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CHAPTER 3.0

PRE-INSULATED DOUBLE STEEL PIPES

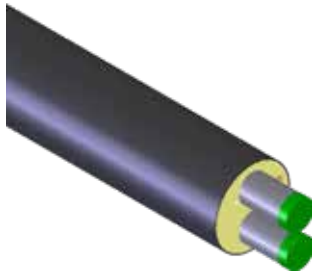


TABLE 3.0.1
Line conditions

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 – 200 in insulation series 1, series 2 and series 3. See chapter 3.9 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

These technical specifications are made for insulated double steel pipes for district heating, manufactured by Set Pipes and for use under the following conditions:

MAXIMUM FLOW PIPELINE TEMPERATURE	85°C
MAXIMUM TEMPERATURE DIFFERENCE	40°C
MAXIMUM PRESSURE	16 bar

Please contact Set Pipes technical department if the pipe line needs to exceed the above maximum line conditions. EN 13941 does not give specific instructions for double pipes and therefore it is necessary to review each specific project.

DESCRIPTION

Pre-insulated double steel pipes and fittings are produced in accordance to EN 15632-1, EN 253 and EN 448. Most requirements are from EN 253, for example regarding steel, casing pipe and insulation. The combination of these materials is in accordance to EN 15698.

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 3.0.2
Steel pipe EN 253

TECHNICAL REQUIREMENTS	P 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

TABLE 3.0.3

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
REDUCTION:	EN 10203-2

TABLE 3.0.4

 Main dimensions f
or steel pipes

DN = Diameter Nominal

 d_o = Outer diameter

 t_1 = Wall thickness - FW 401

 t_2 = Wall thickness - EN 253

 L_p = Space between pipes

DN	d_o [mm]	t_1 [mm]	t_2 [mm]	L_p [mm]
20	26,9	2,6	2,0	19
25	33,7	3,2	2,3	19
32	42,4	3,2	2,6	19
40	48,3	3,2	2,6	19
50	60,3	3,2	2,9	20
65	76,1	3,2	2,9	20
80	88,9	3,2	3,2	25
100	114,3	3,6	3,6	25
125	139,7	3,6	3,6	30
150	168,3	4,0	4,0	40
200	219,1	4,5	4,5	45

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 3.0.5

 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 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 cover 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 3.0.6

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 3.0.7

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]
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

PRODUCTION CONTROL OF PRE-INSULATION DOUBLE 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 double pipes are according to EN 15698-1, table A.1. Further details regarding casing pipe, insulation foam and steel pipe can be found in EN 253, Edition D.

The quality control of pre-insulated 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 part 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 3.0.8

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 3.1 APPLICATION DESIGN

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 við 70°C)

c_p = Specific heat for water (4191 J/kg·K við 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:

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

CHAPTER 3.1.1 PRESSURE DROP

TOTAL PRESSURE DROP FOR PRE – INSULATED DOUBLE 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. 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:

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

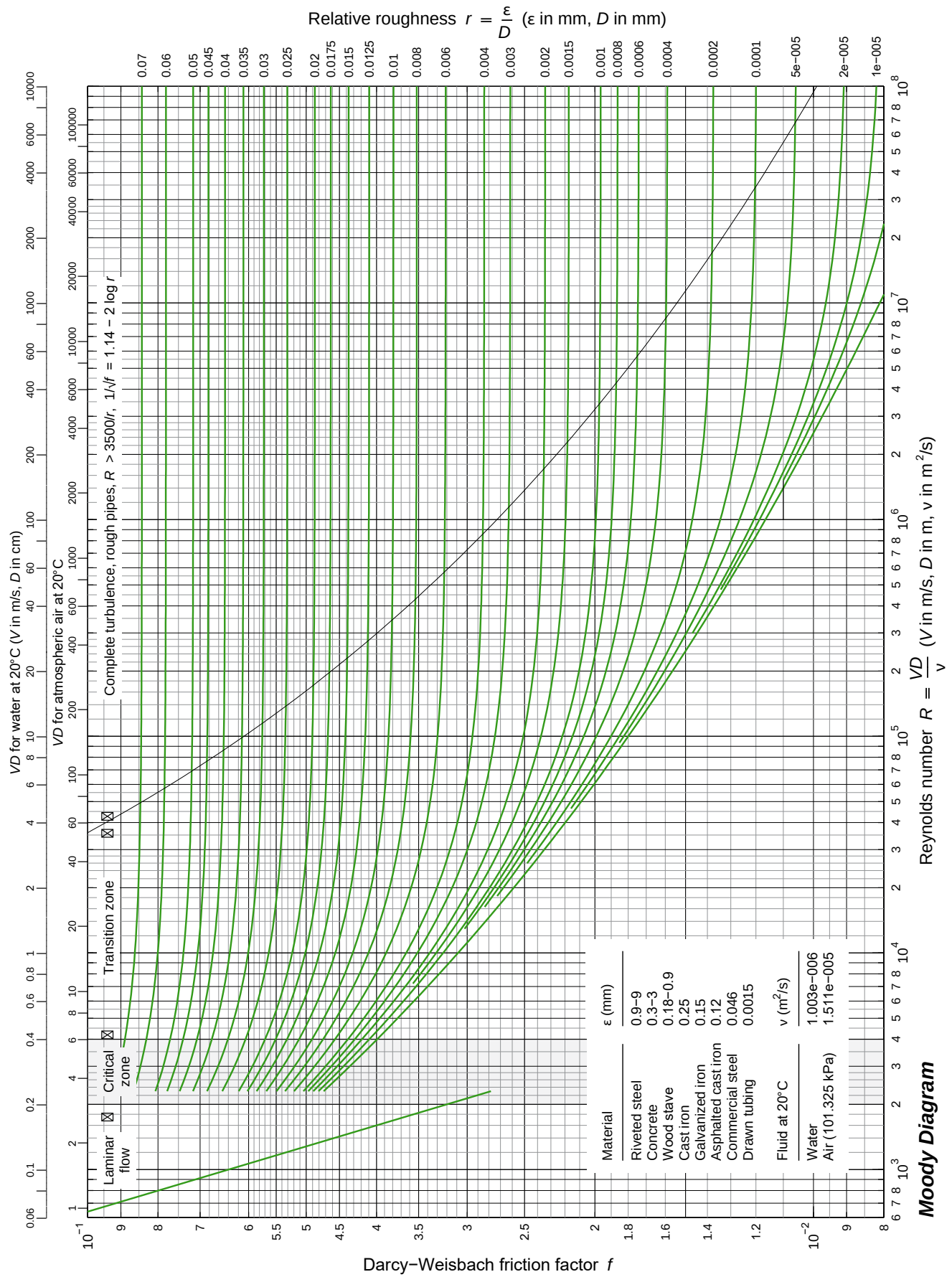
THUS:

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 > 4000 then the flow will be turbulent which is fluctuating and agitated vortex that leads to increased 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.

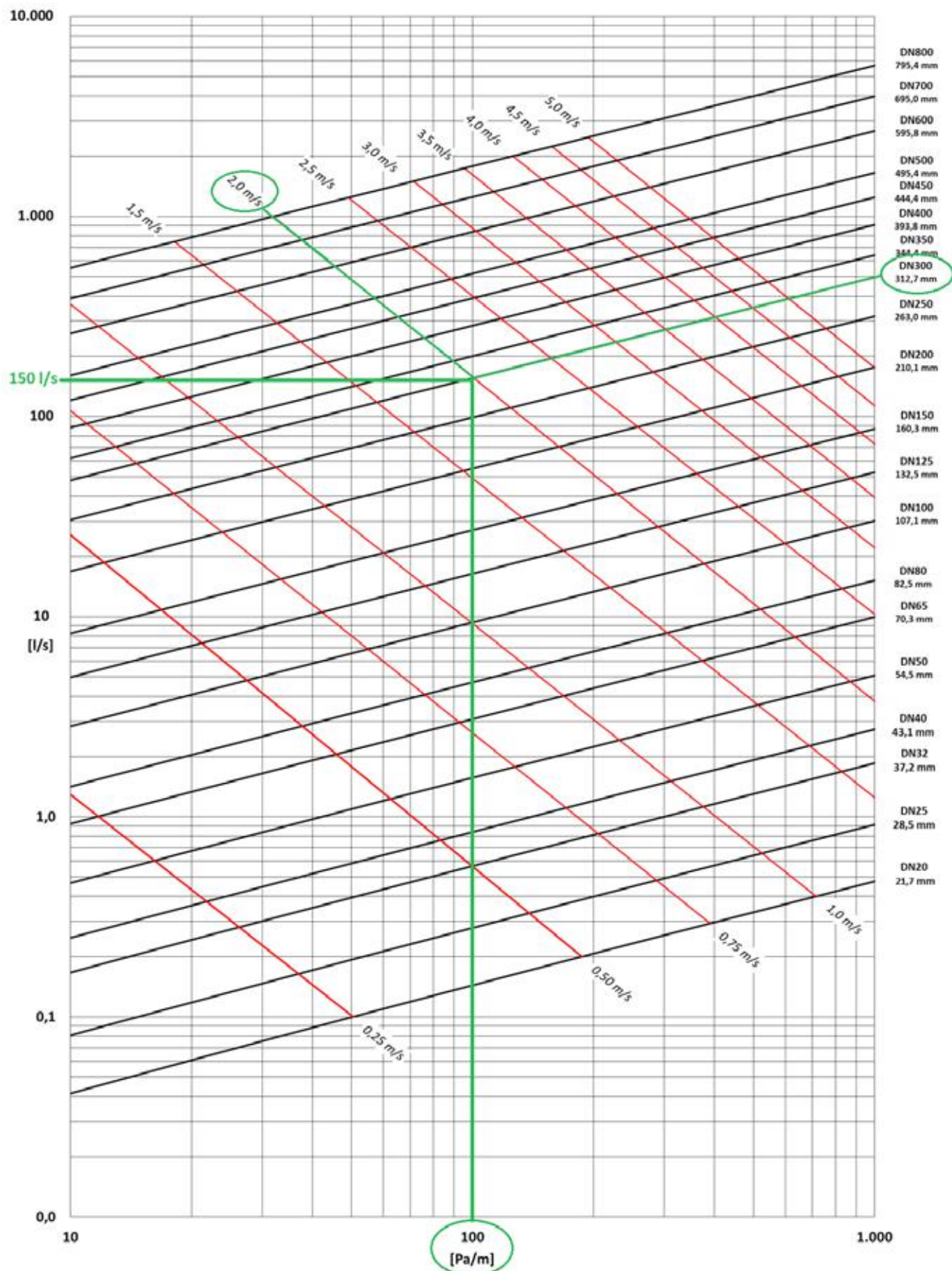
Graph 3.1.1.2 shows pressure loss in a single flow pipe taking into consideration water need, pipe dimension, and average water velocity. Also there is an example on how to use the graph.

GRAPH 3.1.1.1 - MOODY GRAPH

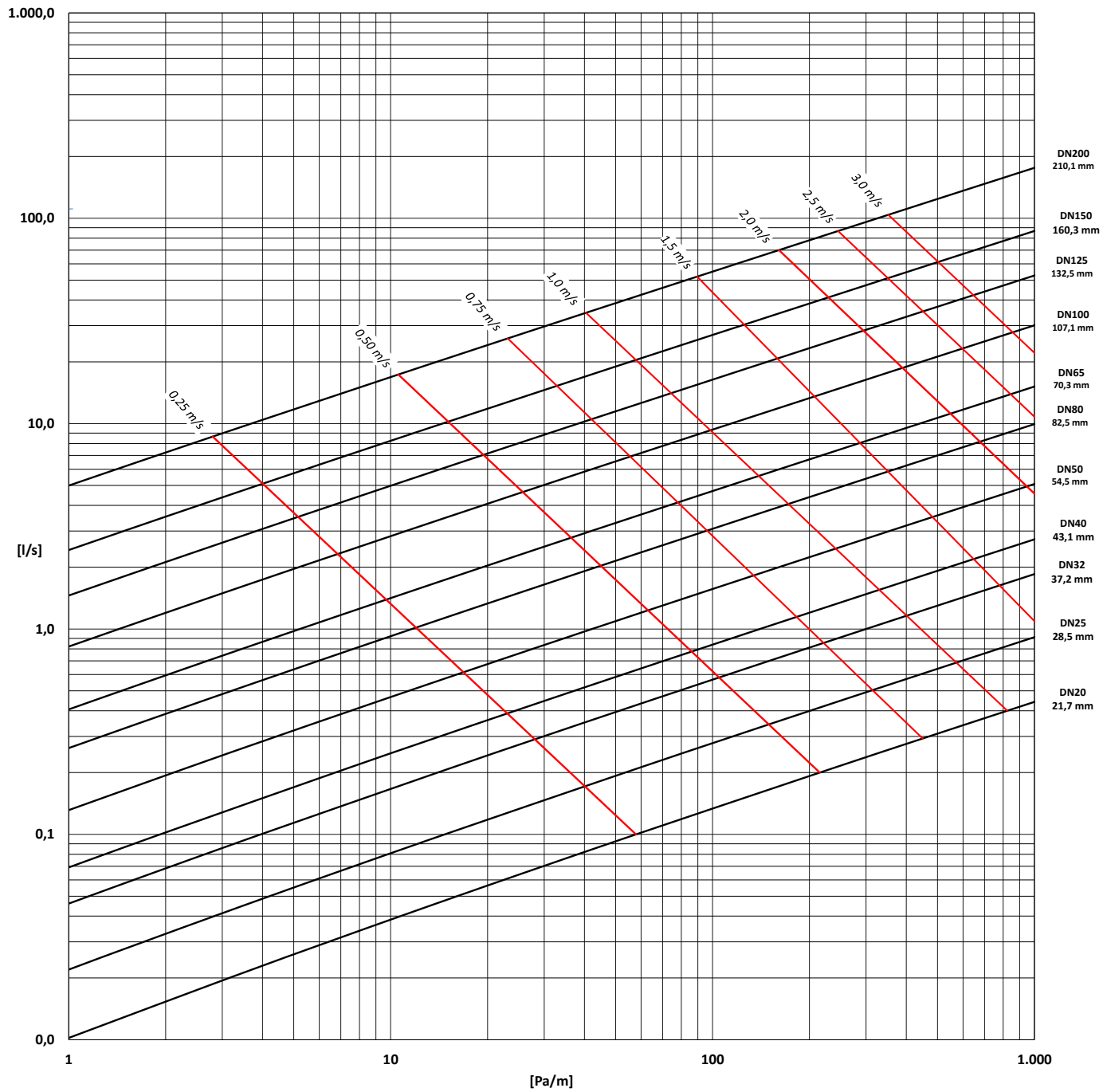


AN EXAMPLE HOW TO USE THE PRESSURE DROP GRAPH

A residential house has a water demand of about 0,60 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 0,50 m/s and the recommended pipe dimension would be DN 32.



GRAPH 3.1.1.2 - PRESSURE LOSS GRAPH FOR STEEL PIPES



CHAPTER 3.1.2 EXPANSION

EXPANSION – PRE-INSULATED DOUBLE 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 expand 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. However, standard EN 13941 does not address double pipes. Therefore, the following is based on the same with higher security.

FREE EXPANSION

With a flow and return pipeline in the same casing pipe a different expansions force can be found in the cross section of the pipe. L_{max} for double pipe is calculated in tables 3.1.2.1, 3.1.2.2 og 3.1.2.3.

TABLE 3.1.2.1

Maximum length between expansions for double pipe [m] insulation 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 pipe			Casing pipe		Depth of the pipe			
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	2,3	125	3,0	40,1	30,9	25,1	21,2
25	33,7	2,6	140	3,0	50,4	39,0	31,8	26,8
32	42,4	2,6	160	3,0	55,5	43,1	35,2	29,8
40	48,3	2,6	160	3,0	63,5	49,4	40,4	34,1
50	60,3	2,9	200	3,2	69,0	54,0	44,3	37,6
65	76,1	2,9	225	3,4	76,4	60,1	49,5	42,1
80	88,9	3,2	250	3,6	86,9	68,7	56,7	48,3
100	114,3	3,6	315	4,1	95,4	76,1	63,3	54,2
125	139,7	3,6	400	4,8	87,2	70,4	59,0	50,8
150	168,3	4,0	450	5,2	100,1	81,4	68,5	59,2
200	219,1	4,5	560	6,0	109,7	90,4	76,9	66,9

TABLE 3.1.2.2

Maximum length between expansions for double pipe [m] insulation 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 pipe			Casing pipe		Depth of the pipe			
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	2,3	140	3,0	30,5	23,6	19,2	16,2
25	33,7	2,6	160	3,0	37,5	29,1	23,8	20,1
32	42,4	2,6	180	3,0	42,0	32,7	26,7	22,6
40	48,3	2,6	180	3,0	48,1	37,5	30,7	26,0
50	60,3	2,9	225	3,4	52,1	40,9	33,6	28,6
65	76,1	2,9	250	3,6	58,6	46,2	38,1	32,4
80	88,9	3,2	280	3,9	66,0	52,3	43,3	36,9
100	114,3	3,6	355	4,5	71,7	57,4	47,9	41,0
125	139,7	3,6	450	5,2	65,5	53,0	44,6	38,4
150	168,3	4,0	500	5,6	76,3	62,2	52,5	45,4
200	219,1	4,5	630	6,6	82,3	68,0	58,0	50,5

TABLE 3.1.2.3

Maximum length between expansions for double pipe [m] insulation 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 pipe			Casing pipe		Depth of the pipe			
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	2,3	160	3,0	26,3	20,4	16,7	14,1
25	33,7	2,6	180	3,0	32,9	25,6	20,9	17,7
32	42,4	2,6	200	3,2	37,3	29,1	23,9	20,2
40	48,3	2,6	200	3,2	42,7	33,4	27,4	23,2
50	60,3	2,9	250	3,6	46,1	36,3	29,9	25,5
65	76,1	2,9	280	3,9	51,3	40,6	33,6	28,6
80	88,9	3,2	315	4,1	57,4	45,7	37,9	32,4
100	114,3	3,6	400	4,8	62,0	49,9	41,7	35,9
125	139,7	3,6	500	5,6	57,3	46,7	39,4	34,0
150	168,3	4,0	560	6,0	66,0	54,1	45,9	39,8
200	219,1	4,5	710	7,2	70,2	58,4	50,0	43,8

CHAPTER 3.1.3

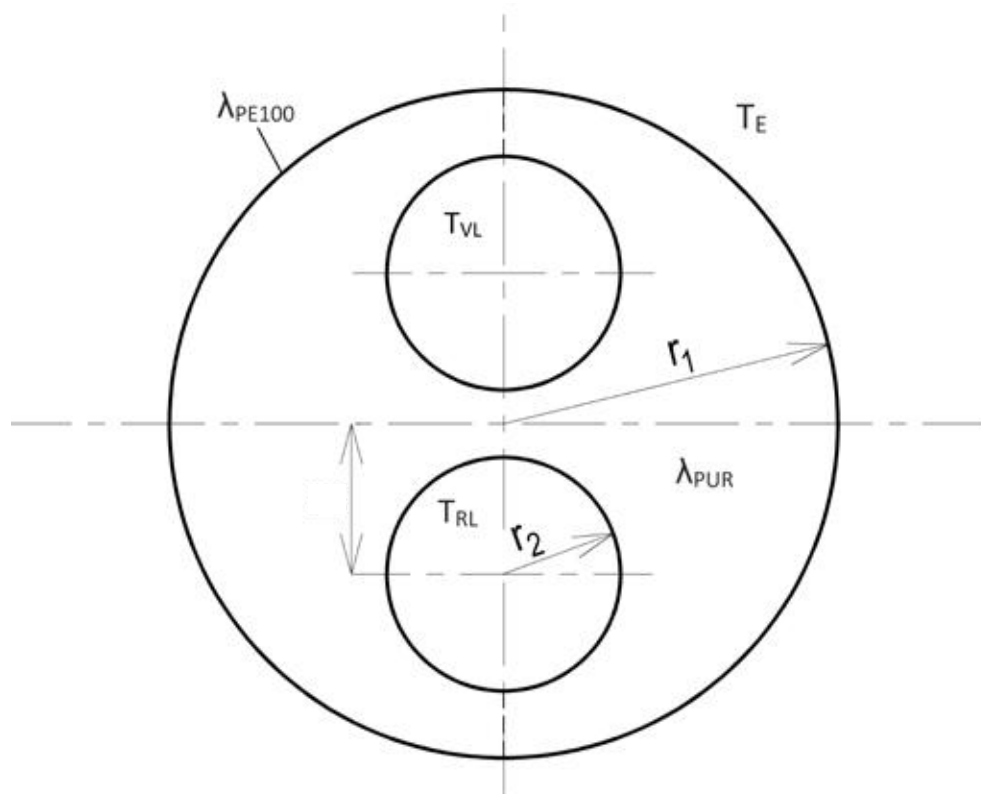
HEAT LOSS

HEAT LOSS - PRE-INSULATED DOUBLE 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.

FIG 3.1.3.1

Cross section of double pipe



All results in the tables are calculated by Set Pipes technical department. Calculations for heat loss in double pipes is more complicated and are based on a FEM method together with traditional methods as described in chapter 2.

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 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.

TOTAL HEAT LOSS FOR A BURIED PRE- INSULATED DOUBLE STEEL PIPES

In tables 3.1.3.1, 3.1.3.2 og 3.1.3.3 the results for total heat loss for buried double pipe, insulation series 1-3 in regards to overall heat loss coefficient and average water temperature T_M are shown

TABLE 3.1.3.1

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

DN = Diameter Nominal

D_o = Outer diameter of the casing pipe [m]

$U_{\text{Pipe in soil}}$ = Overall heat loss coefficient

T_M = The average temperature

DN	D_o [mm]	$U_{\text{PIPE IN SOIL}}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	125	0,175	3,49	6,99	9,43	10,5	12,2	14,0
25-25	140	0,191	3,82	7,65	9,56	11,5	13,4	15,3
32-32	160	0,208	4,17	8,34	10,4	12,5	14,6	16,7
40-40	160	0,249	4,98	9,96	12,5	14,9	17,4	19,9
50-50	200	0,242	4,84	9,67	12,1	14,5	16,9	19,3
65-65	225	0,289	5,77	11,5	14,4	17,3	20,2	23,1
80-80	250	0,330	6,60	13,2	16,5	19,8	23,1	26,4
100-100	315	0,331	6,63	13,3	16,6	19,9	23,2	26,5
125-125	400	0,258	5,17	10,3	12,9	15,5	18,1	20,7
150-150	450	0,372	7,43	14,9	18,6	22,3	26,0	29,7
200-200	560	0,417	8,34	16,7	20,8	25,0	29,2	33,3

TABLE 3.1.3.2

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

DN = Diameter Nominal

D_o = Outer diameter of the
casing pipe [m]

$U_{\text{Pipe in soil}}$ = Overall heat loss coefficient

T_M = The average temperature

DN	D_o [mm]	$U_{\text{PIPE IN SOIL}}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	140	0,155	3,10	6,21	7,76	9,31	10,9	12,4
25-25	160	0,164	3,29	6,58	8,22	9,86	11,5	13,2
32-32	180	0,180	3,60	7,20	8,99	10,8	12,6	14,4
40-40	180	0,208	4,16	8,32	10,4	12,5	14,6	16,6
50-50	225	0,203	4,07	8,13	10,2	12,2	14,2	16,3
65-65	250	0,238	4,76	9,53	11,9	14,3	16,7	19,1
80-80	280	0,260	5,19	10,4	13,0	15,6	18,2	20,8
100-100	355	0,258	5,16	10,3	12,9	15,5	18,1	20,6
125-125	450	0,243	4,86	9,7	12,2	14,6	17,0	19,5
150-150	500	0,287	5,75	11,5	14,4	17,2	20,1	23,0
200-200	630	0,303	6,06	12,1	15,1	18,2	21,2	24,2

TABLE 3.1.3.3

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

DN = Diameter Nominal

D_o = Outer diameter of the
casing pipe [m]

$U_{\text{Pipe in soil}}$ = Overall heat loss coefficient

T_M = The average temperature

DN	D_o [mm]	$U_{\text{PIPE IN SOIL}}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	160	0,138	2,75	5,50	6,88	8,25	9,63	11,0
25-25	180	0,147	2,93	5,87	7,34	8,80	10,3	11,7
32-32	200	0,161	3,21	6,43	8,04	9,64	11,2	12,9
40-40	200	0,182	3,64	7,29	9,11	10,9	12,7	14,6
50-50	250	0,179	3,58	7,15	8,94	10,7	12,5	14,3
65-65	280	0,202	4,04	8,09	10,1	12,1	14,2	16,2
80-80	315	0,215	4,31	8,61	10,8	12,9	15,1	17,2
100-100	400	0,214	4,28	8,56	10,7	12,8	15,0	17,1
125-125	500	0,208	4,16	8,32	10,4	12,5	14,6	16,6
150-150	560	0,235	4,70	9,39	11,7	14,1	16,4	18,8
200-200	710	0,242	4,84	9,68	12,1	14,5	16,9	19,4

CHAPTER 3.2 TRANSPORT AND STORAGE

PRE-INSULATED DOUBLE 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 table below or loose according to customer requests.

TABLE 3.2.1

Weight and number of pipes in bundle

CASING PIPE OUTER DIAMETER [mm]	LENGTHS			
	6 M [pc]	WEIGHT [KG] Series 1	12 M [pc]	WEIGHT [KG] Series 1
125	26	868	26	1737
140	23	851	23	1702
160	20	930	20	1860
200	14	1005	14	2010
225	9	811	9	1622
250	7	799	7	1599

FIG 3.2.1

UNLOADING WITH SLINGS

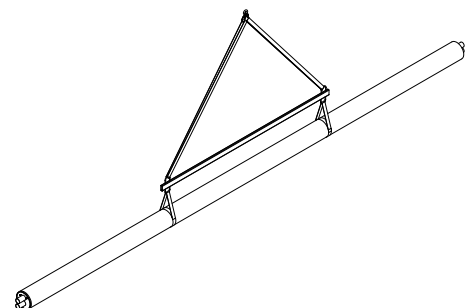
Use wide nylon web slings while unloading and for further handling. Ropes, chains or other lifting equipment are prohibited.

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 belts wider than 100 mm

during loading. Do not use chains, ropes, wires or other lifting equipment. When loading of larger pipes, 12 m and 16 m it is necessary to use a support bar between belts (see photo 2.2.1). The support bar to be at least 4 m 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.

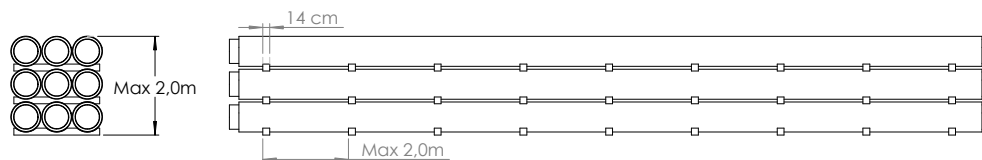


STACK

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

FIG 3.2.2
STACKS WITH WOODEN
SPACING STRIPS

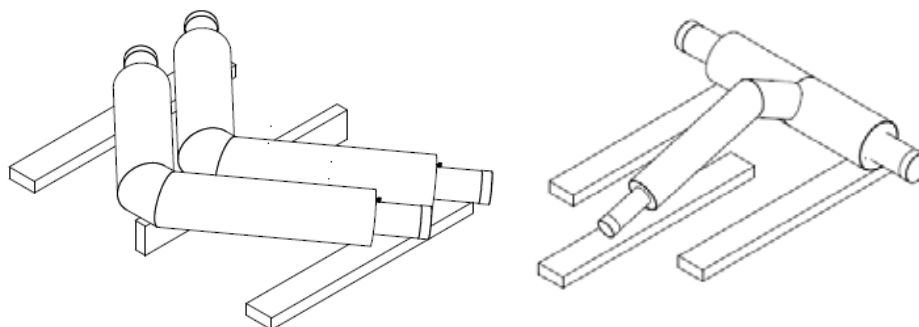
Stack pipes so the max. pressure does not exceed be $<0,3 \text{ N/mm}^2$ (3 kg/cm^2)



FITTINGS

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

FIG 3.2.3
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 $+20^\circ\text{C}$. Insulation material Poly (light colored) and Isocyanate (dark colored) may under no circumstances freeze or reach a temperature below 0°C during use or storage or the foam will crystallize and no longer possible to use.

CHAPTER 3.3 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 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 a project planning, factors like safety and size need to be taken into account. The standard EN 13941 suggests the following classification

TABLE 3.3.1
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.

CHAPTER 3.3.1 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 3.3.1.1
U and Z compensators

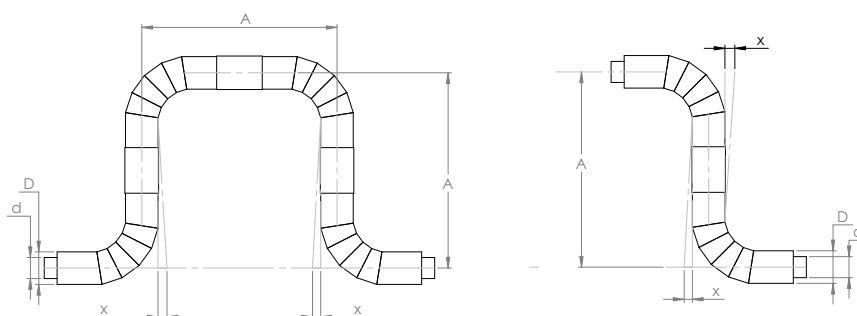


TABLE 3.3.1.1

Maximum length between expansions for double pipe [m] insulation 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 pipe			Casing pipe		Depth of the pipe			
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	2,3	125	3,0	40,1	30,9	25,1	14,1
25	33,7	2,6	140	3,0	50,4	39,0	31,8	17,7
32	42,4	2,6	160	3,0	55,5	43,1	35,2	20,2
40	48,3	2,6	160	3,0	63,5	49,4	40,4	23,2
50	60,3	2,9	200	3,2	69,0	54,0	44,3	25,5
65	76,1	2,9	225	3,4	76,4	60,1	49,5	28,6
80	88,9	3,2	250	3,6	86,9	68,7	56,7	32,4
100	114,3	3,6	315	4,1	95,4	76,1	63,3	35,9
125	139,7	3,6	400	4,8	87,2	70,4	59,0	34,0
150	168,3	4,0	450	5,2	100,1	81,4	68,5	39,8
200	219,1	4,5	560	6,0	109,7	90,4	76,9	43,8

TABLE 3.3.1.2

Maximum length between expansions for double pipe [m] insulation 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 pipe			Casing pipe		Depth of the pipe			
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	2,3	140	3,0	30,5	23,6	19,2	16,2
25	33,7	2,6	160	3,0	37,5	29,1	23,8	20,1
32	42,4	2,6	180	3,0	42,0	32,7	26,7	22,6
40	48,3	2,6	180	3,0	48,1	37,5	30,7	26,0
50	60,3	2,9	225	3,4	52,1	40,9	33,6	28,6
65	76,1	2,9	250	3,6	58,6	46,2	38,1	32,4
80	88,9	3,2	280	3,9	66,0	52,3	43,3	36,9
100	114,3	3,6	355	4,5	71,7	57,4	47,9	41,0
125	139,7	3,6	450	5,2	65,5	53,0	44,6	38,4
150	168,3	4,0	500	5,6	76,3	62,2	52,5	45,4
200	219,1	4,5	630	6,6	82,3	68,0	58,0	50,5

TABLE 3.3.1.3

Maximum length between expansions for double pipe [m] insulation 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 pipe			Casing pipe		Depth of the pipe			
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	2,3	160	3,0	26,3	20,4	16,7	14,1
25	33,7	2,6	180	3,0	32,9	25,6	20,9	17,7
32	42,4	2,6	200	3,2	37,3	29,1	23,9	20,2
40	48,3	2,6	200	3,2	42,7	33,4	27,4	23,2
50	60,3	2,9	250	3,6	46,1	36,3	29,9	25,5
65	76,1	2,9	280	3,9	51,3	40,6	33,6	28,6
80	88,9	3,2	315	4,1	57,4	45,7	37,9	32,4
100	114,3	3,6	400	4,8	62,0	49,9	41,7	35,9
125	139,7	3,6	500	5,6	57,3	46,7	39,4	34,0
150	168,3	4,0	560	6,0	66,0	54,1	45,9	39,8
200	219,1	4,5	710	7,2	70,2	58,4	50,0	43,8

CHAPTER 3.3.2 **EXPANSION FOAM PADS**

EXPANSION FOAM PADS

In order to absorb expansion movements of the pipe system in bends, branches and 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

The laminated wrap around has a width of 1000 mm and 5 mm thick, each roll is 154m long.

Cutting size of expansion foam pad is according to table 3.3.2.1.

TABLE 3.3.2.1

Expansion foam pad cutting

D_o = Outer diameter of the casing pipe [mm]

Y = Number of strips pcs.

b = Width [mm]

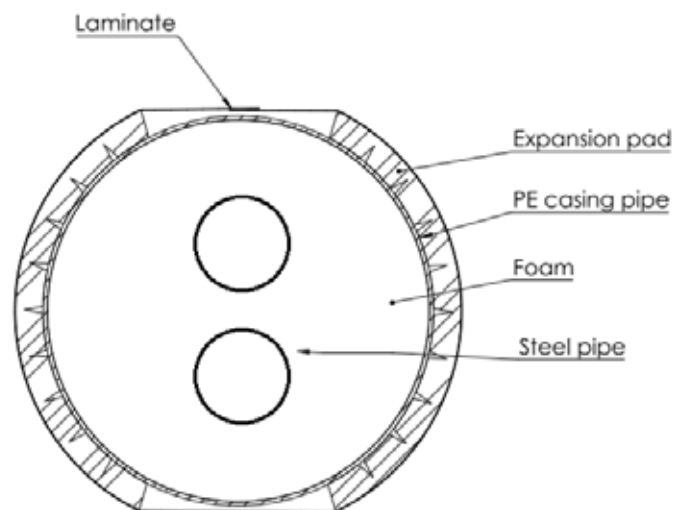
S = Size no.

D_o [mm]	Y pc.	b [mm]	S nr.
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 3.3.2.1

Installation of expansion foam pads



CHAPTER 3.3.3

FIXING PLATES

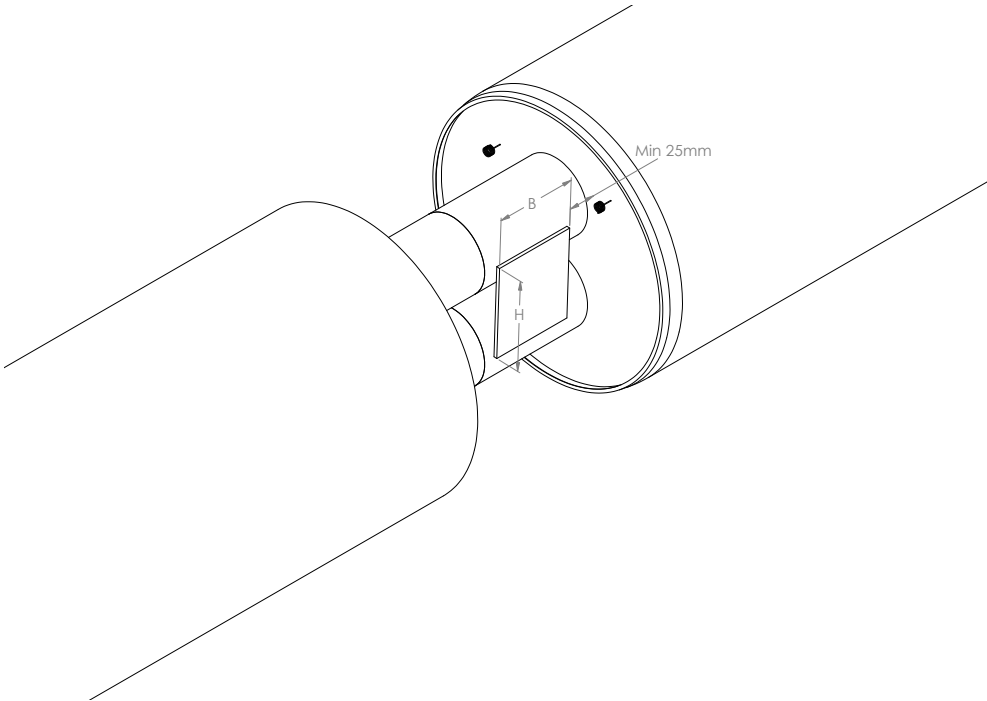
FIXING PLATES

To ensure the pipeline absorbs all thermal expansion it is necessary to use fixing plates on all joints unless using fittings such as bends or T pieces. The minimum length between fixing plates is the pipe length, 12m or 16 m. All fittings have fixing plates included and therefore reinforced joints. If the fixing plates need to be welded less than 25 mm from foam it is necessary to remove foam until the minimum distance of 25 mm is reached.

TABLE 3.3.3.1
Dimensions of fixing plates

PIPE DN	DISTANCE BETWEEN PIPES Lp [mm]	PLATE			WELD SIZE (WS) [mm]
		H [mm]	B [mm]	t [mm]	
20	19	45,9	50	4	2,8
25	19	52,7	50	4	2,8
32	19	61,4	50	4	2,8
40	19	67,3	60	4	2,8
50	20	80,3	70	5	3,5
65	20	96,1	100	5	3,5
80	25	113,9	100	6	4,2
100	25	139,3	120	6	4,2
125	30	169,7	150	6	4,2
150	40	208,3	200	6	4,2
200	45	264,1	250	8	5,7

FIG 3.3.3.1
Fixing plates for double pipes



CHAPTER 3.3.4 PRE HEATING

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

When a pipeline is preheated the heating temperature must be determined. Generally the average soil temperature (T_E) and the maximum forward flow media temperature (T_{VL}) 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 [$^{\circ}\text{C}$]
- T_E = Soil temperature [$^{\circ}\text{C}$]

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

THUS:

- α_{St} = Tensile and compressive stress [N/mm^2]
- E_{St} = Modulus of elasticity for steel = 210 GPa
- σ = Expansion coefficient for steel = $12,6 \times 10^{-6} \text{ K}^{-1}$

EXAMPLE: 250 m DN 125 is to be used with a maximum temperature of 85°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.

$$\Delta T = \frac{(85-10)}{2}$$

$$\Delta T = 37,5 \text{ K}$$

$$\Delta L = 12,6 \times 10^{-6} \text{ K}^{-1} \cdot 37,5 \text{ K} \cdot 250 \text{ m}$$

$$\Delta L = 0,12 \text{ m}$$

$$\sigma_{st} = 2,1 \times 10^5 \frac{\text{N}}{\text{mm}^2} \cdot 12,6 \times 10^{-6} \text{ K}^{-1} \cdot 37,5 \text{ K}$$

$$\sigma_{st} = 99 \frac{\text{N}}{\text{mm}^2}$$

Degree of 37,5°K causes stress and length changes of the material.

The total length of the 250 m will be 0,12 m on each end of the pipeline.

The steel stress is $\pm 99 \text{ N/mm}^2 < 190 \text{ N/mm}^2$.

UNDERGROUND INSTALLATION OF DOUBLE PIPES

These instructions are in accordance to the EN 13941 standard.

CHAPTER 3.3.5 WEATHER 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 3.3.6 TRENCH

TRENCH

Figure 3.3.6.1 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 our technical department for further information.

Figure 3.3.6.1 shows the minimum trench width (B) and the minimum distance between pipes needed (C) according the casing pipe diameter

FIG 3.3.6.1
Trench cross section with
vertical parallel pipes [mm]

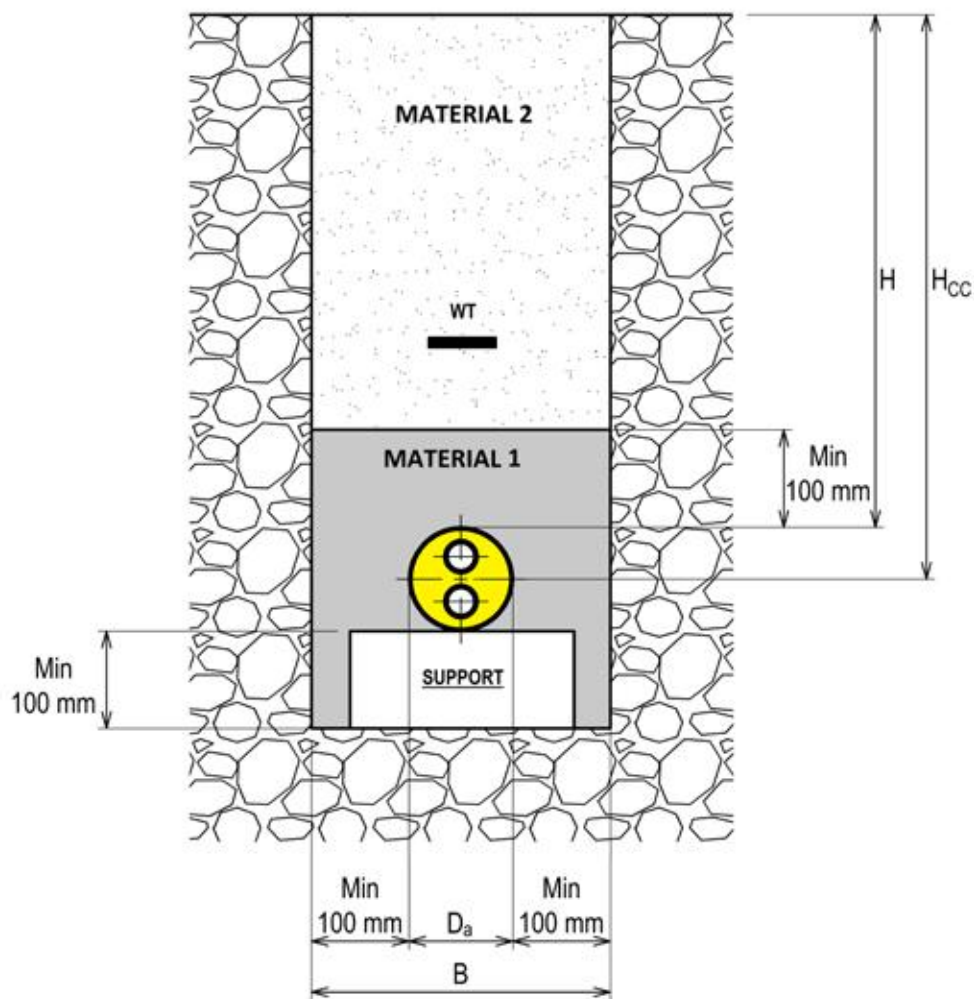


TABLE 3.3.6.1
Minimum width for a trench
with double pipe [mm]

Da = Casing pipe

Da	125	140	160	180	200	225	250	280	315	355	400	450	500	560	630	710
B	325	340	360	380	400	425	450	480	515	555	600	650	700	760	830	910

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 3.3.7 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 set 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 3.3.7.1

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	$\frac{d_{60}}{d_{10}} > 1,8$

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

It Begin trench filling with compacted sand ensuring the layer is at least 0.10m 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 simultanously 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 3.3.8 ANCHOR INSTALLATION

ANCHOR INSTALLATION

Table 3.3.8.1 og mynd 3.3.8.1 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.

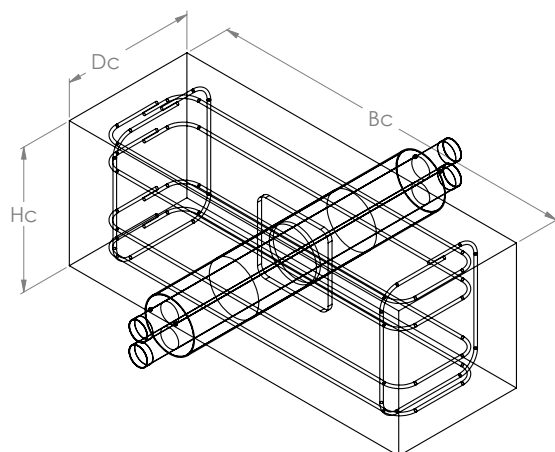
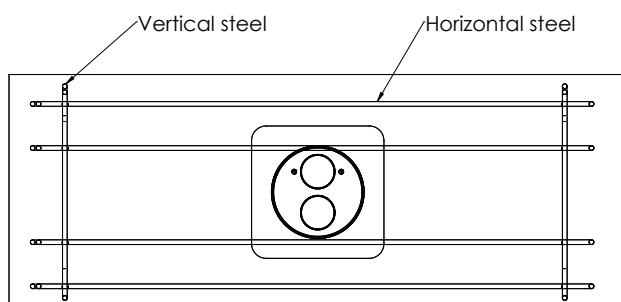
TABLE 3.3.8.1

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

FIG 3.3.8.1

Anchor



CHAPTER 3.3.9 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 3.3.10 CURVED PIPES

CURVED PIPES

Set Pipes supplies insulated curved pipes ($R_{2,min}$). The pipes are available in dimensions DN 20 – DN 200. 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 3.3.10.1

Curved pipe dimensions

d_o = Outer diameter of the steel pipe

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

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

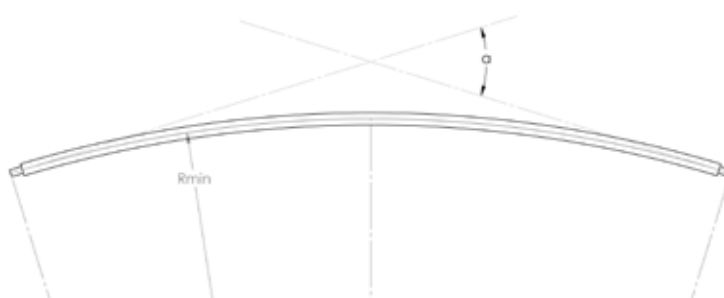
α_1 = Curve angle R_1

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

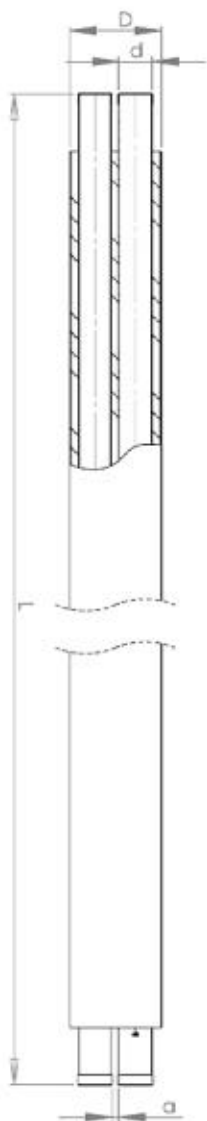
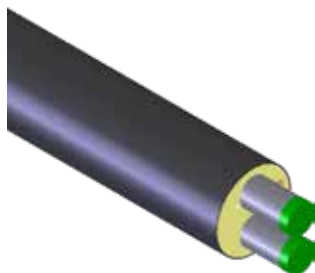
FIG 3.3.10.1

Curved pipe



CHAPTER 3.9 PRODUCT CATALOGUE

CHAPTER 3.9.1 PRE-INSULATED DOUBLE STEEL PIPES INSULATION SERIES 1

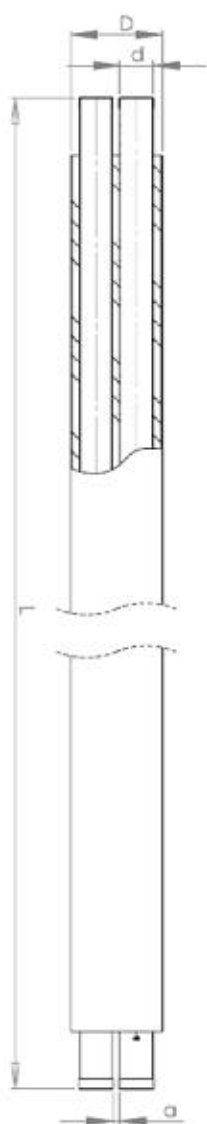
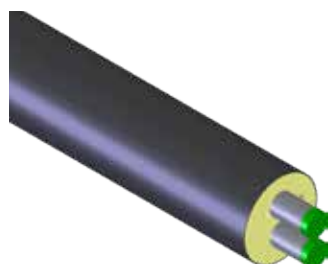


6 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4101.020	20-20	26,9	2,6	125	3,0	19,0	30,4
1.4101.025	25-25	33,7	2,6	140	3,0	19,0	40,2
1.4101.032	32-32	42,4	2,6	160	3,0	19,0	50,4
1.4101.040	40-40	48,3	2,6	160	3,0	19,0	54,9
1.4101.050	50-50	60,3	2,9	200	3,2	20,0	77,8
1.4101.065	65-65	76,1	2,9	225	3,4	20,0	97,2
1.4101.080	80-80	88,9	3,2	250	3,6	25,0	122,5
1.4101.100	100-100	114,3	3,6	315	4,1	25,0	179,9
1.4101.125	125-125	139,7	3,6	400	4,8	30,0	239,7
1.4101.150	150-150	168,3	4,0	450	5,2	40,0	310,7
1.4101.200	200-200	219,1	4,5	560	6,0	45,0	456,5

12 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4102.025	25-25	33,7	2,6	140	3,0	19,0	80,5
1.4102.032	32-32	42,4	2,6	160	3,0	19,0	100,9
1.4102.040	40-40	48,3	2,6	160	3,0	19,0	109,8
1.4102.050	50-50	60,3	2,9	200	3,2	20,0	155,5
1.4102.065	65-65	76,1	2,9	225	3,4	20,0	194,4
1.4102.080	80-80	88,9	3,2	250	3,6	25,0	245,0
1.4102.100	100-100	114,3	3,6	315	4,1	25,0	359,7
1.4102.125	125-125	139,7	3,6	400	4,8	30,0	479,4
1.4102.150	150-150	168,3	4,0	450	5,2	40,0	621,4
1.4102.200	200-200	219,1	4,5	560	6,0	45,0	913,0

16 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4103.100	100-100	114,3	3,6	315	4,1	25,0	479,6
1.4103.125	125-125	139,7	3,6	400	4,8	30,0	639,1
1.4103.150	150-150	168,3	4,0	450	5,2	40,0	828,5
1.4103.200	200-200	219,1	4,5	560	6,0	45,0	1217,4

PRE-INSULATED DOUBLE STEEL PIPES INSULATION SERIES 2

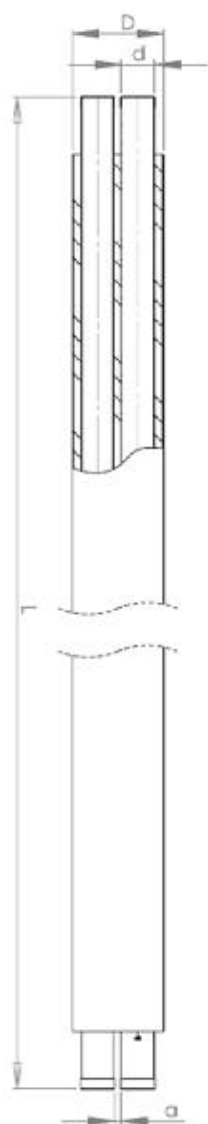
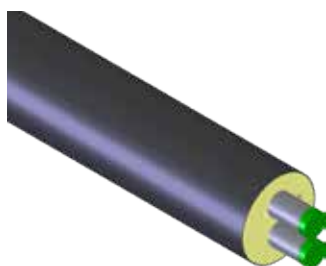


6 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4201.020	20-20	26,9	2,6	140	3,0	19,0	32,8
1.4201.025	25-25	33,7	2,6	160	3,0	19,0	43,7
1.4201.032	32-32	42,4	2,6	180	3,0	19,0	54,3
1.4201.040	40-40	48,3	2,6	180	3,0	19,0	58,7
1.4201.050	50-50	60,3	2,9	225	3,4	20,0	84,3
1.4201.065	65-65	76,1	2,9	250	3,6	20,0	104,4
1.4201.080	80-80	88,9	3,2	280	3,9	25,0	132,3
1.4201.100	100-100	114,3	3,6	355	4,5	25,0	196,2
1.4201.125	125-125	139,7	3,6	450	5,2	30,0	264,4
1.4201.150	150-150	168,3	4,0	500	5,6	40,0	338,1
1.4201.200	200-200	219,1	4,5	630	6,6	45,0	504,5

12 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4202.025	25-25	33,7	2,6	160	3,0	19,0	87,5
1.4202.032	32-32	42,4	2,6	180	3,0	19,0	108,5
1.4202.040	40-40	48,3	2,6	180	3,0	19,0	117,5
1.4202.050	50-50	60,3	2,9	225	3,4	20,0	168,6
1.4202.065	65-65	76,1	2,9	250	3,6	20,0	208,8
1.4202.080	80-80	88,9	3,2	280	3,9	25,0	264,7
1.4202.100	100-100	114,3	3,6	355	4,5	25,0	392,3
1.4202.125	125-125	139,7	3,6	450	5,2	30,0	528,8
1.4202.150	150-150	168,3	4,0	500	5,6	40,0	676,3
1.4202.200	200-200	219,1	4,5	630	6,6	45,0	1009,1

16 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4203.100	100-100	114,3	3,6	355	4,5	25,0	523,1
1.4203.125	125-125	139,7	3,6	450	5,2	30,0	705,1
1.4203.150	150-150	168,3	4,0	500	5,6	40,0	901,7
1.4203.200	200-200	219,1	4,5	630	6,6	45,0	1345,4

PRE-INSULATED DOUBLE STEEL PIPES INSULATION SERIES 3



6 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4302.020	20-20	26,9	2,6	160	3,0	19,0	36,3
1.4302.025	25-25	33,7	2,6	180	3,0	19,0	47,6
1.4302.032	32-32	42,4	2,6	200	3,2	19,0	59,1
1.4302.040	40-40	48,3	2,6	200	3,2	19,0	63,6
1.4302.050	50-50	60,3	2,9	250	3,6	20,0	91,5
1.4302.065	65-65	76,1	2,9	280	3,9	20,0	114,3
1.4302.080	80-80	88,9	3,2	315	4,1	25,0	144,3
1.4302.100	100-100	114,3	3,6	400	4,8	25,0	215,7
1.4302.125	125-125	139,7	3,6	500	5,6	30,0	291,9
1.4302.150	150-150	168,3	4,0	560	6,0	40,0	373,9
1.4302.200	200-200	219,1	4,5	710	7,2	45,0	565,0

12 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4302.025	25-25	33,7	2,6	180	3,0	19,0	95,2
1.4302.032	32-32	42,4	2,6	200	3,2	19,0	118,3
1.4302.040	40-40	48,3	2,6	200	3,2	19,0	127,2
1.4302.050	50-50	60,3	2,9	250	3,6	20,0	183,0
1.4302.065	65-65	76,1	2,9	280	3,9	20,0	228,5
1.4302.080	80-80	88,9	3,2	315	4,1	25,0	288,7
1.4302.100	100-100	114,3	3,6	400	4,8	25,0	431,4
1.4302.125	125-125	139,7	3,6	500	5,6	30,0	583,7
1.4302.150	150-150	168,3	4,0	560	6,0	40,0	747,9
1.4302.200	200-200	219,1	4,5	710	7,2	45,0	1130,1

16 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t ₁ [mm]	D [mm]	t ₂ [mm]		
1.4302.100	100-100	114,3	3,6	400	4,8	25,0	575,2
1.4302.125	125-125	139,7	3,6	500	5,6	30,0	778,3
1.4302.150	150-150	168,3	4,0	560	6,0	40,0	997,2
1.4302.200	200-200	219,1	4,5	710	7,2	45,0	1506,8

CHAPTER 3.9.2

DOUBLE BEND 90°

HORIZONTAL

INSULATION SERIES 1



DOUBLE BEND 90°

VERTICAL

INSULATION SERIES 1



DOUBLE BEND 30°, 45° & 60°

HORIZONTAL

INSULATION SERIES 1



DOUBLE BEND 30°, 45° & 60°

VERTICAL

ISOLATION SERIES 1



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4110.020	20-20	125	1000	10,1
1.4110.025	25-25	140	1000	11,1
1.4110.032	32-32	160	1000	13,7
1.4110.040	40-40	160	1000	15,9
1.4110.050	50-50	200	1000	20,6
1.4110.065	65-65	225	1000	26,6
1.4110.080	80-80	250	1000	33,3
1.4110.100	100-100	315	1000	48,1
1.4110.125	125-125	400	1000	62,8
1.4110.150	150-150	450	1200	99,5
1.4110.200	200-200	560	1300	156,1

Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4111.020	20-20	125	1000	10,1
1.4111.025	25-25	140	1000	11,1
1.4111.032	32-32	160	1000	13,7
1.4111.040	40-40	160	1000	15,9
1.4111.050	50-50	200	1000	20,6
1.4111.065	65-65	225	1000	26,6
1.4111.080	80-80	250	1000	33,3
1.4111.100	100-100	315	1000	48,1
1.4111.125	125-125	400	1000	62,8
1.4111.150	150-150	450	1200	99,5
1.4111.200	200-200	560	1300	156,1

Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4114.020	20-20	125	1000	9,3
1.4114.025	25-25	140	1000	10,2
1.4114.032	32-32	160	1000	12,6
1.4114.040	40-40	160	1000	14,7
1.4114.050	50-50	200	1000	19,0
1.4114.065	65-65	225	1000	24,5
1.4114.080	80-80	250	1000	30,7
1.4114.100	100-100	315	1000	44,3
1.4114.125	125-125	400	1000	57,8
1.4114.150	150-150	450	1200	91,5
1.4114.200	200-200	560	1300	143,6

Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4115.020	20-20	125	1000	9,3
1.4115.025	25-25	140	1000	10,2
1.4115.032	32-32	160	1000	12,6
1.4115.040	40-40	160	1000	14,7
1.4115.050	50-50	200	1000	19,0
1.4115.065	65-65	225	1000	24,5
1.4115.080	80-80	250	1000	30,7
1.4115.100	100-100	315	1000	44,3
1.4115.125	125-125	400	1000	57,8
1.4115.150	150-150	450	1200	91,5
1.4115.200	200-200	560	1300	143,6

**DOUBLE BEND 90°
HORIZONTAL
INSULATION SERIES 2**



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4210.020	20-20	140	1000	10,6
1.4210.025	25-25	160	1000	11,9
1.4210.032	32-32	180	1000	14,8
1.4210.040	40-40	180	1000	17,0
1.4210.050	50-50	225	1000	22,3
1.4210.065	65-65	250	1000	28,6
1.4210.080	80-80	280	1000	35,9
1.4210.100	100-100	355	1000	52,4
1.4210.125	125-125	450	1000	69,1
1.4210.150	150-150	500	1200	108,6

**DOUBLE BEND 90°
VERTICAL
INSULATION SERIES 2**



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4211.020	20-20	140	1000	10,6
1.4211.025	25-25	160	1000	11,9
1.4211.032	32-32	180	1000	14,8
1.4211.040	40-40	180	1000	17,0
1.4211.050	50-50	225	1000	22,3
1.4211.065	65-65	250	1000	28,6
1.4211.080	80-80	280	1000	35,9
1.4211.100	100-100	355	1000	52,4
1.4211.125	125-125	450	1000	69,1
1.4211.150	150-150	500	1200	108,6

**DOUBLE BEND 30°, 45° & 60°
HORIZONTAL
INSULATION SERIES 2**



Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4214.020	20-20	140	1000	9,7
1.4214.025	25-25	160	1000	11,0
1.4214.032	32-32	180	1000	13,6
1.4214.040	40-40	180	1000	15,6
1.4214.050	50-50	225	1000	20,5
1.4214.065	65-65	250	1000	26,3
1.4214.080	80-80	280	1000	33,1
1.4214.100	100-100	355	1000	48,2
1.4214.125	125-125	450	1000	63,6
1.4214.150	150-150	500	1200	99,9

**DOUBLE BEND 30°, 45° & 60°
VERTICAL
ISOLATION SERIES 2**

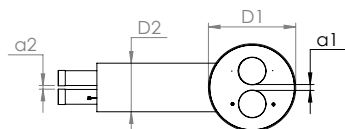
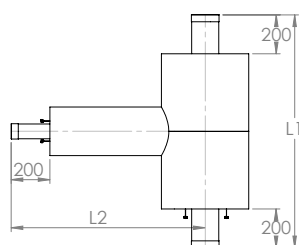
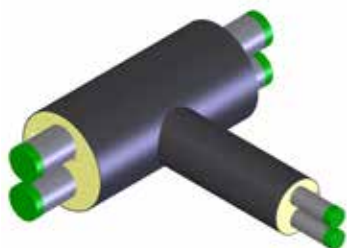


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4215.020	20-20	140	1000	9,7
1.4215.025	25-25	160	1000	11,0
1.4215.032	32-32	180	1000	13,6
1.4215.040	40-40	180	1000	15,6
1.4215.050	50-50	225	1000	20,5
1.4215.065	65-65	250	1000	26,3
1.4215.080	80-80	280	1000	33,1
1.4215.100	100-100	355	1000	48,2
1.4215.125	125-125	450	1000	63,6
1.4215.150	150-150	500	1200	99,9

CHAPTER 3.9.3

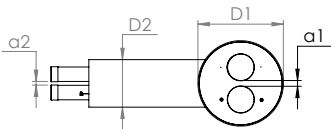
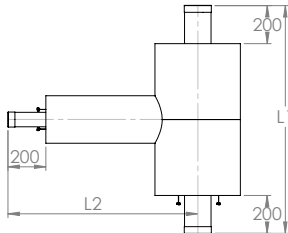
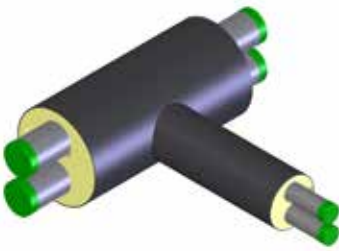
DOUBLE T-PIECES

INSULATION SERIES 1



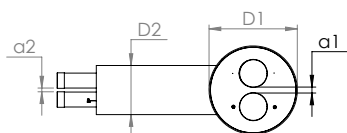
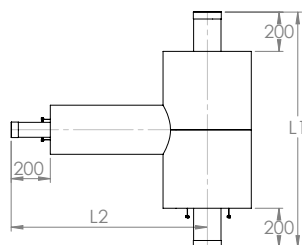
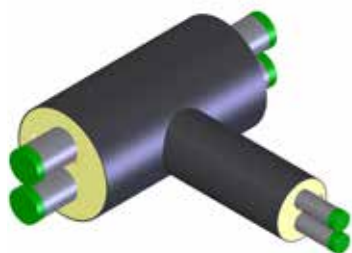
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.120.020.020	20-20	125	20-20	125	1000/800	9,4
14.120.025.020	25-25	140	20-20	125	1000/800	9,4
14.120.025.025	25-25	140	25-25	140	1000/800	9,7
14.120.032.020	32-32	160	20-20	125	1000/800	10,8
14.120.032.025	32-32	160	25-25	140	1000/800	11,1
14.120.032.032	32-32	160	32-32	160	1000/800	12,2
14.120.040.020	40-40	160	20-20	125	1000/800	11,7
14.120.040.025	40-40	160	25-25	140	1000/800	12,1
14.120.040.032	40-40	160	32-32	160	1000/800	13,2
14.120.040.040	40-40	160	40-40	160	1000/800	14,0
14.120.050.020	50-50	200	20-20	125	1000/800	14,5
14.120.050.025	50-50	200	25-25	140	1000/800	14,9
14.120.050.032	50-50	200	32-32	160	1000/800	16,0
14.120.050.040	50-50	200	40-40	160	1000/800	16,8
14.120.050.050	50-50	200	50-50	200	1200/800	21,4
14.120.065.020	65-65	225	20-20	125	1000/800	17,3
14.120.065.025	65-65	225	25-25	140	1000/800	17,6
14.120.065.032	65-65	225	32-32	160	1000/800	18,7
14.120.065.040	65-65	225	40-40	160	1000/800	19,5
14.120.065.050	65-65	225	50-50	200	1200/800	24,7
14.120.065.065	65-65	225	65-65	225	1200/800	26,8
14.120.080.025	80-80	250	25-25	140	1000/800	21,2
14.120.080.032	80-80	250	32-32	160	1000/800	22,3
14.120.080.040	80-80	250	40-40	160	1000/800	23,1
14.120.080.050	80-80	250	50-50	200	1200/800	29,1
14.120.080.065	80-80	250	65-65	225	1200/800	31,2
14.120.080.080	80-80	250	80-80	250	1200/800	34,0
14.120.100.025	100-100	315	25-25	140	1000/800	29,3
14.120.100.032	100-100	315	32-32	160	1000/800	30,3
14.120.100.040	100-100	315	40-40	160	1000/800	31,2
14.120.100.050	100-100	315	50-50	200	1200/800	39,0
14.120.100.065	100-100	315	65-65	225	1200/800	41,1
14.120.100.080	125-125	315	80-80	250	1200/800	43,8
14.120.100.100	100-100	315	100-100	315	1200/800	49,7
14.120.125.025	125-125	400	25-25	140	1000/900	38,0
14.120.125.032	125-125	400	32-32	160	1000/900	39,2
14.120.125.040	125-125	400	40-40	160	1000/900	40,1
14.120.125.050	125-125	400	50-50	200	1200/900	50,3
14.120.125.065	125-125	400	65-65	225	1200/900	52,6
14.120.125.080	125-125	400	80-80	250	1200/900	55,7
14.120.125.100	125-125	400	100-100	315	1400/900	70,3
14.120.125.125	125-125	400	125-125	400	1400/900	76,9
14.120.150.025	150-150	450	25-25	140	1000/900	48,2
14.120.150.032	150-150	450	32-32	160	1000/900	49,3
14.120.150.040	150-150	450	40-40	160	1000/900	50,2
14.120.150.050	150-150	450	50-50	200	1200/900	62,7
14.120.150.065	150-150	450	65-65	225	1200/900	65,0
14.120.150.080	150-150	450	80-80	250	1200/900	68,0

DOUBLE T-PIECES INSULATION SERIES 1



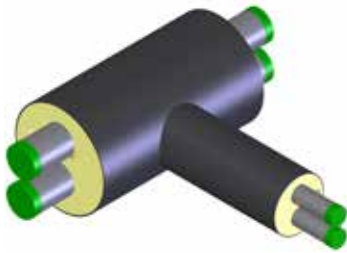
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.120.150.100	150-150	450	100-100	315	1400/900	84,8
14.120.150.125	150-150	450	125-125	400	1400/900	91,3
14.120.150.150	150-150	450	150-150	450	1400/900	99,4
14.120.200.025	200-200	560	25-25	140	1000/1000	69,7
14.120.200.032	200-200	560	32-32	160	1000/1000	72,2
14.120.200.040	200-200	560	40-40	160	1000/1000	72,0
14.120.200.050	200-200	560	50-50	200	1200/1000	89,7
14.120.200.065	200-200	560	65-65	225	1200/1000	92,2
14.120.200.080	200-200	560	80-80	250	1200/1000	95,5
14.120.200.100	200-200	560	100-100	315	1400/1000	118,1
14.120.200.125	200-200	560	125-125	400	1400/1000	125,3
14.120.200.200	200-200	560	200-200	500	1400/1000	152,4

DOUBLE T-PIECES INSULATION SERIES 2

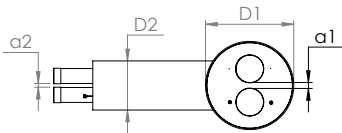
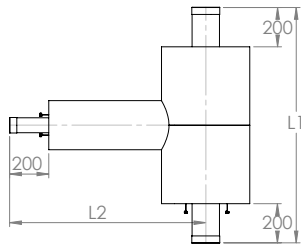


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.220.020.020	20-20	140	20-20	140	1000/800	9,4
14.220.025.020	25-25	160	20-20	140	1000/800	9,9
14.220.025.025	25-25	160	25-25	160	1000/800	10,4
14.220.032.020	32-32	180	20-20	140	1000/800	11,4
14.220.032.025	32-32	180	25-25	160	1000/800	11,9
14.220.032.032	32-32	180	32-32	180	1000/800	13,0
14.220.040.020	40-40	180	20-20	140	1000/800	12,4
14.220.040.025	40-40	180	25-25	160	1000/800	12,9
14.220.040.032	40-40	180	32-32	180	1000/800	14,1
14.220.040.040	40-40	180	40-40	180	1000/800	14,9
14.220.050.020	50-50	225	20-20	140	1000/800	15,4
14.220.050.025	50-50	225	25-25	160	1000/800	15,9
14.220.050.032	50-50	225	32-32	180	1000/800	17,0
14.220.050.040	50-50	225	40-40	180	1000/800	17,8
14.220.050.050	50-50	225	50-50	225	1200/800	22,8
14.220.065.020	65-65	250	20-20	140	1000/800	18,3
14.220.065.025	65-65	250	25-25	160	1000/800	18,7
14.220.065.032	65-65	250	32-32	180	1000/800	19,9
14.220.065.040	65-65	250	40-40	180	1000/800	20,7
14.220.065.050	65-65	250	50-50	225	1200/800	26,3
14.220.065.065	65-65	250	65-65	250	1200/800	28,5
14.220.080.025	80-80	280	25-25	160	1000/800	22,6
14.220.080.032	80-80	280	32-32	180	1000/800	23,7
14.220.080.040	80-80	280	40-40	180	1000/800	24,5
14.220.080.050	80-80	280	50-50	225	1200/800	31,1
14.220.080.065	80-80	280	65-65	250	1200/800	33,2
14.220.080.080	80-80	280	80-80	280	1200/800	36,2
14.220.100.025	100-100	355	25-25	160	1000/800	31,4
14.220.100.032	100-100	355	32-32	180	1000/800	32,4
14.220.100.040	100-100	355	40-40	180	1000/800	33,3
14.220.100.050	100-100	355	50-50	225	1200/800	41,9
14.220.100.065	100-100	355	65-65	250	1200/800	44,0
14.220.100.080	100-100	355	80-80	280	1200/800	46,9
14.220.100.100	100-100	355	100-100	355	1200/800	53,3
14.220.125.025	125-125	450	25-25	160	1000/900	41,1
14.220.125.032	125-125	450	32-32	180	1000/900	42,3
14.220.125.040	125-125	450	40-40	180	1000/900	43,3
14.220.125.050	125-125	450	50-50	225	1200/900	54,6
1.4220.125.050	125-125	450	50-50	225	1200/900	54,6
1.4220.125.065	125-125	450	65-65	250	1200/900	57,0
1.4220.125.080	125-125	450	80-80	280	1200/900	60,2
1.4220.125.100	125-125	450	100-100	355	1400/900	76,3
14.220.125.125	125-125	450	125-125	450	1400/900	83,4
14.220.150.025	150-150	500	25-25	160	1000/900	51,7
14.220.150.032	150-150	500	32-32	180	1000/900	52,9
14.220.150.040	150-150	500	40-40	180	1000/900	53,8
14.220.150.050	150-150	500	50-50	225	1200/900	67,6

DOUBLE T-PIECES
INSULATION SERIES 2

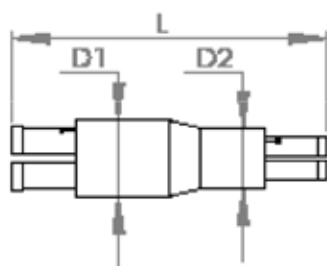


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.220.150.065	150-150	500	65-65	250	1200/900	69,9
14.220.150.080	150-150	500	80-80	280	1200/900	73,1
14.220.150.100	150-150	500	100-100	355	1400/900	91,5
14.220.150.125	150-150	500	125-125	450	1400/900	98,4
14.220.150.150	150-150	500	150-150	500	1400/900	106,7



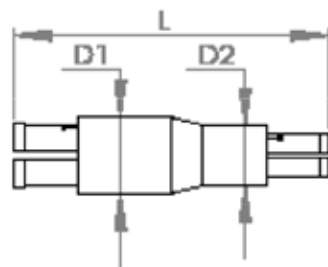
CHAPTER 3.9.4

DOUBLE REDUCTION INSULATION SERIES 1



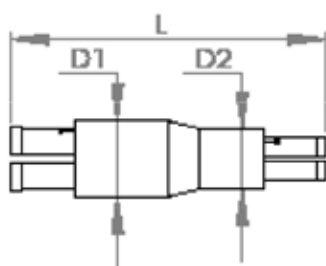
Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.4130.025.020	25-20	140/125	1000	3,2
1.4130.032.020	32-20	160/125	1000	3,6
1.4130.032.025	32-25	160/140	1000	3,8
1.4130.040.020	40-20	160/125	1000	4,0
1.4130.040.025	40-25	160/140	1000	4,2
1.4130.050.020	50-20	200/125	1000	4,8
1.4130.050.025	50-25	200/140	1000	5,0
1.4130.050.032	50-32	200/160	1000	5,4
1.4130.050.040	50-40	200/160	1000	5,8
1.4130.065.020	65-20	225/125	1000	5,6
1.4130.065.025	65-25	225/140	1000	5,8
1.4130.065.032	65-32	225/160	1000	6,2
1.4130.065.040	65-40	225/160	1000	6,6
1.4130.065.050	65-50	225/200	1000	7,3
1.4130.080.020	80-20	250/125	1000	6,7
1.4130.080.025	80-25	250/140	1000	6,8
1.4130.080.032	80-32	250/160	1000	7,3
1.4130.080.040	80-40	250/160	1000	7,7
1.4130.080.050	80-50	250/200	1000	8,4
1.4130.080.065	80-65	250/225	1000	9,2
1.4130.100.020	100-20	315/125	1000	9,2
1.4130.100.025	100-25	315/140	1000	9,4
1.4130.100.032	100-32	315/160	1000	9,8
1.4130.100.040	100-40	315/160	1000	10,2
1.4130.100.050	100-50	315/200	1000	11,0
1.4130.100.065	100-65	315/225	1000	11,8
1.4130.100.080	100-80	315/250	1000	12,9
1.4130.125.020	125-20	400/125	1500	20,0
1.4130.125.025	125-25	400/140	1500	20,3
1.4130.125.032	125-32	400/160	1500	20,9
1.4130.125.040	125-40	400/160	1500	21,6
1.4130.125.050	125-50	400/200	1500	22,8
1.4130.125.065	125-65	400/225	1500	24,1
1.4130.125.080	125-80	400/250	1500	25,8
1.4130.125.100	125-100	400/315	1500	30,0
1.4130.150.020	150-20	450/125	1500	24,9
1.4130.150.025	150-25	450/140	1500	25,2
1.4130.150.032	150-32	450/160	1500	25,9
1.4130.150.040	150-40	450/160	1500	26,6
1.4130.150.050	150-50	450/200	1500	27,7
1.4130.150.065	150-65	450/225	1500	29,0
1.4130.150.080	150-80	450/250	1500	30,8
1.4130.150.100	150-100	450/315	1500	34,9
1.4130.150.125	150-125	450/400	1500	39,9
1.4130.200.020	200-20	560/125	1500	36,0
1.4130.200.025	200-25	560/140	1500	36,3
1.4130.200.032	200-32	560/160	1500	37,0
1.4130.200.040	200-40	560/180	1500	37,7

**DOUBLE REDUCTION
INSULATION SERIES 1**



Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.4130.200.050	200-50	560/200	1500	38,8
1.4130.200.065	200-65	560/225	1500	40,1
1.4130.200.080	200-80	560/250	1500	41,9
1.4130.200.100	200-100	560/315	1500	46,0
1.4130.200.125	200-125	560/400	1500	51,0
1.4130.200.150	200-150	560/450	1500	56,0

DOUBLE REDUCTION INSULATION SERIES 2



Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.4230.025.020	25-20	160/140	1000	3,3
1.4230.032.020	32-20	180/140	1000	3,8
1.4230.032.025	32-25	180/160	1000	4,0
1.4230.040.020	40-20	180/140	1000	4,1
1.4230.040.025	40-25	180/160	1000	4,3
1.4230.050.020	50-20	225/140	1000	5,0
1.4230.050.025	50-25	225/160	1000	5,1
1.4230.050.032	50-32	225/180	1000	5,6
1.4230.050.040	50-40	225/180	1000	6,0
1.4230.065.020	65-20	250/140	1000	5,8
1.4230.065.025	65-25	250/160	1000	6,0
1.4230.065.032	65-32	250/180	1000	6,5
1.4230.065.040	65-40	250/180	1000	6,8
1.4230.065.050	65-50	250/225	1000	7,6
1.4230.080.020	80-20	280/140	1000	7,0
1.4230.080.025	80-25	280/160	1000	7,1
1.4230.080.032	80-32	280/180	1000	7,6
1.4230.080.040	80-40	280/180	1000	8,0
1.4230.080.050	80-50	280/225	1000	8,8
1.4230.080.065	80-65	280/250	1000	9,6
1.4230.100.020	100-20	355/140	1000	9,7
1.4230.100.025	100-25	355/160	1000	9,8
1.4230.100.032	100-32	355/180	1000	10,3
1.4230.100.040	100-40	355/180	1000	10,7
1.4230.100.050	100-50	355/225	1000	11,5
1.4230.100.065	100-65	355/250	1000	12,3
1.4230.100.080	100-80	355/280	1000	13,5
1.4230.125.020	125-20	450/140	1500	21,1
1.4230.125.025	125-25	450/160	1500	21,4
1.4230.125.032	125-32	450/180	1500	22,1
1.4230.125.040	125-40	450/180	1500	22,7
1.4230.125.050	125-50	450/225	1500	24,0
1.4230.125.065	125-65	450/250	1500	25,4
1.4230.125.080	125-80	450/280	1500	27,2
1.4230.125.100	125-100	450/355	1500	31,7
1.4230.150.020	150-20	500/140	1500	26,2
1.4230.150.025	150-25	500/160	1500	26,5
1.4230.150.032	150-32	500/180	1500	27,3
1.4230.150.040	150-40	500/180	1500	27,9
1.4230.150.050	150-50	500/225	1500	29,2
1.4230.150.065	150-65	500/250	1500	30,6
1.4230.150.080	150-80	500/280	1500	32,4
1.4230.150.100	150-100	500/355	1500	36,9
1.4230.150.125	150-125	500/450	1500	42,2

CHAPTER 3.9.5

TRANSITION FORK DOUBLE TO SINGLE INSULATION SERIES 1



Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D [mm]	Steel Pipe DN	Casing pipe D [mm]		
1.4121.020	20	125	20	90	1000/300	6,0
1.4121.025	25	140	25	90	1000/300	7,8
1.4121.032	32	160	32	110	1000/320	9,8
1.4121.040	40	160	40	110	1000/320	10,6
1.4121.050	50	200	50	125	1200/340	15,4
1.4121.065	65	225	65	140	1200/340	19,2
1.4121.080	80	250	80	160	1200/400	24,5
1.4121.100	100	315	100	200	1400/420	40,4
1.4121.125	125	400	125	225	1400/450	59,3
1.4121.150	150	450	150	250	1400/500	81,3
1.4121.200	200	560	200	315	1600/600	125,4

* Please contact Set Pipes technical department for different types of connections.

TRANSITION FORK DOUBLE TO SINGLE INSULATION SERIES 2

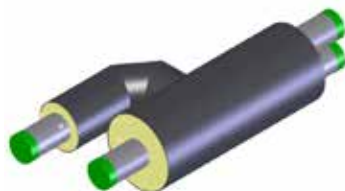


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D [mm]	Steel Pipe DN	Casing pipe D [mm]		
1.4221.020	20	140	20	110	1000/300	6,5
1.4221.025	25	160	25	110	1000/300	8,4
1.4221.032	32	180	32	125	1000/320	10,6
1.4221.040	40	180	40	125	1000/320	11,4
1.4221.050	50	225	50	140	1200/340	16,6
1.4221.065	65	250	65	150	1200/340	20,7
1.4221.080	80	280	80	180	1200/400	26,5
1.4221.100	100	355	100	225	1400/420	43,6
1.4221.125	125	450	125	250	1400/450	64,0
1.4221.150	150	500	150	280	1400/500	87,8

* Please contact Set Pipes technical department for different types of connections.

CHAPTER 3.9.6

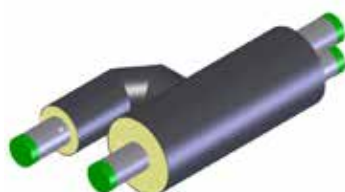
TRANSITION Y FROM DOUBLE TO SINGLE INSULATION SERIES 1



Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D [mm]	Steel Pipe DN	Casing pipe D [mm]		
1.4122.020	20	125	20	90	1000/300	6,8
1.4122.025	25	140	25	90	1000/300	8,8
1.4122.032	32	160	32	110	1000/320	11,1
1.4122.040	40	160	40	110	1000/320	12,0
1.4122.050	50	200	50	125	1200/340	17,3
1.4122.065	65	225	65	140	1200/340	21,5
1.4122.080	80	250	80	160	1200/400	27,2
1.4122.100	100	315	100	200	1400/420	42,7
1.4122.125	125	400	125	225	1400/450	62,0
1.4122.150	150	450	150	250	1400/500	80,3
1.4122.200	200	560	200	315	1600/600	120,9

* Please contact Set Pipes technical department for different types of connections.

TRANSITION Y FROM DOUBLE TO SINGLE INSULATION SERIES 2



Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D [mm]	Steel Pipe DN	Casing pipe D [mm]		
1.4222.020	20	140	20	110	1000/300	7,4
1.4222.025	25	160	25	110	1000/300	9,5
1.4222.032	32	180	32	125	1000/320	12,0
1.4222.040	40	180	40	125	1000/320	13,0
1.4222.050	50	225	50	140	1200/340	18,7
1.4222.065	65	250	65	160	1200/340	23,3
1.4222.080	80	280	80	180	1200/400	29,4
1.4222.100	100	355	100	225	1400/420	46,1
1.4222.125	125	450	125	250	1400/450	67,0
1.4222.150	150	500	150	280	1400/500	86,7

* Please contact Set Pipes technical department for different types of connections.

CHAPTER 3.9.7

TRANSITION Y FROM DOUBLE TO SINGLE INSULATION SERIES 1



Art no.	Main pipe		Branch		Length L1/L2 [mm]	C-C [mm]	L3 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D [mm]	Steel Pipe DN	Casing pipe D [mm]				
1.4123.020	20	125	20	90	1200/800	300	805	10,4
1.4123.025	25	140	25	90	1200/800	300	805	13,0
1.4123.032	32	160	32	110	1200/800	320	775	16,4
1.4123.040	40	160	40	110	1200/800	320	775	17,8
1.4123.050	50	200	50	125	1200/800	340	747	24,6
1.4123.065	65	225	65	140	1200/800	340	740	30,5
1.4123.080	80	250	80	160	1200/800	400	670	38,8
1.4123.100	100	315	100	200	1400/800	420	830	58,5
1.4123.125	125	400	125	225	1400/800	450	788	74,8
1.4123.150	150	450	150	250	1600/1000	500	925	98,9
1.4123.200	200	560	200	315	1600/1000	600	792	145,2

* Please contact Set Pipes technical department for different types of connections.

TRANSITION Y FROM DOUBLE TO SINGLE INSULATION SERIES 2



Art no.	Main pipe		Branch		Length L1/L2 [mm]	C-C [mm]	L3 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D [mm]	Steel Pipe DN	Casing pipe D [mm]				
1.4223.020	20	140	20	110	1200/800	300	795	11,2
1.4223.025	25	160	25	110	1200/800	300	795	14,1
1.4223.032	32	180	32	125	1200/800	320	768	17,7
1.4223.040	40	180	40	125	1200/800	320	768	19,2
1.4223.050	50	225	50	140	1200/800	340	740	26,6
1.4223.065	65	250	65	160	1200/800	340	730	33,0
1.4223.080	80	280	80	180	1200/800	400	660	41,9
1.4223.100	100	355	100	225	1400/800	420	818	63,1
1.4223.125	125	450	125	250	1400/800	450	775	80,8
1.4223.150	150	500	150	280	1600/1000	500	910	106,8

* Please contact Set Pipes technical department for different types of connections.

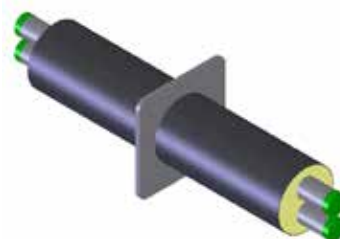
CHAPTER 3.9.8

DOUBLE ANCHOR INSULATION SERIES 1

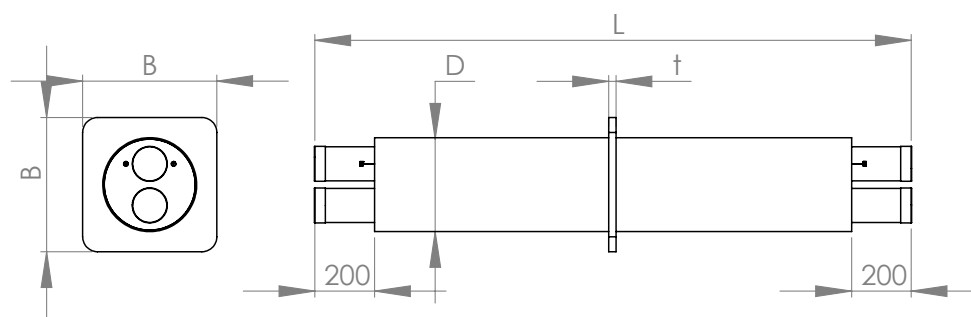


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Anchor plate		Weight [kg/pc]
				B [mm]	t [mm]	
1.4140.020	20-20	125	2000	260	20	18,3
1.4140.025	25-25	125	2000	260	20	19,9
1.4140.032	32-32	160	2000	260	20	23,1
1.4140.040	40-40	160	2000	300	25	31,4
1.4140.050	50-50	200	2000	300	25	37,4
1.4140.065	65-65	225	2000	340	25	47,5
1.4140.080	80-80	250	2000	400	25	63,0
1.4140.100	100-100	315	2000	450	25	86,2
1.4140.125	125-125	400	2000	560	30	133,7
1.4140.150	150-150	450	2000	600	30	163,0
1.4140.200	200-200	560	2000	710	30	233,6

DOUBLE 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]	
1.4240.020	20-20	140	2000	260	20	18,7
1.4240.025	25-25	140	2000	260	20	20,3
1.4240.032	32-32	180	2000	300	25	30,8
1.4240.040	40-40	200	2000	300	25	33,0
1.4240.050	50-50	225	2000	340	25	43,5
1.4240.065	65-65	250	2000	400	25	57,5
1.4240.080	80-80	280	2000	450	25	73,0
1.4240.100	100-100	355	2000	450	25	89,1
1.4240.125	125-125	450	2000	710	30	183,2
1.4240.150	150-150	500	2000	780	25	203,7



CHAPTER 3.9.9

DOUBLE VALVE INSULATION SERIES 1



Art no.	Steel Pipe DN	Casing pipe D [mm]	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.4145.025	25-25	140	111	1700	15,6
1.4145.032	32-32	160	123	1700	19,1
1.4145.040	40-40	160	133	1700	21,2
1.4145.050	50-50	200	152	1700	29,0
1.4145.065	65-65	225	165	1700	36,0
1.4145.080	80-80	250	184	1900	50,9
1.4145.100	100-100	315	209	2200	91,9
1.4145.125	125-125	400	241	2200	127,0
1.4145.150	150-150	450	282	2600	202,4
1.4145.200	200-200	560	336	2600	310,9

DOUBLE VALVE INSULATION SERIES 2



Art no.	Steel Pipe DN	Casing pipe D [mm]	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.4245.025	25-25	160	111	1700	16,8
1.4245.032	32-32	180	123	1700	20,5
1.4245.040	40-40	180	133	1700	22,5
1.4245.050	50-50	225	152	1700	31,2
1.4245.065	65-65	250	165	1700	38,5
1.4245.080	80-80	280	184	1900	55,0
1.4245.100	100-100	355	209	2200	101,0
1.4245.125	125-125	450	241	2200	141,1
1.4245.150	150-150	500	282	2600	224,4

DOUBLE VALVE – 1 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]
1.4146.025	25-25	140	25	382	1700	17,3
1.4146.032	32-32	160	25	388	1700	19,1
1.4146.040	40-40	160	25	401	1700	21,2
1.4146.050	50-50	200	40	411	1700	29,0
1.4146.065	65-65	225	40	415	1700	36,0
1.4146.080	80-80	250	40	426	1900	50,9
1.4146.100	100-100	315	40	450	2200	91,9
1.4146.125	125-125	400	40	455	2200	127,0
1.4146.150	150-150	450	40	475	2600	202,4
1.4146.200	200-200	560	50	520	2600	310,9

DOUBLE VALVE – 1 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]
1.4246.025	25-25	160	25	382	1700	17,8
1.4246.032	32-32	180	25	388	1700	20,5
1.4246.040	40-40	180	25	401	1700	22,5
1.4246.050	50-50	225	40	411	1700	31,2
1.4246.065	65-65	250	40	415	1700	38,5
1.4246.080	80-80	280	40	426	1900	55,0
1.4246.100	100-100	355	40	450	2200	101,0
1.4246.125	125-125	450	40	455	2200	141,1
1.4246.150	150-150	500	40	475	2600	224,4

DOUBLE VALVE – 2 SERVICE VALVE INSULATION SERIES 1



Art no.	Steel Pipe DN	Casing pipe D1 [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.4147.025	25	140	25	382	1700	19,1
1.4147.032	32	160	25	388	1700	22,7
1.4147.040	40	160	25	401	1700	24,8
1.4147.050	50	200	40	411	1700	35,0
1.4147.065	65	225	40	415	1700	42,0
1.4147.080	80	250	40	426	1900	57,0
1.4147.100	100	315	40	450	2200	98,1
1.4147.125	125	400	40	455	2200	133,2
1.4147.150	150	450	40	475	2600	208,8
1.4147.200	200	560	50	520	2600	320,3

DOUBLE VALVE – 2 SERVICE VALVE INSULATION SERIES 2



Art no.	Steel Pipe DN	Casing pipe D1 [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.4247.025	25	160	25	382	1700	20,3
1.4247.032	32	180	25	388	1700	24
1.4247.040	40	180	25	401	1700	26,1
1.4247.050	50	225	40	411	1700	37,2
1.4247.065	65	250	40	415	1700	44,5
1.4247.080	80	280	40	426	1900	61,1
1.4247.100	100	355	40	450	2200	107,3
1.4247.125	125	450	40	455	2200	147,4
1.4247.150	150	500	40	475	2600	230,8

