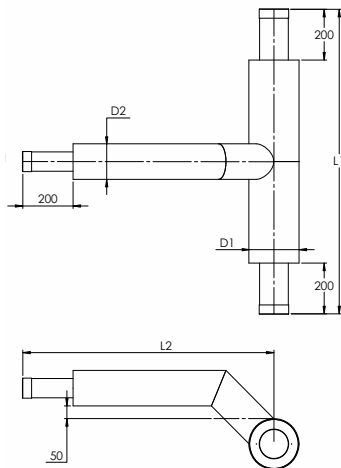
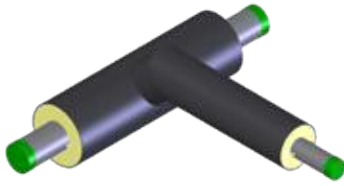
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.600.125	600	900	125	250	1400/1200	211,6
1.224.600.150	600	900	150	280	1400/1200	217,5
1.224.600.200	600	900	200	355	1600/1400	267,4
1.224.600.250	600	900	250	450	1600/1400	288,5
1.224.600.300	600	900	300	500	1800/1500	344,2
1.224.600.350	600	900	350	560	1800/1500	358,7
1.224.600.400	600	900	400	630	1800/1500	388,6
1.224.600.450	600	900	450	710	1800/1500	396,5
1.224.600.500	600	900	500	800	1800/1500	423,2
1.224.600.600	600	900	600	900	2000/1500	503,0

BRANCH 45° INSULATION SERIES 3



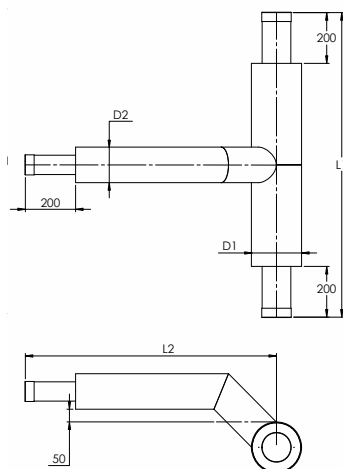
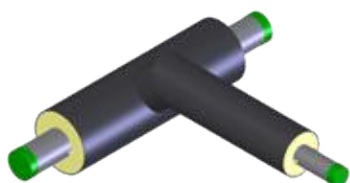
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.020.020	20	125	20	125	1000/1000	6,0
1.324.025.020	25	125	20	125	1000/1000	6,4
1.324.025.025	25	125	25	125	1000/1000	6,8
1.324.032.020	32	140	20	125	1000/1000	7,1
1.324.032.025	32	140	25	125	1000/1000	7,6
1.324.032.032	32	140	32	140	1000/1000	8,5
1.324.040.020	40	140	20	125	1000/1000	7,6
1.324.040.025	40	140	25	125	1000/1000	8,0
1.324.040.032	40	140	32	140	1000/1000	8,9
1.324.040.040	40	140	40	140	1000/1000	9,3
1.324.050.020	50	160	20	125	1000/1000	9,0
1.324.050.025	50	160	25	125	1000/1000	9,5
1.324.050.032	50	160	32	140	1000/1000	10,4
1.324.050.040	50	160	40	140	1000/1000	10,7
1.324.050.050	50	160	50	160	1000/1000	12,4
1.324.065.020	65	180	20	125	1000/1000	10,5
1.324.065.025	65	180	25	125	1000/1000	10,9
1.324.065.032	65	180	32	140	1000/1000	11,8
1.324.065.040	65	180	40	140	1000/1000	12,2
1.324.065.050	65	180	50	160	1000/1000	13,8
1.324.065.065	65	180	65	180	1200/1000	16,1
1.324.080.020	80	200	20	125	1000/1000	12,2
1.324.080.025	80	200	25	125	1000/1000	12,8
1.324.080.032	80	200	32	140	1000/1000	13,7
1.324.080.040	80	200	40	140	1000/1000	14,0
1.324.080.050	80	200	50	160	1000/1000	15,7
1.324.080.065	80	200	65	180	1200/1000	17,9
1.324.080.080	80	200	80	200	1200/1000	20,2
1.324.100.025	100	250	25	125	1000/1000	17,1
1.324.100.032	100	250	32	140	1000/1000	17,9
1.324.100.040	100	250	40	140	1000/1000	18,4
1.324.100.050	100	250	50	160	1000/1000	20,0
1.324.100.065	100	250	65	180	1200/1000	22,7
1.324.100.080	100	250	80	200	1200/1000	24,6
1.324.100.100	100	250	100	250	1200/1000	31,9
1.324.125.025	125	280	25	125	1000/1000	20,2
1.324.125.032	125	280	32	140	1000/1000	21,0
1.324.125.040	125	280	40	140	1000/1000	21,4
1.324.125.050	125	280	50	160	1000/1000	23,1
1.324.125.065	125	280	65	180	1200/1000	26,2
1.324.125.080	125	280	80	200	1200/1000	28,0
1.324.125.100	125	280	100	250	1200/1000	35,7
1.324.125.125	125	280	125	280	1200/1000	39,2
1.324.150.025	150	315	25	125	1000/1000	25,3
1.324.150.032	150	315	32	140	1000/1000	26,1
1.324.150.040	150	315	40	140	1000/1000	26,5
1.324.150.050	150	315	50	160	1000/1000	28,2

BRANCH 45° INSULATION SERIES 3



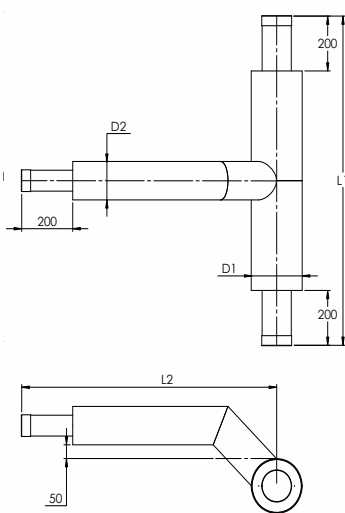
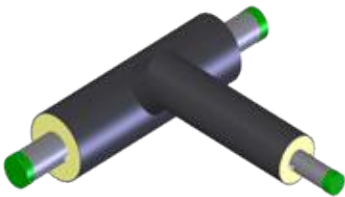
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.150.065	150	315	65	180	1200/1000	31,8
1.324.150.080	150	315	80	200	1200/1000	33,7
1.324.150.100	150	315	100	250	1200/1000	41,9
1.324.150.125	150	315	125	280	1200/1000	45,4
1.324.150.150	150	315	150	315	1200/1000	51,2
1.324.200.025	200	400	25	125	1000/1000	36,2
1.324.200.032	200	400	32	140	1000/1000	37,0
1.324.200.040	200	400	40	140	1000/1000	37,4
1.324.200.050	200	400	50	160	1000/1000	39,0
1.324.200.065	200	400	65	180	1200/1000	37,0
1.324.200.080	200	400	80	200	1200/1000	45,7
1.324.200.100	200	400	100	250	1200/1000	55,3
1.324.200.125	200	400	125	280	1200/1000	58,8
1.324.200.150	200	400	150	315	1200/1000	64,6
1.324.200.200	200	400	200	400	1400/1000	85,0
1.324.250.025	250	500	25	125	1200/1000	56,1
1.324.250.032	250	500	32	140	1200/1000	56,9
1.324.250.040	250	500	40	140	1200/1000	57,2
1.324.250.050	250	500	50	160	1200/1000	58,5
1.324.250.065	250	500	65	180	1200/1000	59,8
1.324.250.080	250	500	80	200	1200/1000	61,6
1.324.250.100	250	500	100	250	1200/1000	72,9
1.324.250.125	250	500	125	280	1200/1000	76,4
1.324.250.150	250	500	150	315	1200/1000	82,1
1.324.250.200	250	500	200	400	1400/1000	106,0
1.324.250.250	250	500	250	500	1400/1000	123,0
1.324.300.025	300	560	25	125	1200/1000	78,6
1.324.300.032	300	560	32	140	1200/1000	79,4
1.324.300.040	300	560	40	140	1200/1000	79,8
1.324.300.050	300	560	50	160	1200/1000	81,4
1.324.300.065	300	560	65	180	1200/1000	83,1
1.324.300.080	300	560	80	200	1200/1000	85,0
1.324.300.100	300	560	100	250	1400/1200	107,5
1.324.300.125	300	560	125	280	1400/1200	111,7
1.324.300.150	300	560	150	315	1400/1200	118,5
1.324.300.200	300	560	200	400	1400/1200	133,8
1.324.300.250	300	560	250	500	1600/1200	148,7
1.324.300.300	300	560	300	560	1600/1000	183,6
1.324.350.025	350	630	25	125	1200/1000	90,4
1.324.350.032	350	630	32	140	1200/1000	90,9
1.324.350.040	350	630	40	140	1200/1000	91,3
1.324.350.050	350	630	50	160	1200/1000	92,8
1.324.350.065	350	630	65	180	1200/1000	94,5
1.324.350.080	350	630	80	200	1200/1000	96,4
1.324.350.100	350	630	100	250	1400/1200	121,3
1.324.350.125	350	630	125	280	1400/1200	125,5
1.324.350.150	350	630	150	315	1400/1200	132,3

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Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.350.200	350	630	200	400	1400/1200	147,6
1.324.350.250	350	630	250	500	1600/1200	161,5
1.324.350.300	350	630	300	560	1600/1300	184,2
1.324.350.350	350	630	350	630	1800/1300	243,3
1.324.400.040	400	710	40	140	1200/1000	116,8
1.324.400.050	400	710	50	160	1200/1000	118,4
1.324.400.065	400	710	65	180	1200/1000	120,0
1.324.400.080	400	710	80	200	1200/1000	122,0
1.324.400.100	400	710	100	250	1400/1200	151,8
1.324.400.125	400	710	125	280	1400/1200	156,0
1.324.400.150	400	710	150	315	1400/1200	162,7
1.324.400.200	400	710	200	400	1400/1200	177,9
1.324.400.250	400	710	250	500	1400/1200	198,2
1.324.400.300	400	710	300	560	1600/1300	215,1
1.324.400.350	400	710	350	630	1600/1300	226,8
1.324.400.400	400	710	400	710	1800/1300	316,1
1.324.450.050	450	800	50	160	1200/1000	123,8
1.324.450.065	450	800	65	180	1200/1000	125,3
1.324.450.080	450	800	80	200	1200/1000	126,9
1.324.450.100	450	800	100	250	1200/1000	128,8
1.324.450.125	450	800	125	280	1400/1200	159,5
1.324.450.150	450	800	150	315	1400/1200	163,7
1.324.450.200	450	800	200	400	1400/1200	170,3
1.324.450.250	450	800	250	500	1400/1200	185,3
1.324.450.300	450	800	300	560	1600/1200	221,8
1.324.450.350	450	800	350	630	1600/1300	233,3
1.324.450.400	450	800	400	710	1800/1300	292,2
1.324.450.450	450	800	450	800	1800/1300	324,4
1.324.500.040	500	900	40	140	1200/1000	141,1
1.324.500.050	500	900	50	160	1200/1000	142,7
1.324.500.065	500	900	65	180	1200/1000	144,2
1.324.500.080	500	900	80	200	1200/1000	146,2
1.324.500.100	500	900	100	250	1400/1200	180,4
1.324.500.125	500	900	125	280	1400/1200	184,5
1.324.500.150	500	900	150	315	1400/1200	191,2
1.324.500.200	500	900	200	400	1400/1200	206,1
1.324.500.250	500	900	250	500	1600/1200	219,0
1.324.500.300	500	900	300	560	1600/1300	240,5
1.324.500.350	500	900	350	630	1800/1300	320,0
1.324.500.400	500	900	400	710	1800/1300	352,0
1.324.500.450	500	900	450	800	1800/1300	359,5
1.324.500.500	500	900	500	900	1800/1300	382,7
1.324.600.065	600	1000	65	180	1200/1200	184,7
1.324.600.080	600	1000	80	200	1200/1200	187,0
1.324.600.100	600	1000	100	250	1400/1200	226,1
1.324.600.125	600	1000	125	280	1400/1200	230,1

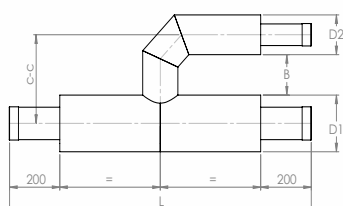
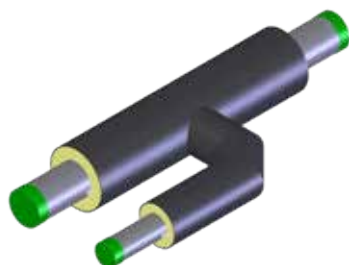
BRANCH 45°
INSULATION SERIES 3



Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.600.150	600	1000	150	315	1400/1200	236,6
1.324.600.200	600	1000	200	400	1600/1400	292,4
1.324.600.250	600	1000	250	500	1600/1400	315,6
1.324.600.300	600	1000	300	560	1800/1500	378,0
1.324.600.350	600	1000	350	630	1800/1500	395,3
1.324.600.400	600	1000	400	710	1800/1500	432,0
1.324.600.450	600	1000	450	800	1800/1500	440,2
1.324.600.500	600	1000	500	900	1800/1500	466,6
1.324.600.600	600	1000	600	1000	2000/1500	554,8

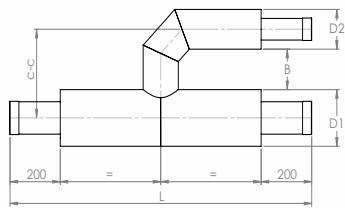
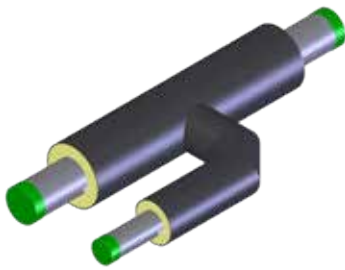
CHAPTER 2.9.4

BRANCH PARALLEL INSULATION SERIES 1



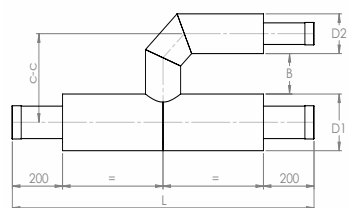
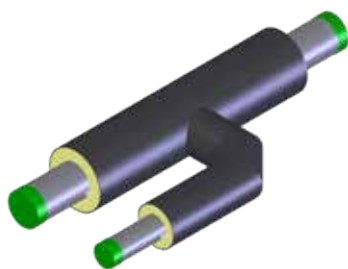
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.020.020	20	90	20	90	1000	240	3,9
1.125.025.020	25	90	20	90	1000	240	4,4
1.125.025.025	25	90	25	90	1000	240	4,6
1.125.032.020	32	110	20	90	1000	250	5,0
1.125.032.025	32	110	25	90	1000	250	5,4
1.125.032.032	32	110	32	110	1000	260	6,1
1.125.040.020	40	110	20	90	1000	250	5,5
1.125.040.025	40	110	25	90	1000	250	5,8
1.125.040.032	40	110	32	110	1000	260	6,4
1.125.040.040	40	110	40	110	1000	260	6,7
1.125.050.020	50	125	20	90	1000	258	6,9
1.125.050.025	50	125	25	90	1000	258	7,2
1.125.050.032	50	125	32	110	1000	268	7,8
1.125.050.040	50	125	40	110	1000	268	8,1
1.125.050.050	50	125	50	125	1000	275	9,2
1.125.065.020	65	140	20	90	1000	265	8,2
1.125.065.025	65	140	25	90	1000	265	8,5
1.125.065.032	65	140	32	110	1000	275	9,1
1.125.065.040	65	140	40	110	1000	275	9,4
1.125.065.065	65	140	50	125	1000	283	10,5
1.125.065.050	65	140	65	140	1000	290	11,6
1.125.080.020	80	160	20	90	1000	275	10,0
1.125.080.025	80	160	25	90	1000	275	10,3
1.125.080.032	80	160	32	110	1000	285	10,9
1.125.080.040	80	160	40	110	1000	285	11,2
1.125.080.050	80	160	50	125	1000	293	12,3
1.125.080.065	80	160	65	140	1000	300	13,4
1.125.080.080	80	160	80	160	1000	310	14,9
1.125.100.025	100	200	25	90	1000	295	14,0
1.125.100.032	100	200	32	110	1000	305	14,3
1.125.100.040	100	200	40	110	1000	305	15,0
1.125.100.050	100	200	50	125	1000	313	16,1
1.125.100.065	100	200	65	140	1000	320	17,2
1.125.100.080	100	200	80	160	1000	330	18,7
1.125.100.100	100	200	100	200	1200	350	26,0
1.125.125.025	125	225	25	90	1200	308	20,3
1.125.125.032	125	225	32	110	1200	318	21,1
1.125.125.040	125	225	40	110	1200	318	21,4
1.125.125.050	125	225	50	125	1200	325	22,7
1.125.125.065	125	225	65	140	1200	333	23,9
1.125.125.080	125	225	80	160	1200	343	25,6
1.125.125.100	125	225	100	200	1200	363	29,2
1.125.125.125	125	225	125	225	1200	375	31,9
1.125.150.025	150	250	25	90	1200	320	25,8
1.125.150.032	150	250	32	110	1200	330	26,5
1.125.150.040	150	250	40	110	1200	330	26,8
1.125.150.050	150	250	50	125	1200	338	28,1

BRANCH PARALLEL INSULATION SERIES 1



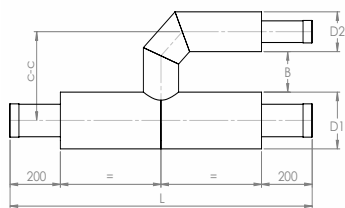
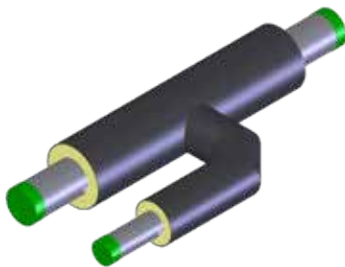
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.150.065	150	250	65	140	1200	345	29,3
1.125.150.080	150	250	80	160	1200	355	31,0
1.125.150.100	150	250	100	200	1200	375	34,7
1.125.150.125	150	250	125	225	1200	388	37,4
1.125.150.150	150	250	150	250	1400	400	48,3
1.125.200.025	200	315	25	90	1200	353	37,1
1.125.200.032	200	315	32	110	1200	363	37,9
1.125.200.040	200	315	40	110	1200	363	38,2
1.125.200.050	200	315	50	125	1200	370	39,5
1.125.200.065	200	315	65	140	1200	378	40,7
1.125.200.080	200	315	80	160	1200	388	42,4
1.125.200.100	200	315	100	200	1200	408	46,1
1.125.200.125	200	315	125	225	1200	420	48,8
1.125.200.150	200	315	150	250	1200	433	53,3
1.125.200.200	200	315	200	315	1400	515	74,4
1.125.250.025	250	400	25	90	1200	395	52,3
1.125.250.032	250	400	32	110	1200	405	53,0
1.125.250.040	250	400	40	110	1200	405	53,4
1.125.250.050	250	400	50	125	1200	413	54,7
1.125.250.065	250	400	65	140	1200	420	55,9
1.125.250.080	250	400	80	160	1200	430	57,7
1.125.250.100	250	400	100	200	1400	450	71,9
1.125.250.125	250	400	125	225	1400	463	75,0
1.125.250.150	250	400	150	250	1400	475	80,1
1.125.250.200	250	400	200	315	1400	508	91,3
1.125.250.250	250	400	250	400	1400	650	112,1
1.125.300.025	300	450	25	90	1200	420	67,4
1.125.300.032	300	450	32	110	1200	430	68,0
1.125.300.040	300	450	40	110	1200	430	68,5
1.125.300.050	300	450	50	125	1200	438	69,8
1.125.300.065	300	450	65	140	1200	445	71,0
1.125.300.080	300	450	80	160	1200	455	72,8
1.125.300.100	300	450	100	200	1400	475	89,7
1.125.300.125	300	450	125	225	1400	488	92,8
1.125.300.150	300	450	150	250	1400	500	97,9
1.125.300.200	300	450	200	315	1400	533	109,1
1.125.300.250	300	450	250	400	1400	575	125,3
1.125.300.300	300	450	300	450	2000	750	203,5
1.125.350.025	350	500	25	90	1200	445	77,7
1.125.350.032	350	500	32	110	1200	455	76,3
1.125.350.040	350	500	40	110	1200	455	76,8
1.125.350.050	350	500	50	125	1200	463	78,2
1.125.350.065	350	500	65	140	1200	470	79,4
1.125.350.080	350	500	80	160	1200	480	81,2
1.125.350.100	350	500	100	200	1400	500	99,8
1.125.350.125	350	500	125	225	1400	513	102,9
1.125.350.150	350	500	150	250	1400	525	108,0

BRANCH PARALLEL INSULATION SERIES 1



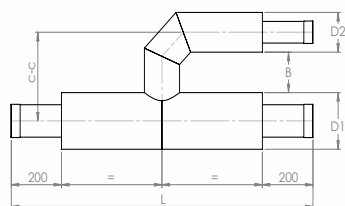
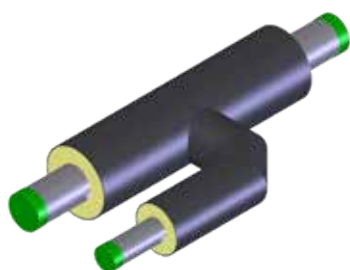
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.350.200	350	500	200	315	1400	558	119,3
1.125.350.250	350	500	250	400	1400	650	138,0
1.125.350.300	350	500	300	450	2000	725	215,9
1.125.350.350	350	500	350	500	2000	800	232,9
1.125.400.040	400	560	40	110	1200	485	97,0
1.125.400.050	400	560	50	125	1200	493	98,4
1.125.400.065	400	560	65	140	1200	500	99,7
1.125.400.080	400	560	80	160	1200	510	101,4
1.125.400.100	400	560	100	200	1400	530	123,7
1.125.400.125	400	560	125	225	1400	543	126,8
1.125.400.150	400	560	150	250	1400	555	132,0
1.125.400.200	400	560	200	315	1400	588	143,3
1.125.400.250	400	560	250	400	1400	630	159,7
1.125.400.300	400	560	300	450	2000	755	251,0
1.125.400.350	400	560	350	500	2000	830	268,1
1.125.400.400	400	560	400	560	2000	910	304,3
1.125.450.050	450	630	40	110	1200	485	103,9
1.125.450.065	450	630	50	125	1200	493	105,3
1.125.450.080	450	630	65	140	1200	500	106,5
1.125.450.100	450	630	80	160	1200	510	108,2
1.125.450.125	450	630	100	200	1400	530	131,4
1.125.450.150	450	630	125	225	1400	543	134,4
1.125.450.200	450	630	150	250	1400	555	139,4
1.125.450.250	450	630	200	315	1400	588	150,5
1.125.450.300	450	630	250	400	1400	630	166,6
1.125.450.350	450	630	300	450	2000	755	260,4
1.125.450.400	450	630	350	500	2000	830	277,3
1.125.450.450	450	630	400	560	2000	910	312,6
1.125.450.450	450	630	450	630	2000	1010	332,2
1.125.500.040	500	710	40	110	1200	520	118,0
1.125.500.050	500	710	50	125	1200	528	119,4
1.125.500.065	500	710	65	140	1200	535	120,6
1.125.500.080	500	710	80	160	1200	545	122,3
1.125.500.100	500	710	100	200	1400	565	148,3
1.125.500.125	500	710	125	225	1400	578	151,3
1.125.500.150	500	710	150	250	1400	590	156,4
1.125.500.200	500	710	200	315	1400	623	167,6
1.125.500.250	500	710	250	400	1400	665	183,8
1.125.500.300	500	710	300	450	2000	740	283,0
1.125.500.350	500	710	350	500	2000	815	299,5
1.125.500.400	500	710	400	560	2000	895	334,0
1.125.500.450	500	710	450	630	2000	995	351,6
1.125.500.500	500	710	500	710	2000	1130	389,8
1.125.600.065	600	800	65	140	1200	575	157,5
1.125.600.080	600	800	80	160	1200	585	159,2
1.125.600.100	600	800	100	200	1400	605	191,7
1.125.600.125	600	800	125	225	1400	618	194,7

**BRANCH PARALLEL
INSULATION SERIES 1**



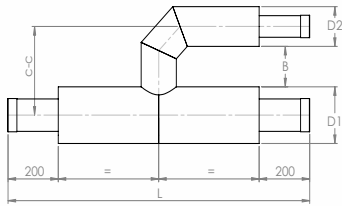
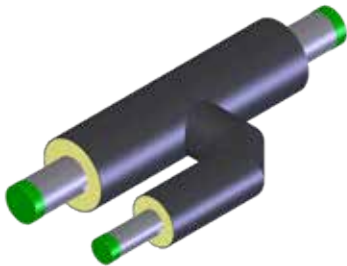
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.600.150	600	800	150	250	1400	630	199,7
1.125.600.200	600	800	200	315	1600	663	241,3
1.125.600.250	600	800	250	400	1600	705	258,8
1.125.600.300	600	800	300	450	2000	730	342,6
1.125.600.350	600	800	350	500	2000	805	358,6
1.125.600.400	600	800	400	560	2000	885	392,0
1.125.600.450	600	800	450	630	2000	985	409,4
1.125.600.500	600	800	500	710	2000	1120	445,1
1.125.600.600	600	800	600	800	2000	1310	529,6

BRANCH PARALLEL INSULATION SERIES 2



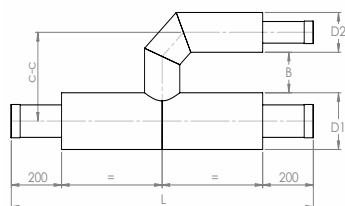
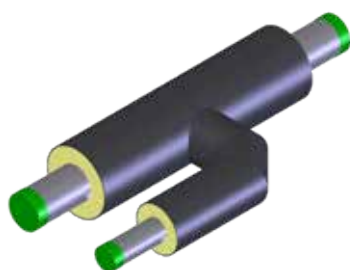
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.020.020	20	110	20	110	1000	260	4,5
1.225.025.020	25	110	20	110	1000	260	4,9
1.225.025.025	25	110	25	110	1000	260	5,2
1.225.032.020	32	125	20	110	1000	260	5,5
1.225.032.025	32	125	25	110	1000	268	6,0
1.225.032.032	32	125	32	125	1000	275	6,7
1.225.040.020	40	125	20	110	1000	268	6,1
1.225.040.025	40	125	25	110	1000	268	6,4
1.225.040.032	40	125	32	125	1000	275	7,0
1.225.040.040	40	125	40	125	1000	275	7,3
1.225.050.020	50	140	20	110	1000	275	7,4
1.225.050.025	50	140	25	110	1000	275	7,7
1.225.050.032	50	140	32	125	1000	283	8,4
1.225.050.040	50	140	40	125	1000	283	8,7
1.225.050.050	50	140	50	140	1000	290	9,8
1.225.065.020	65	160	20	110	1000	285	8,8
1.225.065.025	65	160	25	110	1000	285	9,1
1.225.065.032	65	160	32	125	1000	293	9,8
1.225.065.040	65	160	40	125	1000	293	10,1
1.225.065.065	65	160	50	140	1000	300	11,2
1.225.065.050	65	160	65	160	1000	310	12,4
1.225.080.020	80	180	20	110	1000	295	10,7
1.225.080.025	80	180	25	110	1000	295	11,0
1.225.080.032	80	180	32	125	1000	303	11,7
1.225.080.040	80	180	40	125	1000	303	12,0
1.225.080.050	80	180	50	140	1000	310	13,1
1.225.080.065	80	180	65	160	1000	320	14,3
1.225.080.080	80	180	80	180	1000	330	16,0
1.225.100.025	100	225	25	110	1000	318	15,0
1.225.100.032	100	225	32	125	1000	325	16,1
1.225.100.040	100	225	40	125	1000	326	16,5
1.225.100.050	100	225	50	140	1000	333	17,2
1.225.100.065	100	225	65	160	1000	343	18,4
1.225.100.080	100	225	80	180	1200	353	23,9
1.225.100.100	100	225	100	225	1200	375	28,0
1.225.125.025	125	250	25	110	1200	330	21,7
1.225.125.032	125	250	32	125	1200	338	22,5
1.225.125.040	125	250	40	125	1200	338	22,8
1.225.125.050	125	250	50	140	1200	345	24,1
1.225.125.065	125	250	65	160	1200	355	25,5
1.225.125.080	125	250	80	180	1200	365	27,4
1.225.125.100	125	250	100	225	1200	388	31,5
1.225.125.125	125	250	125	250	1200	400	34,4
1.225.150.025	150	280	25	110	1200	345	27,6
1.225.150.032	150	280	32	125	1200	353	28,4
1.225.150.040	150	280	40	125	1200	353	28,7
1.225.150.050	150	280	50	140	1200	360	30,0

BRANCH PARALLEL INSULATION SERIES 2



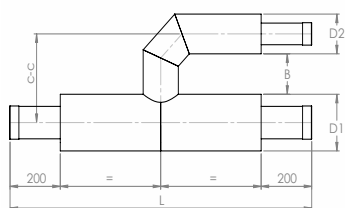
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.150.050	150	280	50	140	1200	360	30,0
1.225.150.065	150	280	65	160	1200	370	31,4
1.225.150.080	150	280	80	180	1200	380	33,2
1.225.150.100	150	280	100	225	1200	403	37,3
1.225.150.125	150	280	125	250	1200	415	40,3
1.225.150.150	150	280	150	280	1400	430	52,2
1.225.200.025	200	355	25	110	1200	383	39,9
1.225.200.032	200	355	32	125	1200	390	40,8
1.225.200.040	200	355	40	125	1200	390	41,1
1.225.200.050	200	355	50	140	1200	398	42,4
1.225.200.065	200	355	65	160	1200	408	43,8
1.225.200.080	200	355	80	180	1200	418	45,6
1.225.200.100	200	355	100	225	1200	440	49,8
1.225.200.125	200	355	125	250	1200	453	52,8
1.225.200.150	200	355	150	280	1200	468	57,9
1.225.200.200	200	355	200	355	1400	505	79,8
1.225.250.025	250	450	25	110	1200	430	56,4
1.225.250.032	250	450	32	125	1200	438	57,3
1.225.250.040	250	450	40	125	1200	438	57,6
1.225.250.050	250	450	50	140	1200	445	58,9
1.225.250.065	250	450	65	160	1200	455	60,4
1.225.250.080	250	450	80	180	1200	465	62,3
1.225.250.100	250	450	100	225	1400	488	78,1
1.225.250.125	250	450	125	250	1400	500	81,5
1.225.250.150	250	450	150	280	1400	515	87,2
1.225.250.200	250	450	200	355	1400	553	100,2
1.225.250.250	250	450	250	450	1400	650	121,5
1.225.300.025	300	500	25	110	1200	455	72,1
1.225.300.032	300	500	32	125	1200	463	72,7
1.225.300.040	300	500	40	125	1200	463	73,2
1.225.300.050	300	500	50	140	1200	470	74,6
1.225.300.065	300	500	65	160	1200	480	76,0
1.225.300.080	300	500	80	180	1200	490	77,9
1.225.300.100	300	500	100	225	1400	513	96,6
1.225.300.125	300	500	125	250	1400	525	99,9
1.225.300.150	300	500	150	280	1400	540	105,7
1.225.300.200	300	500	200	355	1400	578	118,6
1.225.300.250	300	500	250	450	1600	675	157,9
1.225.300.300	300	500	300	500	2000	750	219,5
1.225.350.025	350	560	25	110	1200	485	82,0
1.225.350.032	350	560	32	125	1200	493	82,8
1.225.350.040	350	560	40	125	1200	493	83,1
1.225.350.050	350	560	50	140	1200	500	84,5
1.225.350.065	350	560	65	160	1200	510	86,0
1.225.350.080	350	560	80	180	1200	520	87,9
1.225.350.100	350	560	100	225	1400	543	108,6
1.225.350.125	350	560	125	250	1400	555	112,0

BRANCH PARALLEL INSULATION SERIES 2



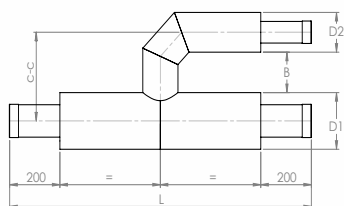
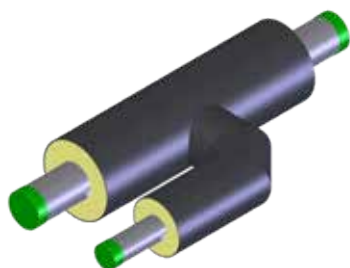
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.350.150	350	560	150	280	1400	570	117,8
1.225.350.200	350	560	200	355	1400	608	131,0
1.225.350.250	350	560	250	450	1600	655	170,0
1.225.350.300	350	560	300	500	2000	780	238,3
1.225.350.350	350	560	350	560	2000	810	255,5
1.225.400.040	400	630	40	125	1200	528	105,0
1.225.400.050	400	630	50	140	1200	535	106,3
1.225.400.065	400	630	65	160	1200	545	107,8
1.225.400.080	400	630	80	180	1200	555	109,8
1.225.400.100	400	630	100	225	1400	578	134,6
1.225.400.125	400	630	125	250	1400	590	138,0
1.225.400.150	400	630	150	280	1400	605	143,9
1.225.400.200	400	630	200	355	1400	643	157,1
1.225.400.250	400	630	250	450	1600	690	200,4
1.225.400.300	400	630	300	500	2000	815	276,9
1.225.400.350	400	630	350	560	2000	845	294,3
1.225.400.400	400	630	400	630	2000	930	334,4
1.225.450.050	450	710	40	125	1200	528	111,8
1.225.450.065	450	710	50	140	1200	535	113,2
1.225.450.080	450	710	65	160	1200	545	114,6
1.225.450.100	450	710	80	180	1200	555	116,5
1.225.450.125	450	710	100	225	1400	578	142,2
1.225.450.150	450	710	125	250	1400	590	145,6
1.225.450.200	450	710	150	280	1400	605	151,3
1.225.450.250	450	710	200	355	1400	643	164,2
1.225.450.300	450	710	250	450	1600	790	213,1
1.225.450.350	450	710	300	500	2000	815	286,1
1.225.450.400	450	710	350	560	2000	845	303,3
1.225.450.450	450	710	400	630	2000	930	242,9
1.225.450.450	450	710	450	710	2000	1030	361,7
1.225.500.040	500	800	40	125	1200	568	129,8
1.225.500.050	500	800	50	140	1200	575	131,2
1.225.500.065	500	800	65	160	1200	585	132,6
1.225.500.080	500	800	80	180	1200	595	134,5
1.225.500.100	500	800	100	225	1400	618	164,0
1.225.500.125	500	800	125	250	1400	630	167,4
1.225.500.150	500	800	150	280	1400	645	173,2
1.225.500.200	500	800	200	355	1400	683	186,3
1.225.500.250	500	800	250	450	1600	830	239,0
1.225.500.300	500	800	300	500	2000	855	319,7
1.225.500.350	500	800	350	560	2000	885	336,9
1.225.500.400	500	800	400	630	2000	970	376,8
1.225.500.450	500	800	450	710	2000	1020	390,7
1.225.500.500	500	800	500	800	2000	1110	431,7
1.225.600.065	600	900	65	160	1200	630	169,1
1.225.600.080	600	900	80	180	1200	640	171,0
1.225.600.100	600	900	100	225	1400	663	206,8

BRANCH PARALLEL INSULATION SERIES 2



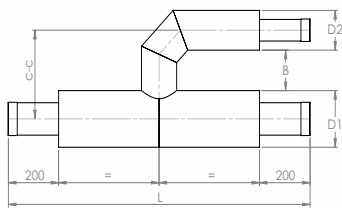
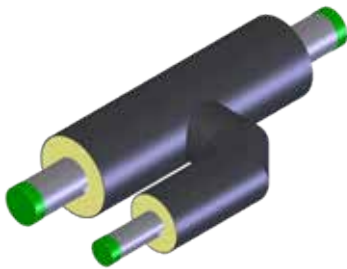
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.600.125	600	900	125	250	1400	675	210,2
1.225.600.150	600	900	150	280	1400	690	216,0
1.225.600.200	600	900	200	355	1600	728	262,6
1.225.600.250	600	900	250	450	1600	775	283,1
1.225.600.300	600	900	300	500	2000	900	381,6
1.225.600.350	600	900	350	560	2000	930	398,8
1.225.600.400	600	900	400	630	2000	1015	438,5
1.225.600.450	600	900	450	710	2000	1065	452,4
1.225.600.500	600	900	500	800	2000	1155	493,3
1.225.600.600	600	900	600	900	2000	1350	581,2

BRANCH PARALLEL INSULATION SERIES 3



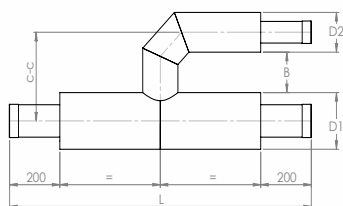
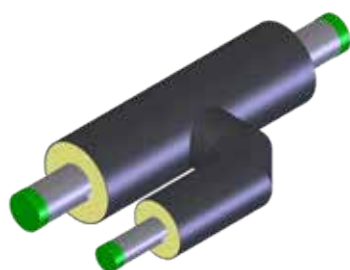
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.020.020	20	125	20	125	1000	275	5,1
1.325.025.020	25	125	20	125	1000	275	5,5
1.325.025.025	25	125	25	125	1000	275	5,8
1.325.032.020	32	140	20	125	1000	275	6,2
1.325.032.025	32	140	25	125	1000	283	6,6
1.325.032.032	32	140	32	140	1000	290	7,3
1.325.040.020	40	140	20	125	1000	283	6,6
1.325.040.025	40	140	25	125	1000	283	6,9
1.325.040.032	40	140	32	140	1000	290	7,6
1.325.040.040	40	140	40	140	1000	290	7,9
1.325.050.020	50	160	20	125	1000	293	8,1
1.325.050.025	50	160	25	125	1000	293	8,4
1.325.050.032	50	160	32	140	1000	300	9,1
1.325.050.040	50	160	40	140	1000	300	9,4
1.325.050.050	50	160	50	160	1000	310	10,7
1.325.065.020	65	180	20	125	1000	303	9,6
1.325.065.025	65	180	25	125	1000	303	9,9
1.325.065.032	65	180	32	140	1000	310	10,6
1.325.065.040	65	180	40	140	1000	310	10,9
1.325.065.065	65	180	50	160	1000	320	12,2
1.325.065.050	65	180	65	180	1000	330	13,5
1.325.080.020	80	200	20	125	1000	313	11,6
1.325.080.025	80	200	25	125	1000	313	11,8
1.325.080.032	80	200	32	140	1000	320	12,5
1.325.080.040	80	200	40	140	1000	320	12,8
1.325.080.050	80	200	50	160	1000	330	14,0
1.325.080.065	80	200	65	180	1000	340	15,4
1.325.080.080	80	200	80	200	1000	350	17,0
1.325.100.025	100	250	25	125	1000	338	16,2
1.325.100.032	100	250	32	140	1000	345	16,8
1.325.100.040	100	250	40	140	1000	345	17,2
1.325.100.050	100	250	50	160	1200	355	22,3
1.325.100.065	100	250	65	180	1200	365	23,9
1.325.100.080	100	250	80	200	1200	375	25,7
1.325.100.100	100	250	100	250	1200	400	30,5
1.325.125.025	125	280	25	125	1200	353	23,6
1.325.125.032	125	280	32	140	1200	360	24,4
1.325.125.040	125	280	40	140	1200	360	24,7
1.325.125.050	125	280	50	160	1200	370	26,2
1.325.125.065	125	280	65	180	1200	380	27,7
1.325.125.080	125	280	80	200	1200	390	29,6
1.325.125.100	125	280	100	250	1200	415	34,3
1.325.125.125	125	280	125	280	1200	430	37,8
1.325.150.025	150	315	25	125	1200	370	29,9
1.325.150.032	150	315	32	140	1200	378	30,7
1.325.150.040	150	315	40	140	1200	378	31,0
1.325.150.050	150	315	50	160	1200	388	32,4

BRANCH PARALLEL INSULATION SERIES 3



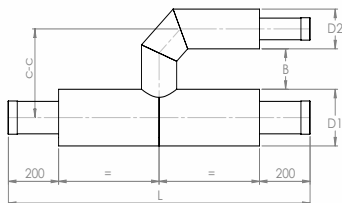
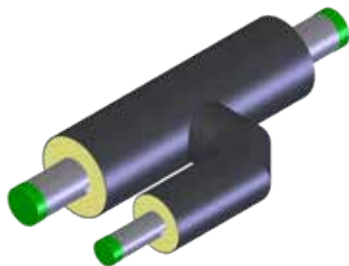
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.150.065	150	315	65	180	1200	398	34,0
1.325.150.080	150	315	80	200	1200	408	35,9
1.325.150.100	150	315	100	250	1200	433	40,6
1.325.150.125	150	315	125	280	1200	448	44,1
1.325.150.150	150	315	150	315	1400	465	57,4
1.325.200.025	200	400	25	125	1200	413	43,5
1.325.200.032	200	400	32	140	1200	420	44,3
1.325.200.040	200	400	40	140	1200	420	44,6
1.325.200.050	200	400	50	160	1200	430	46,1
1.325.200.065	200	400	65	180	1200	440	47,6
1.325.200.080	200	400	80	200	1200	450	49,6
1.325.200.100	200	400	100	250	1200	475	54,4
1.325.200.125	200	400	125	280	1200	490	57,9
1.325.200.150	200	400	150	315	1200	508	63,7
1.325.200.200	200	400	200	400	1400	550	88,9
1.325.250.025	250	500	25	125	1200	463	61,2
1.325.250.032	250	500	32	140	1200	470	62,0
1.325.250.040	250	500	40	140	1200	470	62,4
1.325.250.050	250	500	50	160	1200	480	63,9
1.325.250.065	250	500	65	180	1200	490	65,5
1.325.250.080	250	500	80	200	1200	500	67,5
1.325.250.100	250	500	100	250	1400	525	85,2
1.325.250.125	250	500	125	280	1400	540	89,2
1.325.250.150	250	500	150	315	1400	558	95,6
1.325.250.200	250	500	200	400	1400	600	110,9
1.325.250.250	250	500	250	500	1400	650	132,3
1.325.300.025	300	560	25	125	1200	493	78,4
1.325.300.032	300	560	32	140	1200	500	78,9
1.325.300.040	300	560	40	140	1200	500	79,5
1.325.300.050	300	560	50	160	1200	510	81,1
1.325.300.065	300	560	65	180	1200	520	82,7
1.325.300.080	300	560	80	200	1200	530	84,7
1.325.300.100	300	560	100	250	1400	555	105,6
1.325.300.125	300	560	125	280	1400	570	109,6
1.325.300.150	300	560	150	315	1400	588	116,1
1.325.300.200	300	560	200	400	1400	630	131,4
1.325.300.250	300	560	250	500	1600	680	131,4
1.325.300.300	300	560	300	560	2000	710	238,2
1.325.350.025	350	630	25	125	1200	528	89,8
1.325.350.032	350	630	32	140	1200	535	90,5
1.325.350.040	350	630	40	140	1200	535	91,0
1.325.350.050	350	630	50	160	1200	545	92,6
1.325.350.065	350	630	65	180	1200	555	94,3
1.325.350.080	350	630	80	200	1200	565	96,3
1.325.350.100	350	630	100	250	1400	590	119,8
1.325.350.125	350	630	125	280	1400	605	123,8
1.325.350.150	350	630	150	315	1400	623	130,4

BRANCH PARALLEL INSULATION SERIES 3



Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.350.200	350	630	200	400	1400	665	146,0
1.325.350.250	350	630	250	500	1600	715	190,2
1.325.350.300	350	630	300	560	2000	745	260,6
1.325.350.350	350	630	350	630	2000	780	281,0
1.325.400.040	400	710	40	140	1200	575	116,7
1.325.400.050	400	710	50	160	1200	585	118,3
1.325.400.065	400	710	65	180	1200	595	120,0
1.325.400.080	400	710	80	200	1200	605	122,0
1.325.400.100	400	710	100	250	1400	630	150,6
1.325.400.125	400	710	125	280	1400	645	154,7
1.325.400.150	400	710	150	315	1400	663	161,4
1.325.400.200	400	710	200	400	1400	705	177,1
1.325.400.250	400	710	250	500	1600	755	226,6
1.325.400.300	400	710	300	560	2000	785	307,3
1.325.400.350	400	710	350	630	2000	820	327,8
1.325.400.400	400	710	400	710	2000	910	375,9
1.325.450.050	450	800	40	140	1200	575	123,6
1.325.450.065	450	800	50	160	1200	585	125,1
1.325.450.080	450	800	65	180	1200	595	126,8
1.325.450.100	450	800	80	200	1200	605	128,8
1.325.450.125	450	800	100	250	1400	630	158,2
1.325.450.150	450	800	125	280	1400	645	162,2
1.325.450.200	450	800	150	315	1400	663	168,7
1.325.450.250	450	800	200	400	1400	705	184,1
1.325.450.300	450	800	250	500	1600	755	234,1
1.325.450.350	450	800	300	560	2000	785	316,4
1.325.450.400	450	800	350	630	2000	870	340,8
1.325.450.450	450	800	400	710	2000	860	389,5
1.325.450.450	450	800	450	800	2000	1010	404,2
1.325.500.040	500	900	40	140	1200	620	141,1
1.325.500.050	500	900	50	160	1200	630	142,7
1.325.500.065	500	900	65	180	1200	640	144,3
1.325.500.080	500	900	80	200	1200	650	146,4
1.325.500.100	500	900	100	250	1400	675	179,4
1.325.500.125	500	900	125	280	1400	690	183,5
1.325.500.150	500	900	150	315	1400	708	190,2
1.325.500.200	500	900	200	400	1400	750	205,8
1.325.500.250	500	900	250	500	1600	800	259,7
1.325.500.300	500	900	300	560	2000	830	349,4
1.325.500.350	500	900	350	630	2000	865	369,9
1.325.500.400	500	900	400	710	2000	955	417,8
1.325.500.450	500	900	450	800	2000	1055	438,0
1.325.500.500	500	900	500	900	2000	1150	480,6
1.325.600.065	600	1000	65	180	1200	690	183,2
1.325.600.080	600	1000	80	200	1200	700	185,2
1.325.600.100	600	1000	100	250	1400	725	225,3
1.325.600.125	600	1000	125	280	1400	740	229,4

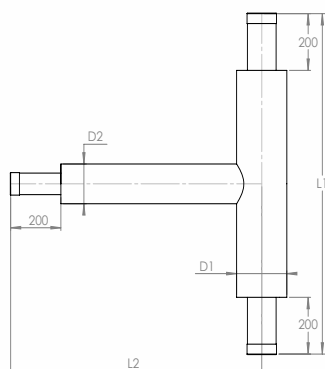
**BRANCH PARALLEL
INSULATION SERIES 3**



Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.600.150	600	1000	150	315	1400	758	236,1
1.325.600.200	600	1000	200	400	1600	800	288,9
1.325.600.250	600	1000	250	500	1600	850	312,7
1.325.600.300	600	1000	300	560	2000	880	416,4
1.325.600.350	600	1000	350	630	2000	915	436,8
1.325.600.400	600	1000	400	710	2000	1055	490,2
1.325.600.450	600	1000	450	800	2000	1105	505,0
1.325.600.500	600	1000	500	900	2000	1200	547,5
1.325.600.600	600	1000	600	1000	2000	1350	637,5

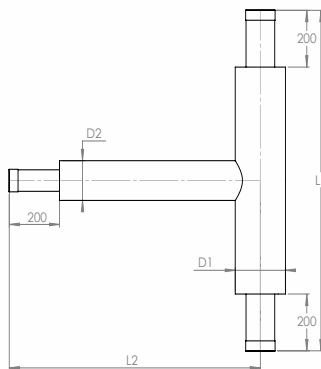
CHAPTER 2.9.5

BRANCH STRAIGHT INSULATION SERIES 1



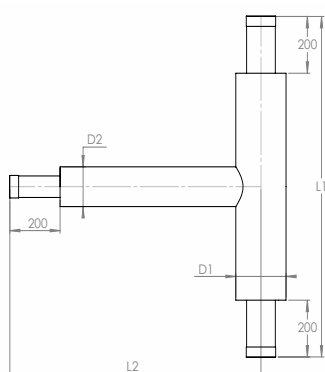
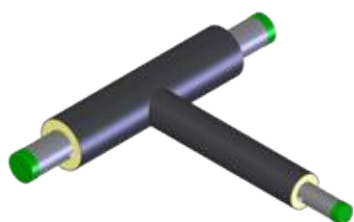
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.020.020	20	90	20	90	1000/800	4,1
1.120.025.020	25	90	20	90	1000/800	4,5
1.120.025.025	25	90	25	90	1000/800	4,8
1.120.032.020	32	110	20	90	1000/800	5,2
1.120.032.025	32	110	25	90	1000/800	5,6
1.120.032.032	32	110	32	110	1000/800	6,2
1.120.040.020	40	110	20	90	1000/800	5,6
1.120.040.025	40	110	25	90	1000/800	5,9
1.120.040.032	40	110	32	110	1000/800	6,5
1.120.040.040	40	110	40	110	1000/800	6,8
1.120.050.020	50	125	20	90	1000/800	7,0
1.120.050.025	50	125	25	90	1000/800	7,3
1.120.050.032	50	125	32	110	1000/800	7,9
1.120.050.040	50	125	40	110	1000/800	8,2
1.120.050.050	50	125	50	125	1000/800	9,3
1.120.065.020	65	140	20	90	1000/800	8,3
1.120.065.025	65	140	25	90	1000/800	8,6
1.120.065.032	65	140	32	110	1000/800	9,2
1.120.065.040	65	140	40	110	1000/800	9,5
1.120.065.050	65	140	50	125	1000/800	10,6
1.120.065.065	65	140	65	140	1000/800	11,6
1.120.080.020	80	160	20	90	1000/800	10,3
1.120.080.025	80	160	25	90	1000/800	10,4
1.120.080.032	80	160	32	110	1000/800	11,0
1.120.080.040	80	160	40	110	1000/800	11,2
1.120.080.050	80	160	50	125	1000/800	12,3
1.120.080.065	80	160	65	140	1000/800	13,3
1.120.080.080	80	160	80	160	1000/800	14,7
1.120.100.025	100	200	25	90	1000/800	14,0
1.120.100.032	100	200	32	110	1000/800	14,6
1.120.100.040	100	200	40	110	1000/800	14,9
1.120.100.050	100	200	50	125	1000/800	16,0
1.120.100.065	100	200	65	140	1000/800	17,0
1.120.100.080	100	200	80	160	1000/800	18,3
1.120.100.100	100	200	100	200	1200/800	23,8
1.120.125.025	125	225	25	90	1000/800	16,7
1.120.125.032	125	225	32	110	1000/800	17,2
1.120.125.040	125	225	40	110	1000/800	17,5
1.120.125.050	125	225	50	125	1000/800	18,6
1.120.125.065	125	225	65	140	1000/800	19,6
1.120.125.080	125	225	80	160	1000/800	20,9
1.120.125.100	125	225	100	200	1200/800	26,9
1.120.125.125	125	225	125	225	1200/800	28,9
1.120.150.025	150	250	25	90	1000/800	21,2
1.120.150.032	150	250	32	110	1000/800	21,7
1.120.150.040	150	250	40	110	1000/800	22,0
1.120.150.050	150	250	50	125	1000/800	23,1

BRANCH STRAIGHT INSULATION SERIES 1



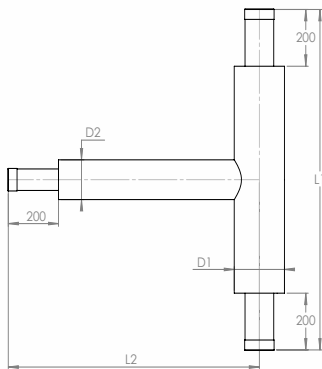
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.150.065	150	250	65	140	1000/800	24,0
1.120.150.080	150	250	80	160	1000/800	25,3
1.120.150.100	150	250	100	200	1200/800	32,2
1.120.150.125	150	250	125	225	1200/800	24,2
1.120.150.150	150	250	150	250	1200/800	37,4
1.120.200.025	200	315	25	90	1000/800	30,3
1.120.200.032	200	315	32	110	1000/800	30,8
1.120.200.040	200	315	40	110	1000/800	31,1
1.120.200.050	200	315	50	125	1000/800	32,1
1.120.200.065	200	315	65	140	1000/800	33,1
1.120.200.080	200	315	80	160	1000/800	34,2
1.120.200.100	200	315	100	200	1200/800	43,2
1.120.200.125	200	315	125	225	1200/800	45,1
1.120.200.150	200	315	150	250	1200/800	48,2
1.120.200.200	200	315	200	315	1400/900	64,1
1.120.250.025	250	400	25	90	1200/800	53,6
1.120.250.032	250	400	32	110	1200/800	54,2
1.120.250.040	250	400	40	110	1200/800	54,4
1.120.250.050	250	400	50	125	1200/800	55,4
1.120.250.065	250	400	65	140	1200/800	56,3
1.120.250.080	250	400	80	160	1200/800	57,5
1.120.250.100	250	400	100	200	1200/800	58,0
1.120.250.125	250	400	125	225	1200/800	59,8
1.120.250.150	250	400	150	250	1200/800	62,8
1.120.250.200	250	400	200	315	1400/900	81,2
1.120.250.250	250	400	250	450	1400/900	90,6
1.120.300.025	300	450	25	90	1200/1000	68,9
1.120.300.032	300	450	32	110	1200/1000	69,5
1.120.300.040	300	450	40	110	1200/1000	69,7
1.120.300.050	300	450	50	125	1200/1000	70,6
1.120.300.065	300	450	65	140	1200/1000	71,5
1.120.300.080	300	450	80	160	1200/1000	72,7
1.120.300.100	300	450	100	200	1400/1000	72,8
1.120.300.125	300	450	125	225	1400/1000	74,5
1.120.300.150	300	450	150	250	1400/1000	77,4
1.120.300.200	300	450	200	315	1400/1000	98,3
1.120.300.250	300	450	250	450	1400/1000	107,4
1.120.300.300	300	450	300	450	1600/1100	143,8
1.120.350.025	350	500	25	90	1200/1000	61,5
1.120.350.032	350	500	32	110	1200/1000	61,9
1.120.350.040	350	500	40	110	1200/1000	62,3
1.120.350.050	350	500	50	125	1200/1000	63,1
1.120.350.065	350	500	65	140	1200/1000	64,4
1.120.350.080	350	500	80	160	1200/1000	65,1
1.120.350.100	350	500	100	200	1400/1000	81,0
1.120.350.125	350	500	125	225	1400/1000	82,6
1.120.350.150	350	500	150	250	1400/1000	85,4

BRANCH STRAIGHT INSULATION SERIES 1



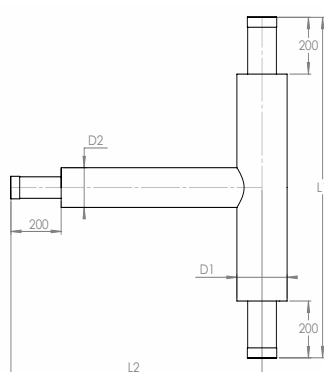
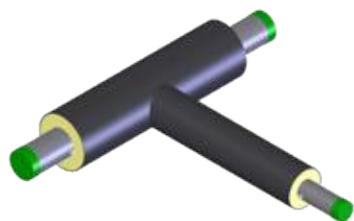
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.350.200	350	500	200	315	1400/1000	107,8
1.120.350.250	350	500	250	400	1400/1000	114,7
1.120.350.300	350	500	300	450	1600/1100	162,0
1.120.350.350	350	500	350	500	1600/1100	188,0
1.120.400.040	400	560	40	110	1200/1000	96,7
1.120.400.050	400	560	50	125	1200/1000	97,9
1.120.400.065	400	560	65	140	1200/1000	98,9
1.120.400.080	400	560	80	160	1200/1000	100,4
1.120.400.100	400	560	100	200	1400/1000	120,7
1.120.400.125	400	560	125	225	1400/1000	122,9
1.120.400.150	400	560	150	250	1400/1000	126,4
1.120.400.200	400	560	200	315	1400/1000	134,0
1.120.400.250	400	560	250	400	1400/1000	144,1
1.120.400.300	400	560	300	450	1600/1100	181,7
1.120.400.350	400	560	350	500	1600/1100	188,5
1.120.400.400	400	560	400	560	1800/1100	215,4
1.120.450.050	450	630	40	110	1200/1000	103,6
1.120.450.065	450	630	50	125	1200/1000	104,8
1.120.450.080	450	630	65	140	1200/1000	105,8
1.120.450.100	450	630	80	160	1200/1000	107,3
1.120.450.125	450	630	100	200	1400/1000	128,4
1.120.450.150	450	630	125	225	1400/1000	130,5
1.120.450.200	450	630	150	250	1400/1000	134,1
1.120.450.250	450	630	200	315	1400/1000	141,4
1.120.450.300	450	630	250	400	1400/1000	151,2
1.120.450.350	450	630	300	450	1600/1100	188,4
1.120.450.400	450	630	350	500	1600/1100	195,1
1.120.450.450	450	630	400	560	1800/1100	223,7
1.120.450.450	450	630	450	630	1800/1100	228,7
1.120.500.040	500	710	40	110	1200/1000	117,6
1.120.500.050	500	710	50	125	1200/1000	118,7
1.120.500.065	500	710	65	140	1200/1000	119,7
1.120.500.080	500	710	80	160	1200/1000	121,1
1.120.500.100	500	710	100	200	1400/1000	144,9
1.120.500.125	500	710	125	225	1400/1000	146,9
1.120.500.150	500	710	150	250	1400/1000	150,3
1.120.500.200	500	710	200	315	1400/1000	157,4
1.120.500.250	500	710	250	400	1400/1000	166,9
1.120.500.300	500	710	300	450	1600/1100	207,2
1.120.500.350	500	710	350	500	1600/1100	213,7
1.120.500.400	500	710	400	560	1800/1100	243,8
1.120.500.450	500	710	450	630	1800/1100	248,6
1.120.500.500	500	710	500	710	1800/1100	258,4
1.120.600.065	600	800	65	140	1200/1200	157,8
1.120.600.080	600	800	80	160	1200/1200	159,5
1.120.600.100	600	800	100	200	1400/1200	190,5
1.120.600.125	600	800	125	225	1400/1200	193,1

**BRANCH STRAIGHT
INSULATION SERIES 1**



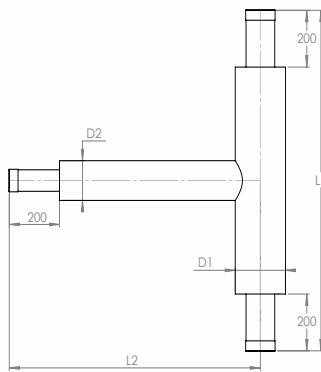
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.600.150	600	800	150	250	1400/1200	197,2
1.120.600.200	600	800	200	315	1600/1200	233,3
1.120.600.250	600	800	250	400	1600/1200	245,0
1.120.600.300	600	800	300	450	1600/1200	260,3
1.120.600.350	600	800	350	500	1600/1200	267,2
1.120.600.400	600	800	400	560	1800/1200	305,4
1.120.600.450	600	800	450	630	1800/1200	210,2
1.120.600.500	600	800	500	710	1800/1200	320,8
1.120.600.600	600	800	600	800	2000/1200	375,8

BRANCH STRAIGHT INSULATION SERIES 2



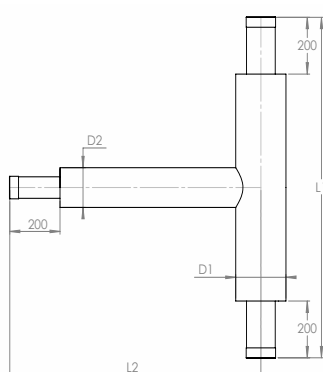
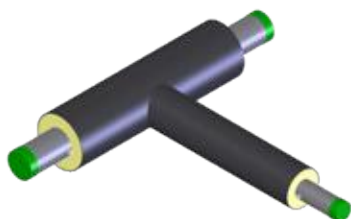
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.020.020	20	110	20	110	1000/800	4,5
1.220.025.020	25	110	20	110	1000/800	4,9
1.220.025.025	25	110	25	110	1000/800	5,3
1.220.032.020	32	125	20	110	1000/800	5,6
1.220.032.025	32	125	25	110	1000/800	6,1
1.220.032.032	32	125	32	125	1000/800	6,7
1.220.040.020	40	125	20	110	1000/800	6,1
1.220.040.025	40	125	25	110	1000/800	6,4
1.220.040.032	40	125	32	125	1000/800	7,1
1.220.040.040	40	125	40	125	1000/800	7,4
1.220.050.020	50	140	20	110	1000/800	7,5
1.220.050.025	50	140	25	110	1000/800	7,8
1.220.050.032	50	140	32	125	1000/800	8,5
1.220.050.040	50	140	40	125	1000/800	8,2
1.220.050.050	50	140	50	140	1000/800	9,8
1.220.065.020	65	160	20	110	1000/800	8,8
1.220.065.025	65	160	25	110	1000/800	9,2
1.220.065.032	65	160	32	125	1000/800	9,8
1.220.065.040	65	160	40	125	1000/800	10,1
1.220.065.050	65	160	50	140	1000/800	11,2
1.220.065.065	65	160	65	160	1000/800	12,2
1.220.080.020	80	180	20	110	1000/800	11,0
1.220.080.025	80	180	25	110	1000/800	11,1
1.220.080.032	80	180	32	125	1000/800	11,7
1.220.080.040	80	180	40	125	1000/800	11,9
1.220.080.050	80	180	50	140	1000/800	13,0
1.220.080.065	80	180	65	160	1000/800	14,1
1.220.080.080	80	180	80	180	1200/800	18,2
1.220.100.025	100	225	25	110	1000/800	14,9
1.220.100.032	100	225	32	125	1000/800	15,4
1.220.100.040	100	225	40	125	1000/800	15,8
1.220.100.050	100	225	50	140	1000/800	16,9
1.220.100.065	100	225	65	160	1000/800	17,9
1.220.100.080	100	225	80	180	1200/800	23,3
1.220.100.100	100	225	100	225	1200/800	25,2
1.220.125.025	125	250	25	110	1000/800	17,7
1.220.125.032	125	250	32	125	1000/800	18,2
1.220.125.040	125	250	40	125	1000/800	18,6
1.220.125.050	125	250	50	140	1000/800	19,6
1.220.125.065	125	250	65	160	1000/800	20,6
1.220.125.080	125	250	80	180	1200/800	26,7
1.220.125.100	125	250	100	225	1200/800	28,5
1.220.125.125	125	250	125	250	1200/800	30,5
1.220.150.025	150	280	25	110	1000/800	22,5
1.220.150.032	150	280	32	125	1000/800	22,9
1.220.150.040	150	280	40	125	1000/800	23,3
1.220.150.050	150	280	50	140	1000/800	24,3

BRANCH STRAIGHT INSULATION SERIES 2



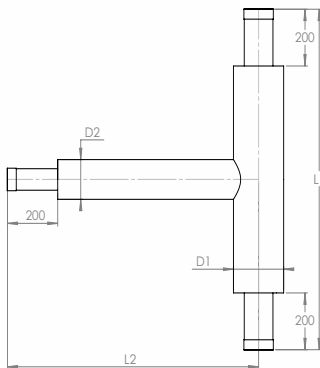
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.150.065	150	280	65	160	1000/800	25,4
1.220.150.080	150	280	80	180	1200/800	32,6
1.220.150.100	150	280	100	225	1200/800	34,1
1.220.150.125	150	280	125	250	1200/800	36,2
1.220.150.150	150	280	150	280	1200/800	39,6
1.220.200.025	200	355	25	110	1000/800	32,4
1.220.200.032	200	355	32	125	1000/800	32,8
1.220.200.040	200	355	40	125	1000/800	33,2
1.220.200.050	200	355	50	140	1000/800	34,1
1.220.200.065	200	355	65	160	1000/800	35,1
1.220.200.080	200	355	80	180	1200/800	45,3
1.220.200.100	200	355	100	225	1200/800	46,1
1.220.200.125	200	355	125	250	1200/800	48,1
1.220.200.150	200	355	150	280	1200/800	51,4
1.220.200.200	200	355	200	355	1400/900	68,6
1.220.250.025	250	450	25	110	1200/800	58,6
1.220.250.032	250	450	32	125	1200/800	59,2
1.220.250.040	250	450	40	125	1200/800	59,4
1.220.250.050	250	450	50	140	1200/800	60,4
1.220.250.065	250	450	65	160	1200/800	61,3
1.220.250.080	250	450	80	180	1200/800	62,6
1.220.250.100	250	450	100	225	1200/800	62,2
1.220.250.125	250	450	125	250	1200/800	64,0
1.220.250.150	250	450	150	280	1200/800	67,2
1.220.250.200	250	450	200	355	1400/900	87,3
1.220.250.250	250	450	250	450	1400/900	97,2
1.220.300.025	300	500	25	110	1200/1000	74,5
1.220.300.032	300	500	32	125	1200/1000	75,1
1.220.300.040	300	500	40	125	1200/1000	75,3
1.220.300.050	300	500	50	140	1200/1000	76,2
1.220.300.065	300	500	65	160	1200/1000	77,2
1.220.300.080	300	500	80	180	1200/1000	78,4
1.220.300.100	300	500	100	225	1400/1000	77,6
1.220.300.125	300	500	125	250	1400/1000	79,3
1.220.300.150	300	500	150	280	1400/1000	82,4
1.220.300.200	300	500	200	355	1400/1000	104,9
1.220.300.250	300	500	250	450	1400/1000	113,3
1.220.300.300	300	500	300	500	1600/1100	155,4
1.220.350.025	350	560	25	110	1200/1000	65,4
1.220.350.032	350	560	32	125	1200/1000	66,4
1.220.350.040	350	560	40	125	1200/1000	66,8
1.220.350.050	350	560	50	140	1200/1000	67,7
1.220.350.065	350	560	65	160	1200/1000	68,5
1.220.350.080	350	560	80	180	1200/1000	69,7
1.220.350.100	350	560	100	225	1400/1000	87,2
1.220.350.125	350	560	125	250	1400/1000	88,9
1.220.350.150	350	560	150	280	1400/1000	91,8

BRANCH STRAIGHT INSULATION SERIES 2



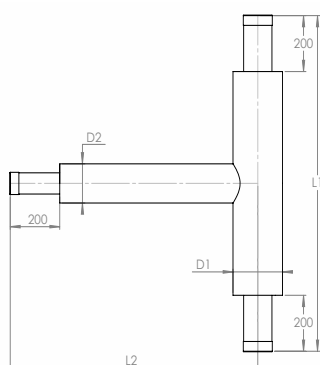
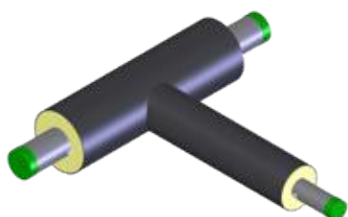
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.350.200	350	560	200	355	1400/1000	116,3
1.220.350.250	350	560	250	500	1600/1000	151,8
1.220.350.300	350	560	300	560	1600/1100	175,6
1.220.350.350	350	560	350	560	1800/1100	184,9
1.220.400.040	400	630	40	125	1200/1000	104,3
1.220.400.050	400	630	50	140	1200/1000	105,5
1.220.400.065	400	630	65	160	1200/1000	106,6
1.220.400.080	400	630	80	180	1200/1000	108,2
1.220.400.100	400	630	100	225	1400/1000	130,5
1.220.400.125	400	630	125	250	1400/1000	132,8
1.220.400.150	400	630	150	280	1400/1000	135,5
1.220.400.200	400	630	200	355	1400/1000	144,8
1.220.400.250	400	630	250	450	1600/1000	181,5
1.220.400.300	400	630	300	500	1600/1100	198,6
1.220.400.350	400	630	350	560	1800/1100	217,1
1.220.400.400	400	630	400	630	1800/1100	232,8
1.220.450.050	450	710	40	125	1200/1000	111,3
1.220.450.065	450	710	50	140	1200/1000	112,4
1.220.450.080	450	710	65	160	1200/1000	113,5
1.220.450.100	450	710	80	180	1200/1000	115,0
1.220.450.125	450	710	100	225	1400/1000	138,2
1.220.450.150	450	710	125	250	1400/1000	140,5
1.220.450.200	450	710	150	280	1400/1000	144,2
1.220.450.250	450	710	200	355	1400/1000	152,2
1.220.450.300	450	710	250	450	1600/1000	188,5
1.220.450.350	450	710	300	500	1600/1100	205,3
1.220.450.400	450	710	350	560	1800/1100	225,7
1.220.450.450	450	710	400	630	1800/1100	241,2
1.220.450.450	450	710	450	710	1800/1100	246,3
1.220.500.040	500	710	40	125	1200/1000	129,0
1.220.500.050	500	800	50	140	1200/1000	130,1
1.220.500.065	500	800	65	160	1200/1000	131,2
1.220.500.080	500	800	80	180	1200/1000	132,7
1.220.500.100	500	800	100	225	1400/1000	159,4
1.220.500.125	500	800	125	250	1400/1000	161,6
1.220.500.150	500	800	150	280	1400/1000	165,2
1.220.500.200	500	800	200	355	1400/1000	172,3
1.220.500.250	500	800	250	450	1600/1000	213,8
1.220.500.300	500	800	300	500	1600/1100	230,2
1.220.500.350	500	800	350	560	1800/1100	252,9
1.220.500.400	500	800	400	630	1800/1100	267,8
1.220.500.450	500	800	450	710	1800/1100	272,7
1.220.500.500	500	800	500	800	1800/1100	284,6
1.220.600.065	600	900	65	160	1200/1200	169,0
1.220.600.080	600	900	80	180	1200/1200	170,8
1.220.600.100	600	900	100	225	1400/1200	204,7
1.220.600.125	600	900	125	250	1400/1200	207,3

**BRANCH STRAIGHT
INSULATION SERIES 2**



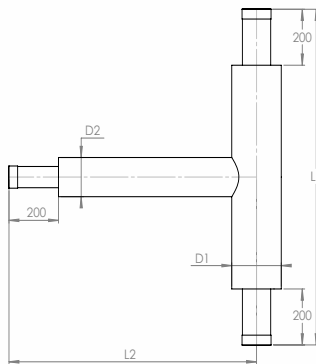
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.600.150	600	900	150	280	1400/1200	211,8
1.220.600.200	600	900	200	355	1600/1200	251,3
1.220.600.250	600	900	250	450	1600/1200	263,9
1.220.600.300	600	900	300	500	1600/1200	283,7
1.220.600.350	600	900	350	560	1800/1200	313,1
1.220.600.400	600	900	400	630	1800/1200	329,1
1.220.600.450	600	900	450	710	1800/1200	334,1
1.220.600.500	600	900	500	800	1800/1200	347,2
1.220.600.600	600	900	600	900	2000/1200	403,8

BRANCH STRAIGHT INSULATION SERIES 3



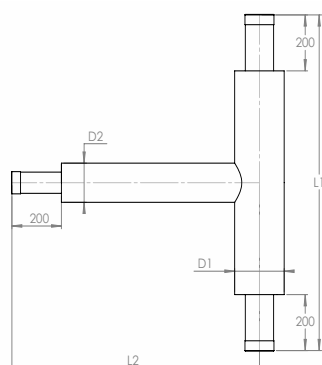
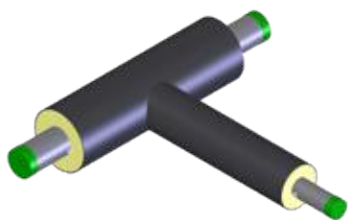
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.020.020	20	125	20	125	1000/800	5,1
1.320.025.020	25	125	20	125	1000/800	5,5
1.320.025.025	25	125	25	125	1000/800	5,8
1.320.032.020	32	140	20	125	1000/800	6,2
1.320.032.025	32	140	25	125	1000/800	6,6
1.320.032.032	32	140	32	140	1000/800	7,2
1.320.040.020	40	140	20	125	1000/800	6,6
1.320.040.025	40	140	25	125	1000/800	6,9
1.320.040.032	40	140	32	140	1000/800	7,6
1.320.040.040	40	140	40	140	1000/800	7,8
1.320.050.020	50	160	20	125	1000/800	8,1
1.320.050.025	50	160	25	125	1000/800	8,4
1.320.050.032	50	160	32	140	1000/800	9,0
1.320.050.040	50	160	40	140	1000/800	9,3
1.320.050.050	50	160	50	160	1000/800	10,4
1.320.065.020	65	180	20	125	1000/800	9,5
1.320.065.025	65	180	25	125	1000/800	9,9
1.320.065.032	65	180	32	140	1000/800	10,5
1.320.065.040	65	180	40	140	1000/800	10,8
1.320.065.050	65	180	50	160	1000/800	11,9
1.320.065.065	65	180	65	180	1000/800	13,0
1.320.080.020	80	200	20	125	1000/800	11,3
1.320.080.025	80	200	25	125	1000/800	11,5
1.320.080.032	80	200	32	140	1000/800	11,7
1.320.080.040	80	200	40	140	1000/800	12,6
1.320.080.050	80	200	50	160	1000/800	13,7
1.320.080.065	80	200	65	180	1000/800	14,8
1.320.080.080	80	200	80	200	1200/800	19,3
1.320.100.025	100	250	25	125	1000/800	16,0
1.320.100.032	100	250	32	140	1000/800	16,4
1.320.100.040	100	250	40	140	1000/800	16,8
1.320.100.050	100	250	50	160	1000/800	17,9
1.320.100.065	100	250	65	180	1000/800	19,1
1.320.100.080	100	250	80	200	1200/800	28,3
1.320.100.100	100	250	100	250	1200/800	26,9
1.320.125.025	125	280	25	125	1000/800	18,6
1.320.125.032	125	280	32	140	1000/800	18,0
1.320.125.040	125	280	40	140	1000/800	18,4
1.320.125.050	125	280	50	160	1000/800	20,5
1.320.125.065	125	280	65	180	1000/800	21,6
1.320.125.080	125	280	80	200	1200/800	28,3
1.320.125.100	125	280	100	250	1200/800	30,0
1.320.125.125	125	280	125	280	1200/800	32,7
1.320.150.025	150	315	25	125	1000/800	24,1
1.320.150.032	150	315	32	140	1000/800	24,4
1.320.150.040	150	315	40	140	1000/800	24,9
1.320.150.050	150	315	50	160	1000/800	25,9

BRANCH STRAIGHT INSULATION SERIES 3



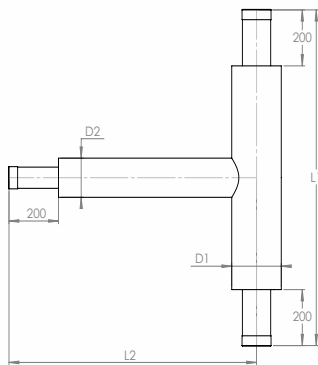
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.150.065	150	315	65	180	1000/800	27,1
1.320.150.080	150	315	80	200	1200/800	35,3
1.320.150.100	150	315	100	250	1200/800	26,6
1.320.150.125	150	315	125	280	1200/800	28,8
1.320.150.150	150	315	150	315	1200/800	42,4
1.320.200.025	200	400	25	125	1000/800	34,9
1.320.200.032	200	400	32	140	1000/800	35,2
1.320.200.040	200	400	40	140	1000/800	35,7
1.320.200.050	200	400	50	160	1000/800	36,7
1.320.200.065	200	400	65	180	1000/800	37,8
1.320.200.080	200	400	80	200	1200/800	49,5
1.320.200.100	200	400	100	250	1200/800	49,7
1.320.200.125	200	400	125	280	1200/800	51,8
1.320.200.150	200	400	150	315	1200/800	55,3
1.320.200.200	200	400	200	400	1400/900	74,1
1.320.250.025	250	500	25	125	1200/800	64,2
1.320.250.032	250	500	32	140	1200/800	64,8
1.320.250.040	250	500	40	140	1200/800	65,0
1.320.250.050	250	500	50	160	1200/800	66,1
1.320.250.065	250	500	65	180	1200/800	67,1
1.320.250.080	250	500	80	200	1200/800	68,4
1.320.250.100	250	500	100	250	1200/800	66,9
1.320.250.125	250	500	125	280	1200/800	68,9
1.320.250.150	250	500	150	315	1200/800	72,3
1.320.250.200	250	500	200	400	1400/900	94,2
1.320.250.250	250	500	250	500	1400/900	104,6
1.320.300.025	300	560	25	125	1200/1000	62,8
1.320.300.032	300	560	32	140	1200/1000	63,0
1.320.300.040	300	560	40	140	1200/1000	63,5
1.320.300.050	300	560	50	160	1200/1000	64,5
1.320.300.065	300	560	65	180	1200/1000	65,5
1.320.300.080	300	560	80	200	1200/1000	66,7
1.320.300.100	300	560	100	250	1400/1000	83,8
1.320.300.125	300	560	125	280	1400/1000	85,7
1.320.300.150	300	560	150	315	1400/1000	88,9
1.320.300.200	300	560	200	400	1400/1000	113,7
1.320.300.250	300	560	250	500	1600/1000	145,8
1.320.300.300	300	560	300	560	1600/1100	170,9
1.320.350.025	350	630	25	125	1200/1000	71,8
1.320.350.032	350	630	32	140	1200/1000	71,9
1.320.350.040	350	630	40	140	1200/1000	72,4
1.320.350.050	350	630	50	160	1200/1000	73,4
1.320.350.065	350	630	65	180	1200/1000	74,5
1.320.350.080	350	630	80	200	1200/1000	75,5
1.320.350.100	350	630	100	250	1400/1000	94,9
1.320.350.125	350	630	125	280	1400/1000	96,8
1.320.350.150	350	630	150	315	1400/1000	99,9

BRANCH STRAIGHT INSULATION SERIES 3



Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.350.200	350	630	200	400	1400/1000	126,9
1.320.350.250	350	630	250	500	1600/1000	168,1
1.320.350.300	350	630	300	560	1600/1100	194,6
1.320.350.350	350	630	350	630	1800/1100	202,2
1.320.400.040	400	710	40	140	1200/1000	115,8
1.320.400.050	400	710	50	160	1200/1000	117,0
1.320.400.065	400	710	65	180	1200/1000	118,2
1.320.400.080	400	710	80	200	1200/1000	119,8
1.320.400.100	400	710	100	250	1400/1000	145,2
1.320.400.125	400	710	125	280	1400/1000	147,6
1.320.400.150	400	710	150	315	1400/1000	151,7
1.320.400.200	400	710	200	400	1400/1000	160,5
1.320.400.250	400	710	250	500	1600/1000	203,9
1.320.400.300	400	710	300	560	1600/1100	222,8
1.320.400.350	400	710	350	630	1800/1100	240,1
1.320.400.400	400	710	400	710	1800/1100	258,7
1.320.450.050	450	800	40	140	1200/1000	122,7
1.320.450.065	450	800	50	160	1200/1000	123,9
1.320.450.080	450	800	65	180	1200/1000	125,1
1.320.450.100	450	800	80	200	1200/1000	126,6
1.320.450.125	450	800	100	250	1400/1000	152,9
1.320.450.150	450	800	125	280	1400/1000	155,3
1.320.450.200	450	800	150	315	1400/1000	159,3
1.320.450.250	450	800	200	400	1400/1000	167,8
1.320.450.300	450	800	250	500	1600/1000	211,0
1.320.450.350	450	800	300	560	1600/1100	229,6
1.320.450.400	450	800	350	630	1800/1100	249,6
1.320.450.450	450	800	400	710	1800/1100	267,1
1.320.450.450	450	800	450	800	1800/1100	272,3
1.320.500.040	500	900	40	140	1200/1000	139,9
1.320.500.050	500	900	50	160	1200/1000	141,1
1.320.500.065	500	900	65	180	1200/1000	142,3
1.320.500.080	500	900	80	200	1200/1000	143,7
1.320.500.100	500	900	100	250	1400/1000	173,5
1.320.500.125	500	900	125	280	1400/1000	175,8
1.320.500.150	500	900	150	315	1400/1000	179,7
1.320.500.200	500	900	200	400	1400/1000	187,9
1.320.500.250	500	900	250	500	1600/1000	236,1
1.320.500.300	500	900	300	560	1600/1100	254,3
1.320.500.350	500	900	350	630	1800/1100	275,6
1.320.500.400	500	900	400	710	1800/1100	292,4
1.320.500.450	500	900	450	800	1800/1100	297,4
1.320.500.500	500	900	500	900	1800/1100	308,0
1.320.600.065	600	1000	65	180	1200/1200	190,9
1.320.600.080	600	1000	80	200	1200/1200	192,6
1.320.600.100	600	1000	100	250	1400/1200	232,2
1.320.600.125	600	1000	125	280	1400/1200	235,1

**BRANCH STRAIGHT
INSULATION SERIES 3**

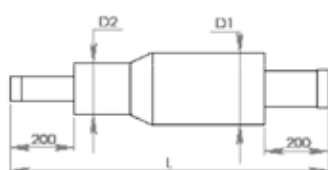


Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.600.150	600	1000	150	315	1400/1200	239,7
1.320.600.200	600	1000	200	400	1600/1200	285,2
1.320.600.250	600	1000	250	500	1600/1200	298,1
1.320.600.300	600	1000	300	560	1800/1200	345,8
1.320.600.350	600	1000	350	630	1800/1200	353,7
1.320.600.400	600	1000	400	710	1800/1200	371,2
1.320.600.450	600	1000	450	800	1800/1200	376,3
1.320.600.500	600	1000	500	900	1800/1200	387,9
1.320.600.600	600	1000	600	1000	2000/1200	436,7

CHAPTER 2.9.6

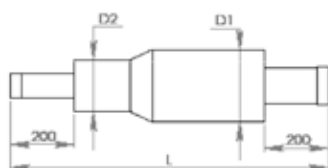
REDUCTION

INSULATION SERIES 1



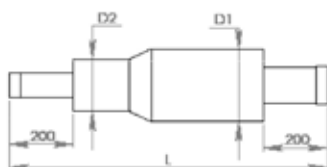
Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.130.025.020	25-20	90/90	1000	3,0
1.130.032.020	32-20	110/90	1000	3,5
1.130.032.025	32-25	110/90	1000	3,7
1.130.040.025	40-25	110/90	1000	3,8
1.130.040.032	40-32	110/110	1000	4,3
1.130.050.025	50-25	125/90	1000	4,6
1.130.050.032	50-32	125/110	1000	5,0
1.130.050.040	50-40	125/110	1000	5,2
1.130.065.040	65-40	140/110	1000	5,9
1.130.065.050	65-50	140/125	1000	6,6
1.130.080.050	80-50	160/125	1000	7,6
1.130.080.065	80-65	160/140	1000	8,3
1.130.100.065	100-65	200/140	1000	10,4
1.130.100.080	100-80	200/160	1000	11,4
1.130.125.080	125-80	225/160	1000	13,5
1.130.125.100	125-100	225/200	1000	14,9
1.130.150.100	150-100	250/200	1000	17,2
1.130.150.125	150-125	250/225	1000	18,7
1.130.200.125	200-125	315/225	1000	23,6
1.130.200.150	200-150	315/250	1000	25,9
1.130.250.150	250-150	400/250	1500	48,9
1.130.250.200	250-200	400/315	1500	56,3
1.130.300.200	300-200	450/315	1500	65,9
1.130.300.250	300-250	450/400	1500	75,9
1.130.350.250	350-250	500/400	1500	81,5
1.130.350.300	350-300	500/450	1500	91,2
1.130.400.300	400-300	560/450	1500	104,0
1.130.400.350	400-350	560/500	1500	109,6
1.130.450.350	450-350	630/500	1500	119,2
1.130.450.400	450-400	630/560	1500	132,0
1.130.500.400	500-400	710/560	1500	135,3
1.130.500.450	500-450	710/630	1500	138,9
1.130.600.450	600-450	800/630	1500	160,6
1.130.600.500	600-500	800/710	1500	169,9

REDUCTION INSULATION SERIES 2



Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.230.025.020	25-20	110/110	1000	3,4
1.230.032.020	32-20	125/110	1000	3,7
1.230.032.025	32-25	125/110	1000	3,9
1.230.040.025	40-25	125/110	1000	4,2
1.230.040.032	40-32	125/125	1000	4,5
1.230.050.025	50-25	140/110	1000	5,0
1.230.050.032	50-32	140/125	1000	5,2
1.230.050.040	50-40	140/125	1000	5,4
1.230.065.040	65-40	160/125	1000	6,4
1.230.065.050	65-50	160/140	1000	7,1
1.230.080.050	80-50	180/140	1000	8,1
1.230.080.065	80-65	180/160	1000	8,9
1.230.100.065	100-65	225/160	1000	11,2
1.230.100.080	100-80	225/180	1000	12,2
1.230.125.080	125-80	250/180	1000	13,7
1.230.125.100	125-100	250/225	1000	16,0
1.230.150.100	150-100	280/225	1000	18,6
1.230.150.125	150-125	280/250	1000	20,1
1.230.200.125	200-125	355/250	1000	25,5
1.230.200.150	200-150	355/280	1000	28,1
1.230.250.150	250-150	450/280	1500	53,2
1.230.250.200	250-200	450/355	1500	61,4
1.230.300.200	300-200	500/355	1500	71,4
1.230.300.250	300-250	500/450	1500	82,5
1.230.350.250	350-250	560/450	1500	89,1
1.230.350.300	350-300	560/500	1500	99,1
1.230.400.300	400-300	630/500	1500	113,4
1.230.400.350	400-350	630/560	1500	120,1
1.230.450.350	450-350	710/560	1500	123,6
1.230.450.400	450-400	710/630	1500	138,0
1.230.500.400	500-400	800/630	1500	148,9
1.230.500.450	500-450	800/710	1500	152,5
1.230.600.450	600-450	900/710	1500	176,2
1.230.600.500	600-500	900/800	1500	187,1

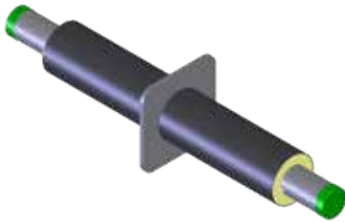
REDUCTION INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.330.025.020	25-20	125/125	1000	3,8
1.330.032.020	32-20	140/125	1000	4,1
1.330.032.025	32-25	140/125	1000	4,3
1.330.040.025	40-25	140/125	1000	4,6
1.330.040.032	40-32	140/140	1000	4,9
1.330.050.025	50-25	160/125	1000	5,5
1.330.050.032	50-32	160/140	1000	5,7
1.330.050.040	50-40	160/140	1000	6,1
1.330.065.040	65-40	180/140	1000	6,9
1.330.065.050	65-50	180/160	1000	7,7
1.330.080.050	80-50	200/160	1000	8,8
1.330.080.065	80-65	200/180	1000	9,6
1.330.100.065	100-65	250/180	1000	12,1
1.330.100.080	100-80	250/200	1000	13,2
1.330.125.080	125-80	280/200	1000	14,9
1.330.125.100	125-100	280/250	1000	17,4
1.330.150.100	150-100	315/250	1000	20,2
1.330.150.125	150-125	315/280	1000	18,7
1.330.200.125	200-125	400/280	1000	28,0
1.330.200.150	200-150	400/315	1000	30,7
1.330.250.200	250-150	500/315	1500	58,1
1.330.250.250	250-200	500/400	1500	67,3
1.330.300.200	300-200	560/400	1500	78,3
1.330.300.250	300-250	560/500	1500	90,4
1.330.350.250	350-250	630/500	1500	98,5
1.330.350.300	350-300	630/560	1500	109,6
1.330.400.300	400-300	710/560	1500	125,5
1.330.400.350	400-350	710/630	1500	133,7
1.330.450.350	450-350	800/630	1500	137,2
1.330.450.400	450-400	800/710	1500	153,1
1.330.500.400	500-400	900/710	1500	166,1
1.330.500.450	500-450	900/800	1500	169,7
1.330.600.450	600-450	1000/800	1500	195,8
1.330.600.500	600-500	1000/900	1500	208,8

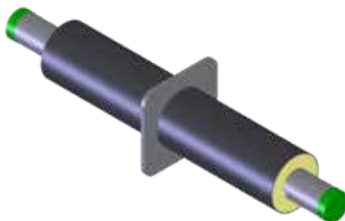
CHAPTER 2.9.7

ANCHOR INSULATION SERIES 1

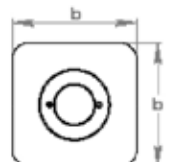
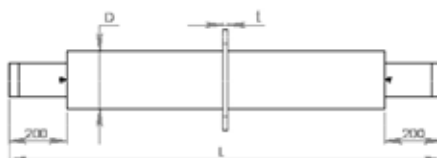


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Anchor plate		Weight (kg/pc)
				b [mm]	t [mm]	
1.140.032	32	110	2000	260,0	15	13,9
1.140.040	40	110	2000	260,0	15	14,6
1.140.050	50	125	2000	260,0	20	19,6
1.140.065	65	140	2000	260,0	20	21,8
1.140.080	80	160	2000	260,0	20	24,9
1.140.100	100	200	2000	300,0	25	38,1
1.140.125	125	225	2000	340,0	25	47,1
1.140.150	150	250	2000	400,0	25	62,9
1.140.200	200	315	2000	450,0	25	85,2
1.140.250	250	400	2000	560,0	30	135,0
1.140.300	300	450	2000	600,0	30	163,3
1.140.350	350	500	2000	650,0	30	185,5
1.140.400	400	560	2000	710,0	30	227,8
1.140.450	450	630	2000	780,0	30	295,0
1.140.500	500	710	2000	860,0	30	346,3
1.140.600	600	800	2000	1000,0	35	465,5

ANCHOR INSULATION SERIES 2



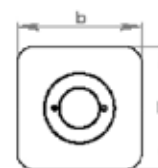
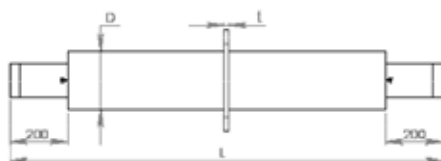
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Anchor plate		Weight (kg/pc)
				b [mm]	t [mm]	
1.240.032	32	125	2000	260,0	15	14,3
1.240.040	40	125	2000	260,0	15	14,9
1.240.050	50	140	2000	260,0	20	20,0
1.240.065	65	160	2000	260,0	20	22,4
1.240.080	80	180	2000	300,0	20	29,2
1.240.100	100	225	2000	340,0	25	44,2
1.240.125	125	250	2000	400,0	25	57,1
1.240.150	150	280	2000	400,0	25	64,6
1.240.200	200	355	2000	450,0	25	88,1
1.240.250	250	450	2000	560,0	30	139,6
1.240.300	300	500	2000	650,0	30	183,2
1.240.350	350	560	2000	710,0	30	211,7
1.240.400	400	630	2000	780,0	30	261,4
1.240.450	450	710	2000	860,0	30	306,7
1.240.500	500	800	2000	1000,0	30	384,1
1.240.600	600	900	2000	1150,0	35	538,7



ANCHOR INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Anchor plate		Weight [kg/pc]
				b [mm]	t [mm]	
1.340.032	32	140	2000	260	15	14,7
1.340.040	40	140	2000	260	15	15,4
1.340.050	50	160	2000	260	20	20,7
1.340.065	65	180	2000	300	20	26,7
1.340.080	80	200	2000	300	20	30,0
1.340.100	100	250	2000	400	25	54,2
1.340.125	125	280	2000	400	25	58,8
1.340.150	150	315	2000	400	25	66,9
1.340.200	200	400	2000	560	25	113,6
1.340.250	250	500	2000	650	30	170,4
1.340.300	300	560	2000	710	30	209,3
1.340.350	350	630	2000	780	30	245,3
1.340.400	400	710	2000	860	30	304,0
1.340.450	450	800	2000	1000	30	382,9
1.340.500	500	900	2000	1150	30	478,6
1.340.600	600	1000	2000	1250	35	604,7



CHAPTER 2.9.8

VALVE

INSULATION SERIES 1



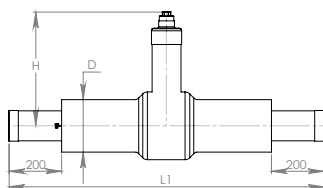
Art no.	Steel Pipe DN	Casing pipe D [mm]	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.145.025	25	90	382	1500	7,9
1.145.032	32	110	388	1500	10,5
1.145.040	40	110	401	1500	11,4
1.145.050	50	125	411	1500	13,9
1.145.065	65	140	415	1500	19,2
1.145.080	80	160	426	1500	23,9
1.145.100	100	200	450	1500	37,7
1.145.125	125	225	455	1500	51,6
1.145.150	150	250	475	1500	62,5
1.145.200	200	315	520	1500	93,1
1.145.250	250	400	557	1500	146,5
1.145.300	300	450	664	1800	256,1
1.145.350	350	500	830	1800	328,6
1.145.400	400	560	830	1800	435,8
1.145.450	450	630	900	1800	784,1
1.145.500	500	710	1000	1800	907,8
1.145.600	600	800	1075	2000	1973,3

VALVE

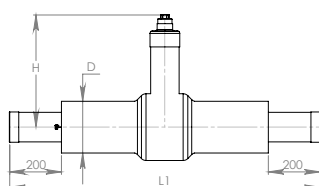
INSULATION SERIES 2



Art no.	Steel Pipe DN	Casing pipe D [mm]	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.245.025	25	110	382	1500	8,6
1.245.032	32	125	388	1500	11,1
1.245.040	40	125	401	1500	12,0
1.245.050	50	140	411	1500	14,5
1.245.065	65	160	415	1500	20,2
1.245.080	80	180	426	1500	25,0
1.245.100	100	225	450	1500	39,4
1.245.125	125	250	455	1500	53,5
1.245.150	150	280	475	1500	65,1
1.245.200	200	355	520	1500	97,4
1.245.250	250	450	557	1500	153,1
1.245.300	300	500	664	1800	266,7
1.245.350	350	560	830	1800	342,5
1.245.400	400	630	830	1800	454,3
1.245.450	450	710	900	1800	802,6
1.245.500	500	800	1000	1800	931,3
1.245.600	600	900	1075	2000	2010,1



VALVE INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D [mm]	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.345.025	25	125	382	1500	9,1
1.345.032	32	140	388	1500	11,7
1.345.040	40	140	401	1500	12,7
1.345.050	50	160	411	1500	15,4
1.345.065	65	180	415	1500	21,2
1.345.080	80	200	426	1500	26,3
1.345.100	100	250	450	1500	41,3
1.345.125	125	280	455	1500	56,2
1.345.150	150	315	475	1500	68,4
1.345.200	200	400	520	1500	102,6
1.345.250	250	500	557	1500	160,5
1.345.300	300	560	664	1800	280,6
1.345.350	350	630	830	1800	361,0
1.345.400	400	710	830	1800	477,8
1.345.450	450	800	900	1800	826,0
1.345.500	500	900	1000	1800	961,0
1.345.600	600	1000	1075	2000	2056,1

CHAPTER 2.9.9

VALVE – 1 SERVICE VALVE

INSULATION SERIES 1



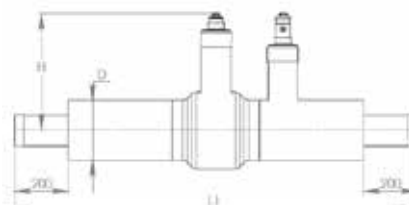
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.146.025	25	90	25	382	1500	8,8
1.146.032	32	110	25	388	1500	11,3
1.146.040	40	110	25	401	1500	12,2
1.146.050	50	125	40	411	1500	15,4
1.146.065	65	140	40	415	1500	20,7
1.146.080	80	160	40	426	1500	25,3
1.146.100	100	200	40	450	1500	38,8
1.146.125	125	225	40	455	1500	52,6
1.146.150	150	250	40	475	1500	63,3
1.146.200	200	315	50	520	1500	94,0
1.146.250	250	400	50	557	1500	146,5
1.146.300	300	450	50	664	1800	253,4
1.146.350	350	500	50	830	1800	324,9
1.146.400	400	560	65	830	1800	432,6
1.146.450	450	630	65	900	1800	780,8
1.146.500	500	710	65	1000	1800	902,6
1.146.600	600	800	65	1075	2000	1962,9

VALVE – 1 SERVICE VALVE

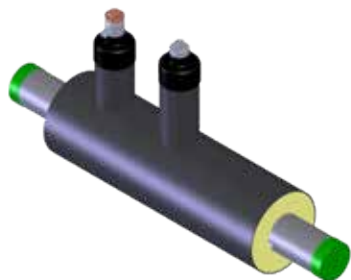
INSULATION SERIES 2



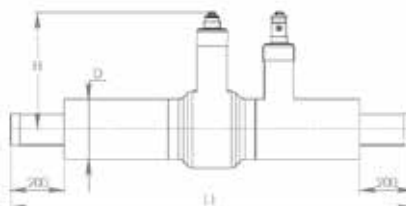
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.246.025	25	110	25	382	1500	9,4
1.246.032	32	125	25	388	1500	11,8
1.246.040	40	125	25	401	1500	12,8
1.246.050	50	140	40	411	1500	16,0
1.246.065	65	160	40	415	1500	21,6
1.246.080	80	180	40	426	1500	26,3
1.246.100	100	225	40	450	1500	40,3
1.246.125	125	250	40	455	1500	54,3
1.246.150	150	280	40	475	1500	65,6
1.246.200	200	355	50	520	1500	97,9
1.246.250	250	450	50	557	1500	152,5
1.246.300	300	500	50	664	1800	262,9
1.246.350	350	560	50	830	1800	337,5
1.246.400	400	630	65	830	1800	449,2
1.246.450	450	710	65	900	1800	797,4
1.246.500	500	800	65	1000	1800	923,9
1.246.600	600	900	65	1075	2000	1996,1



VALVE – 1 SERVICE VALVE INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.346.025	25	125	25	382	1500	9,9
1.346.032	32	140	25	388	1500	12,4
1.346.040	40	140	25	401	1500	13,3
1.346.050	50	160	40	411	1500	16,8
1.346.065	65	180	40	415	1500	22,5
1.346.080	80	200	40	426	1500	27,4
1.346.100	100	250	40	450	1500	42,1
1.346.125	125	280	40	455	1500	56,6
1.346.150	150	315	40	475	1500	68,5
1.346.200	200	400	50	520	1500	102,6
1.346.250	250	500	50	557	1500	159,2
1.346.300	300	560	50	664	1800	275,5
1.346.350	350	630	50	830	1800	354,1
1.346.400	400	710	65	830	1800	470,4
1.346.450	450	800	65	900	1800	818,6
1.346.500	500	900	65	1000	1800	950,8



CHAPTER 2.9.10

VALVE – 2 SERVICE VALVE INSULATION SERIES 1

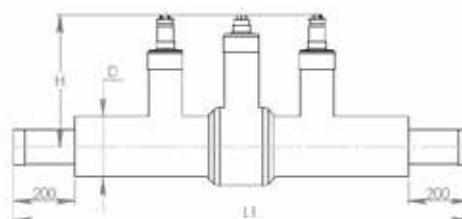


Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.147.025	25	90	25	382	1500	10,1
1.147.032	32	110	25	388	1500	12,6
1.147.040	40	110	25	401	1500	13,5
1.147.050	50	125	40	411	1500	17,5
1.147.065	65	140	40	415	1500	22,8
1.147.080	80	160	40	426	1500	27,4
1.147.100	100	200	40	450	1500	40,9
1.147.125	125	225	40	455	1500	54,7
1.147.150	150	250	40	475	1500	65,4
1.147.200	200	315	50	520	1500	96,8
1.147.250	250	400	50	557	1500	149,4
1.147.300	300	450	50	664	1800	256,2
1.147.350	350	500	50	830	1800	327,7
1.147.400	400	560	65	830	1800	437,2
1.147.450	450	630	65	900	1800	785,4
1.147.500	500	710	65	1000	1800	907,3

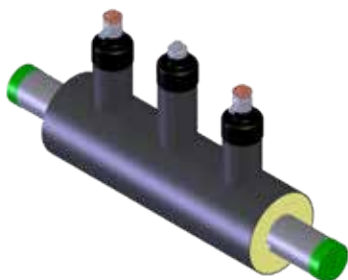
VALVE – 2 SERVICE VALVE INSULATION SERIES 2



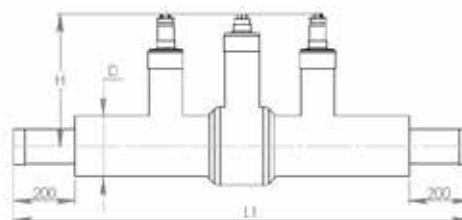
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.247.025	25	110	25	382	1500	10,7
1.247.032	32	125	25	388	1500	13,1
1.247.040	40	125	25	401	1500	14,1
1.247.050	50	140	40	411	1500	18,1
1.247.065	65	160	40	415	1500	23,7
1.247.080	80	180	40	426	1500	28,3
1.247.100	100	225	40	450	1500	42,4
1.247.125	125	250	40	455	1500	56,4
1.247.150	150	280	40	475	1500	67,7
1.247.200	200	355	50	520	1500	100,7
1.247.250	250	450	50	557	1500	155,4
1.247.300	300	500	50	664	1800	265,7
1.247.350	350	560	50	830	1800	340,3
1.247.400	400	630	65	830	1800	453,8
1.247.450	450	710	65	900	1800	802,0
1.247.500	500	800	65	1000	1800	928,5



VALVE – 2 SERVICE VALVE INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.347.025	25	125	25	382	1500	11,2
1.347.032	32	140	25	388	1500	13,7
1.347.040	40	140	25	401	1500	14,6
1.347.050	50	160	40	411	1500	18,9
1.347.065	65	180	40	415	1500	24,6
1.347.080	80	200	40	426	1500	29,5
1.347.100	100	250	40	450	1500	44,1
1.347.125	125	280	40	455	1500	58,7
1.347.150	150	315	40	475	1500	70,6
1.347.200	200	400	50	520	1500	105,5
1.347.250	250	500	50	557	1500	162,0
1.347.300	300	560	50	664	1800	278,3
1.347.350	350	630	50	830	1800	356,9
1.347.400	400	710	65	830	1800	475,0
1.347.450	450	800	65	900	1800	823,3
1.347.500	500	900	65	1000	1800	955,4



CHAPTER 2.9.11

SERVICE VALVE INSULATION SERIES 1

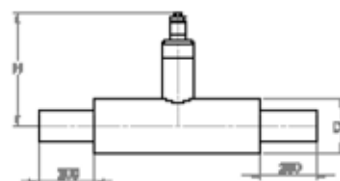


Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Length L [mm]	Weight [kg/pc]
1.155.025.025	25	90	25	1000	4,3
1.155.032.025	32	110	25	1000	5,2
1.155.040.025	40	110	25	1000	5,5
1.155.050.025	50	125	25	1000	6,9
1.155.065.040	65	140	25	1000	8,3
1.155.080.040	80	160	40	1000	10,9
1.155.100.040	100	200	40	1000	14,8
1.155.125.040	125	225	40	1000	17,6
1.155.150.040	150	250	40	1000	22,2
1.155.200.050	200	315	40	1000	31,6
1.155.250.050	250	400	50	1000	44,8
1.155.300.050	300	450	50	1000	57,4
1.155.355.050	350	500	50	1000	64,2
1.155.400.050	400	560	50	1000	80,6
1.155.450.050	450	630	65	1000	88,4
1.155.500.050	500	710	65	1000	100,0
1.155.600.050	600	800	65	1000	129,2

SERVICE VALVE INSULATION SERIES 2



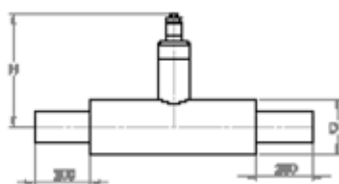
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Length L [mm]	Weight [kg/pc]
1.255.025.025	25	110	25	1000	4,7
1.255.032.025	32	125	25	1000	5,5
1.255.040.025	40	125	25	1000	5,8
1.255.050.025	50	140	25	1000	7,2
1.255.065.040	65	160	25	1000	8,7
1.255.080.040	80	180	40	1000	11,4
1.255.100.040	100	225	40	1000	15,6
1.255.125.040	125	250	40	1000	18,5
1.255.150.040	150	280	40	1000	23,4
1.255.200.050	200	355	40	1000	33,6
1.255.250.050	250	450	50	1000	47,8
1.255.300.050	300	500	50	1000	60,7
1.255.355.050	350	560	50	1000	68,4
1.255.400.050	400	630	50	1000	86,3
1.255.450.050	450	710	65	1000	94,1
1.255.500.050	500	800	65	1000	107,2
1.255.600.050	600	900	65	1000	138,3



SERVICE VALVE INSULATION SERIES 3



Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Length L [mm]	Weight [kg/pc]
1.355.025.025	25	125	25	1000	4,9
1.355.032.025	32	140	25	1000	5,8
1.355.040.025	40	140	25	1000	6,1
1.355.050.025	50	160	25	1000	7,7
1.355.065.040	65	180	25	1000	9,2
1.355.080.040	80	200	40	1000	12,0
1.355.100.040	100	250	40	1000	16,5
1.355.125.040	125	280	40	1000	19,7
1.355.150.040	150	315	40	1000	24,9
1.355.200.050	200	400	40	1000	35,9
1.355.250.050	250	500	50	1000	51,1
1.355.300.050	300	560	50	1000	64,9
1.355.355.050	350	630	50	1000	74,1
1.355.400.050	400	710	50	1000	93,5
1.355.450.050	450	800	65	1000	101,3
1.355.500.050	500	900	65	1000	116,3
1.355.600.050	600	1000	65	1000	149,7



CHAPTER 2.9.12 COMPENSATOR INSULATION SERIES 1



MATERIAL: Steel pipe - Compensator
Casing pipe - Polyethylene
PU insulation

USE: District heating

STANDARD: EN 448

Art no.	Diameter DN	Casing pipe D [mm]	Length L [mm]	Compensator Length L1 [mm]	Elongation L2 [mm]	Weight [kg]
1.830.065	65	140	1400	610	100	15,0
1.830.080	80	160	1400	610	100	18,0
1.830.100	100	200	1400	700	125	26,0
1.830.125	125	225	1400	700	125	34,0
1.830.150	150	250	1400	700	125	44,0
1.830.200	200	315	1400	725	125	64,0
1.830.250	250	400	1400	725	125	93,0
1.830.300	300	450	1400	760	125	123,0
1.830.350	350	500	1400	785	125	145,0

CONTINUOUS COMPENSATOR

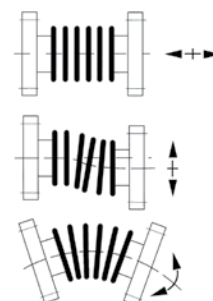
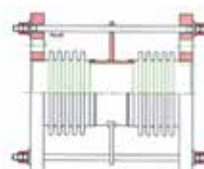
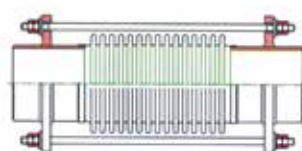


Art no.	DN	Elongation L2 [mm]	Weight [kg/pc]
1.810.040	40	100	6,4
1.810.050	50	100	8,1
1.810.065	65	100	9,7
1.810.080	80	100	12,4
1.810.100	100	125	19,7
1.810.125	125	125	25,0
1.810.150	150	125	33,5
1.810.200	200	125	50,2
1.810.250	250	125	70,9
1.810.300	300	125	83,0
1.810.350	350	125	95,0

COMPENSATORS FOR LATERAL MOVEMENTS AND VIBRATION



Lateral compensator with tie rod to compensate lateral movements. For further information about compensators please contact Set Pipes sales department.



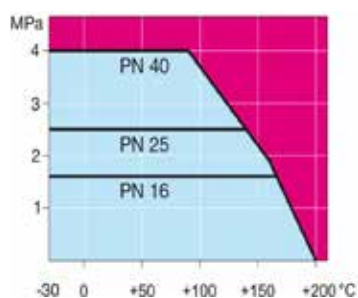
ONE-STEP EXPANSION JOINTS



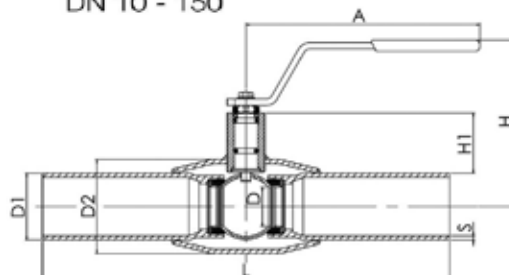
Art no.	DN	Installation length [mm]	Spring rate [N/mm]	Weight [kg/pc]
1.840.040	40	335	280,0	4,0
1.840.050	50	450	290,3	3,2
1.840.065	65	480	345,8	5,0
1.840.080	80	500	229,6	5,8
1.840.100	100	550	280,5	7,9
1.840.125	125	550	422,5	11,1
1.840.150	150	630	328,3	15,8
1.840.200	200	700	366,3	30,0
1.840.250	250	700	410,0	37,9
1.840.300	300	700	377,4	55,0
1.840.350	350	700	523,9	80,0
1.840.400	400	700	670,3	71,0
1.840.450	450	700	1080	79,4
1.840.500	500	750	663,0	105,7
1.840.600	600	750	852,1	149,2
1.840.700	700	750	1126	165,9

CHAPTER 2.9.13

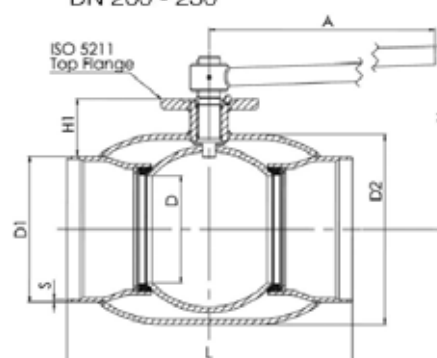
STEEL BALL VALVES WELDING/WELDING



DN 10 - 150



DN 200 - 250

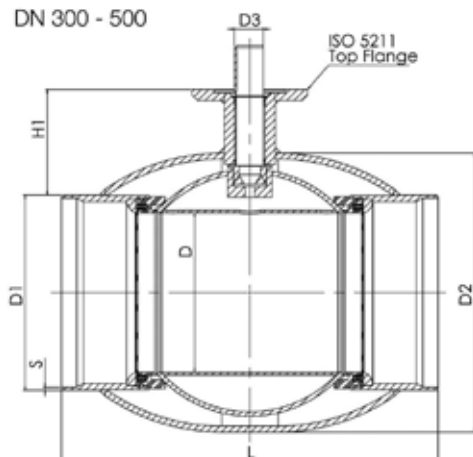


Art no.	DN	PN	A [mm]	D1 [mm]	D2 [mm]	H [mm]	H1 [mm]	L [mm]	S [mm]	Weight [kg/pc]
1.910.015	15	40	145	21,3	33,7	98	22	230	2,0	0,60
1.910.020	20	40	145,0	26,9	42,4	103	23	230	2,3	0,80
1.910.025	25	40	145,0	33,7	48,3	118	34	230	2,6	1,0
1.910.032	32	40	145,0	42,4	60,3	121	33	260	2,6	1,4
1.910.040	40	40	188,0	48,3	70,0	120	43	260	2,6	1,8
1.910.050	50	40	188,0	60,3	88,9	127	44	300	2,9	2,6
1.910.065	65	25	277,5	76,1	101,6	159	62	300	2,9	4,0
1.910.080	80	25	277,5	88,9	121,0	171	68	300	3,2	5,3
1.910.100	100	25	278,5	114,3	146,0	218	101	325	3,6	8,3
1.910.125	125	25	400,0	139,7	177,8	252	101	325	4,0	13,4
1.910.150	150	25	600,0	168,3	219,1	272	107	350	4,5	18,0
1.910.200	200	25	870,0	219,1	273,0	280	92	400	4,5	39,0
1.910.250	250	25	1200,0	273	355,6	350	108	530	5,0	74,0

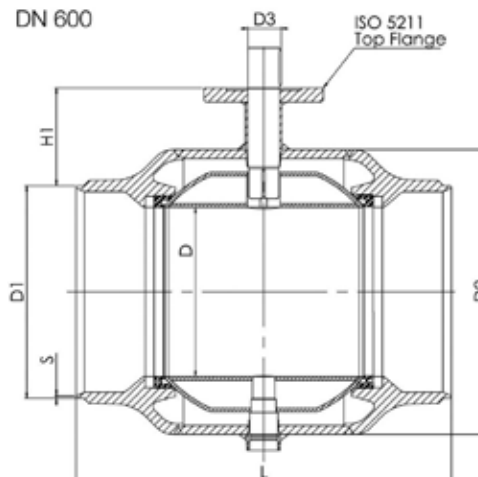
STEEL BALL VALVES WELDING/WELDING



DN 300 - 500

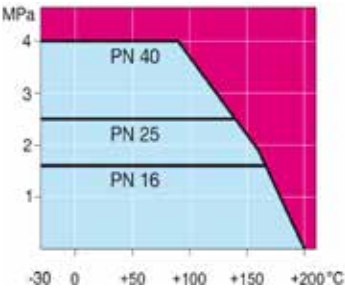
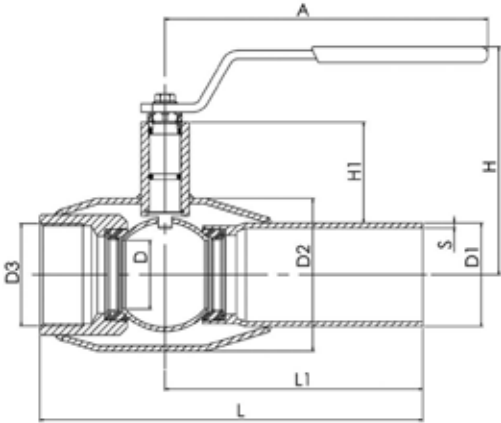


DN 600



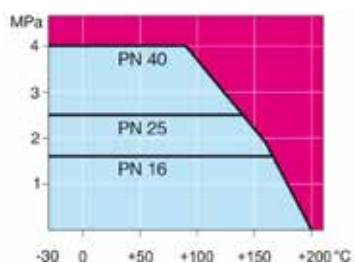
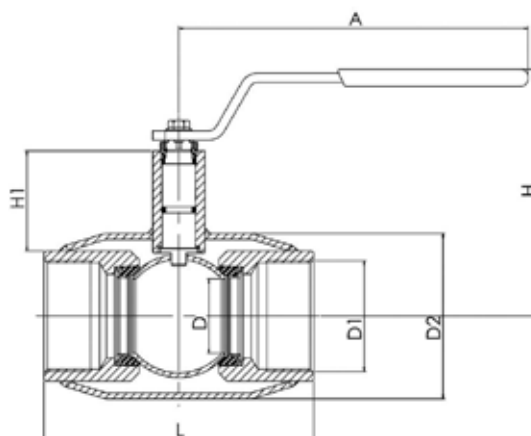
Art no.	DN	PN	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H1 [mm]	L [mm]	S [mm]	Weight [kg/pc]
1.910.300	300	25	250	323,9	457	50	133	550	5,6	110,0
1.910.350	350	25	290	355,6	508	50	192	686	5,6	170,0
1.910.400	400	25	340	406,4	610	70	242	762	7,0	250,0
1.910.500	500	25	390	508,0	660	90	259	914	7,0	400,0
1.910.600	600	25	486	610,0	813	90	274	1065	7,1	997,0

STEEL BALL VALVES
FEMALE THREADS/WELDING



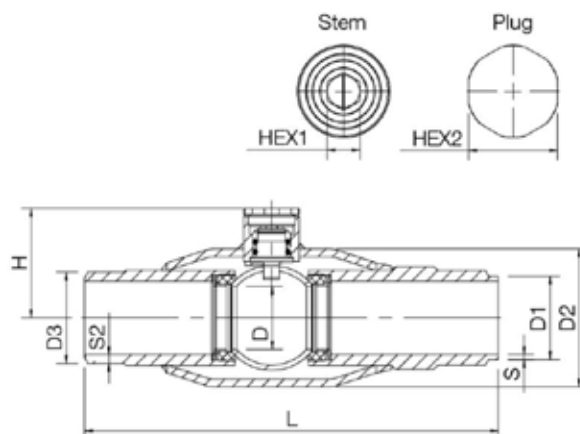
Art no.	DN	PN	A [mm]	D [mm]	D1 [mm]	D2 [mm]	D3 [BSP]	H [mm]	L [mm]	L1 [mm]	S [mm]	Weight [kg/pc]
1.911.015	15	40	145	10	21,3	33,7	R ½	98	158	115	2,0	0,60
1.911.020	20	40	145	15	26,9	42,4	R ¾	103	165	115	2,3	0,80
1.911.025	25	40	145	20	33,7	48,3	R 1	118	172	115	2,6	1,1
1.911.032	32	40	145	25	42,4	60,3	R 1 ¼	121	195	130	2,6	1,4
1.911.040	40	40	188	32	48,3	70,0	R 1 ½	120	205	130	2,6	1,9
1.911.050	50	40	188	40	60,3	88,9	R 2	127	240	150	2,9	2,7

STEEL BALL VALVES FEMALE THREADS/ FEMALE THREADS



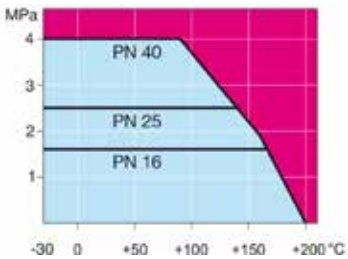
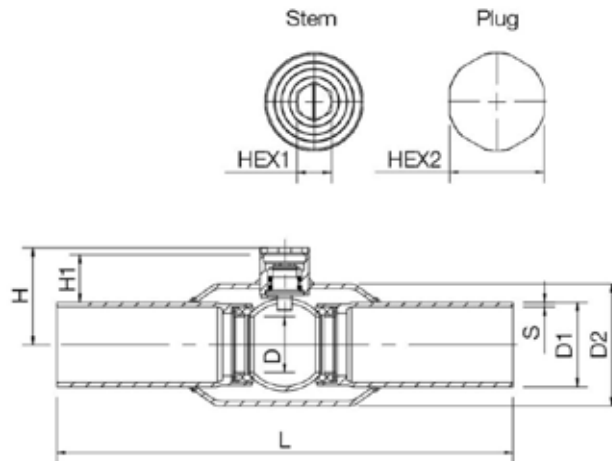
Art no.	DN	PN	A [mm]	D [mm]	D1 [BSP]	D2 [mm]	H [mm]	H1 [mm]	L [mm]	Weight [kg/pc]
1.912.015	15	40	145,0	10	R ½	33,7	98	22	85	0,50
1.912.020	20	40	145,0	15	R ¾	42,4	103	23	100	0,80
1.912.025	25	40	145,0	20	R 1	48,3	118	34	115	1,0
1.912.032	32	40	145,0	25	R 1 ¼	60,3	121	33	130	1,2
1.912.040	40	40	188,0	32	R 1 ½	70,0	120	43	150	1,8
1.912.050	50	40	188,0	40	R 2	88,9	127	44	180	2,6

SPECIAL PURPOSE BALL VALVES – HOT TAPPING VALVES



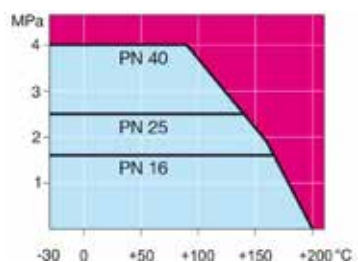
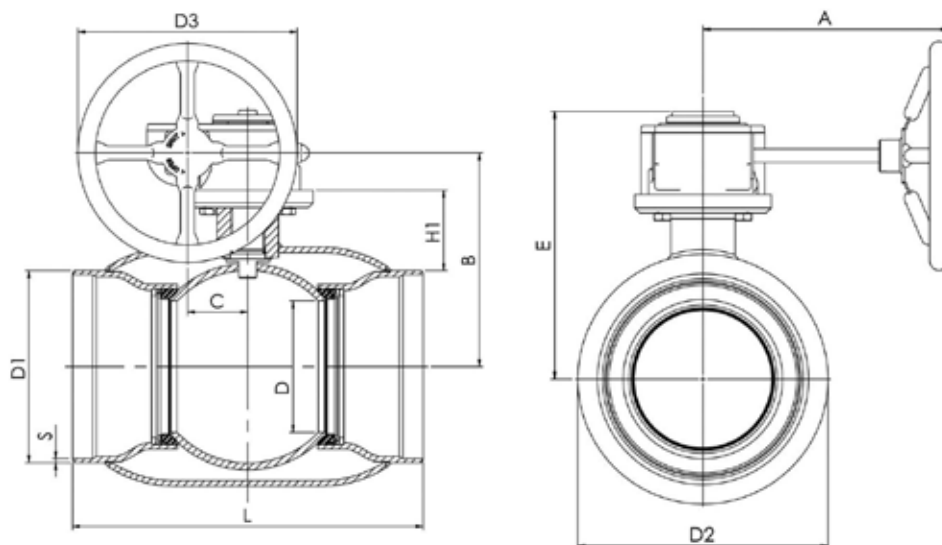
Art no.	DN	PN	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	L [mm]	S [mm]	HEX 1	HEX 2	Weight [kg/pc]
1.909.020	20	40	26,9	48,3	33,7	42	170	2,3	9	22	1,1
1.909.025	25	40	33,7	60,3	36,5	46	209	2,6	9	22	1,5
1.909.032	32	40	36,5	70,0	46,2	55	209	2,6	10	27	2,0
1.909.040	40	40	48,3	88,9	52,1	63	228	2,6	10	27	2,7
1.909.050	50	40	60,3	101,6	64,5	74	260	2,6	15	32	4,5
1.909.065	65	25	76,1	121,0	76,1	88	280	2,9	15	32	5,5
1.909.080	80	25	88,9	146,0	94,5	102	312	3,2	15	36	10,1
1.909.100	100	25	114,0	177,8	122,1	123	349	3,5	19	41	18,0
1.909.125	125	25	139,7	219,1	151,7	143	363	5,6	19	41	29,9
1.909.150	150	25	168,3	219,1	151,7	143	365	4,5	19	41	29,9

**SPECIAL PURPOSE BALL
VALVES – BRANCHING VALVE**



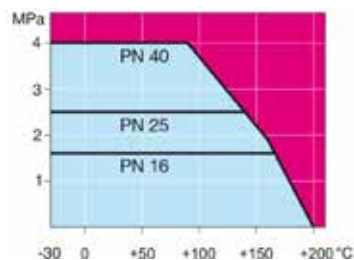
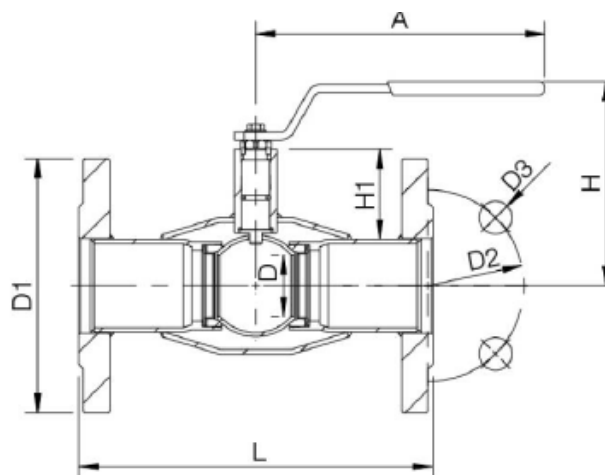
Art no.	DN	PN	D [mm]	D1 [mm]	D2 [mm]	H [mm]	L [mm]	S [mm]	HEX 1	HEX 2	Weight [kg/pc]
1.908.020	20	40	15	26,9	42,4	36	230	2,3	-	19,0	0,80
1.908.025	25	40	20	33,7	48,3	42	230	2,6	9	22,0	1,1
1.908.032	32	40	25	42,4	60,3	46	260	2,6	9	22,0	1,3
1.908.040	40	40	32	48,3	70,0	55	260	2,6	10	27,0	1,5
1.908.050	50	40	40	60,3	88,9	63	300	2,9	10	27,0	2,4
1.908.065	65	25	50	76,1	101,6	74	300	2,9	15	32,0	3,3
1.908.080	80	25	65	88,9	121,0	87	300	3,2	15	32,0	4,6
1.908.100	100	25	80	114,3	146,0	104	325	3,6	15	36,0	7,2
1.908.125	125	25	100	139,7	177,8	123	325	5,0	19	41,0	12,1
1.908.150	150	25	125	168,3	219,1	143	350	5,6	19	41,0	16,6
1.908.200	200	25	150	219,1	273,0	173	390	4,5	32	70,0	31,0

STEEL BALL VALVES WITH GEARS AND ACTUATORS WELDING/WELDING



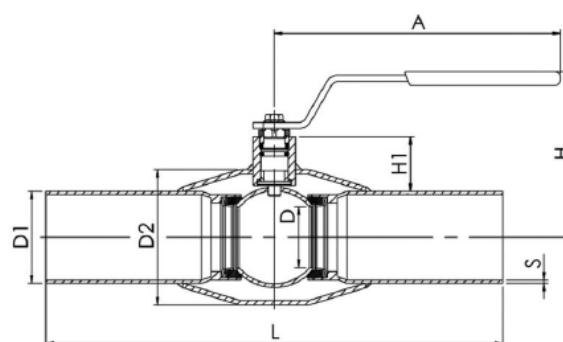
Art no.	DN	PN	A [mm]	C [mm]	D1 [mm]	D2 [mm]	D3 [mm]	E [mm]	L [mm]	S [mm]	Weight [kg/pc]
1.915.100	100	25	186	53	114,3	146	125	239	325	3,6	18
1.915.125	125	25	224	53	139,7	177,8	200	259	325	4,0	20
1.915.150	150	25	224	53	168,3	219,1	200	279	350	4,1	25
1.915.200	200	25	268	69	219,1	273,0	250	293	400	4,5	49
1.915.250	250	25	301	97	273,0	355,6	300	345	530	5,0	94
1.915.300	300	25	363	117	323,9	457,0	500	412	550	5,6	152
1.915.350	350	25	363	117	355,6	508,0	500	487	686	5,6	212
1.915.400	400	25	444	138	406,4	610,0	500	573	762	7,0	293
1.915.500	500	25	475	180	508,0	660,0	500	648	914	7,0	467
1.915.600	600	25	475	180	610,0	813,0	500	715	1065	7,1	1025

STEEL BALL VALVES FLANGE/FLANGE



Art no.	DN	PN	A [mm]	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	H1 [mm]	L [mm]	Weight [kg/pc]
1.916.050	50	40	188,0	40	165	125	18	127	44	230	7,8
1.916.065	65	16	277,5	50	185	145	18	159	62	270	10,5
1.916.080	80	16	227,5	65	200	160	18	171	68	280	12,5
1.916.100	100	16	278,5	80	220	180	18	218	101	300	17,0
1.916.125	125	16	400,0	100	250	210	18	252	101	325	25,0
1.916.150	150	16	600,0	125	285	240	22	272	107	350	33,0
1.916.200	200	16	870,0	150	340	295	22	280	92	400	58,0
1.916.250	250	16	1200,0	200	405	355	26	350	180	500	102,0

STAINLESS STEEL BALL VALVES WELDING/WELDING



Art no.	DN	PN	A [mm]	D [mm]	D1 [mm]	D2 [mm]	H [mm]	H1 [mm]	L [mm]	S [mm]	Weight [kg/pc]
1.920.020	20	40	145	15	26,9	42,4	103	22	230	2,0	0,70
1.920.025	25	40	145	20	33,7	48,3	112	28	230	2,0	0,80
1.920.032	32	40	145	25	42,4	60,3	116	27	260	2,0	1,2
1.920.040	40	40	188	32	48,3	70,0	111	34	260	2,5	1,8
1.920.050	50	40	188	40	60,3	88,9	118	34	300	3,0	2,2
1.920.065	65	25	278	50	76,1	114,3	150	51	300	3,0	3,8
1.920.080	80	25	278	65	88,9	131,0	160	58	300	3,0	4,7
1.920.100	100	25	278	80	114,3	156,0	175	54	325	3,0	6,7
1.920.125	125	25	400	100	139,7	177,8	220	68	325	4,0	13,0
1.920.150	150	25	600	125	168,3	219,1	240	74	350	4,0	18,0
1.920.200	200	25	870	150	219,1	273,0	280	92	400	4,0	32,0
1.920.250	250	25	1200	200	273,0	355,6	340	108	530	4,0	63,0