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CHAPTER 1.0
THE COMPANY

The company Steypuiðjan began its production with concrete pipes for sewage in 1968. Ten years later the company changed its name to Set Pipes and began manufacturing pre-insulated steel pipes and fittings for district heating networks. In 1980 the production of PE casing pipes for insulated district heating pipes, PE water pipes, PP snow-melting pipes, PVC cable conduit pipes and PVC sewage- and drainage pipes began. In 2006 Set Pipes started production of pre-insulated flexible coiled pipes for district heating. Set Pipes also supplies a wide range of accessories and fittings from well-known producers within the market.

Set Pipes is a privately run family business and not on the stock market, despite the huge success on the domestic and export markets in recent years.

FIG. 1.0.1
Aerial photograph of Selfoss, the hometown of Set Pipes in Iceland

FIG. 1.0.2
Aerial photograph of Haltern am See, the hometown of Set Pipes in Germany

The company has invested continuously towards internal technology and worked on numerous development projects placing great emphasis on staff training and education. Ensuring a strong team of qualified staff is by far the most important resource of the company within the competition that prevails in the manufacturing of pre-insulated pipes.

All production departments of Set Pipe companies, follow strict guidelines regarding production methods, approved raw material, and trained personnel, internal and external quality control to ensure good and uniform product quality according to ISO 9001.

FIG. 1.0.3
Bending test device. Test device made by Set Pipes for accurate determination of bending forces in flexible district heating pipes

Continuous development in the research for environmentally friendly energy solutions and greater emphasis on protecting and utilizing heat energy as much as possible, allows Set Pipes the opportunity to participate in the protection of nature and its resources. More effective building insulation is an important factor, and the insulation quality of district heating lines are vital for energy efficiency, meaning a significant reduction of emission and pollution.

CHAPTER 1.1
INTRODUCTION

This book describes the properties of district heating pipes from Set Pipes and is aimed to give further technical information regarding the product properties, handling and installation of various district heating products.

DISCLAIMER

All efforts have been made to ensure all contents of this book are correct. However, Set Pipes assume no responsibility, or liability due to errors. Calculations, designs and graphs shown are only aimed to give a simplified idea of pipe line networks. Please contact our technical department or specialized engineering services for accurate calculations. Changes may be made to certain parts within the book and will be published on the company's web page: *www.set.is*, *www.setpipes.de* and *www.setpipes.com*. All rights reserved.

CHAPTER 1.2
QUALITY

Set Pipes guarantee quality standard and production monitoring to ensure customers long lasting products. The success of the company is not only based on its competent employers and working environment, but also in the product quality. Set Pipes is certified in accordance to the ISO 9001 standard, which continually monitors and manages quality through all operations of the production and service. Various testing is carried out as well as regular auditing of the quality system. Set Pipes monitors the utilization of raw material and recycles in accordance with ISO 14001.

The following institutions are responsible for the certification and regulation of Set Pipes.

CHAPTER 1.3
APPLICATION ASSUMPTIONS

Calculations and installation guidelines comply with the technical requirements of the EN 13941, EN 253, EN 448 and EN 488 standards. Missing calculation factors in EN 13941 can be determined conventionally.

All effort has been made to ensure instruction accuracy, for possible discrepancies please inform at Set Pipes email address: *set@set.is*

A detailed understanding of equations and technical regulation is necessary when calculations are made according to the following guidelines. They do not replace an engineer's assessment. Set Pipes is not responsible for the reader's use of this book.

CHAPTER 1.4
PIPE SELECTION

When choosing material for district heating systems, certain criteria must be followed to ensure the correct choices for each application. The following table shows characteristics of individual product categories:

TABLE 1.4.1
Properties of each product category

Product category	Temperature resistance CCOT	Maximum pressure	Estimated flow
Pre-insulated steel pipes	161°C	16 bar	0,300 - 560 l/s
Pre-insulated steel pipes with PIR foam	175°C	16 bar	0,300 - 440 l/s
EliSteel	120°C	16 bar	0,200 - 0,400 l/s
EliPex	95°C	6 and 10 bar	0,200 - 100 l/s
EliCopp	120°C	16 bar	0,100 - 0,400 l/s

The meaning of “CCOT” is the temperature stability of the foam over a period of 30 years. Other points affect the lifespan of district heating systems, design in accordance to conditions plays a vital role along with the handling of movement due to thermal expansion.

Designing stages can be divided into four main groups:

Heating requirement, determination of pipe size	Q	[W]
Pressure drop determination	Δp_{Pipe}	[Pa/m]
Heat loss determination	q	[W/m]
Expansion determination	ΔL	[m]

Set Pipes can assist with pipe dimension choices, cost estimates and heat loss calculations. Generally, customers bring a calculated heat requirement from an engineering specialist where the needs for the complete system have been determined. If the heat loss and water need are not correctly determined and calculated it can lead to colder water due to slower flow or too much pressure drop due to incorrect pipe dimension.

The correct pipe dimension can be found once the heat requirement is determined.

Pressure drop is calculated between a range of 100 – 200 Pa/m for DN < 150 pipes and 100 – 150 Pa/m for DN ≥ 150 pipes. (page 4).

This is a variable that influences the initial costs and pumping cost. Set Pipes can supply customers with a program for determining the correct pipe dimension based on heat output. Heat loss is a deciding factor in the design of district heating systems.

THE FOLLOWING FACTORS HAVE THE MOST IMPACT ON HEAT LOSS:

- Thermal conductivity of the insulation
- Insulation series
- Pipe laying and Trench work
- Water flow temperature
- Ground temperature
- Condition and density of the ground

Expansion has a significant effect on the service life of the district heating pipes. In order to avoid undesirable expansion, the use of compensators or expansions loops is advised. Thermal expansion in the steel pipe which can in turn damage the casing pipe or insulation foam and is the leading cause of defects in district heating systems. Expansion calculations are not needed for our flexible pipes.

CERTAIN CRITERIA SHOULD BE CONSIDERED FOR THE EXPANSION CALCULATION:

- Flow temperature
- Soil height above pipe
- Heating and cooling fluctuation throughout the service lifespan of the system
- Wall thickness of steel pipe
- Assembly of the fittings

CHAPTER 1.5
STANDARDS

PRE-INSULATED DISTRICT HEATING PIPES FROM SET PIPES ARE MANUFACTURED IN ACCORDANCE TO THE FOLLOWING EUROPEAN STANDARDS:

EN 253 - District heating pipes – Pre-insulated bonded pipe systems for directly buried hot water networks - Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene.

EN 448 - District heating pipes –Pre-insulated bonded pipe systems for directly buried hot water networks – Fitting assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.

EN 488 - District heating pipes – Pre-insulated bonded pipe systems for directly buried hot water networks - Steel valve assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.

EN 489 - District heating pipes –Pre-insulated bonded pipe systems for directly buried hot water networks - Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.

EN 13941 - Design and installation of pre-insulated bonded pipe systems for district heating.

EN 14419 - District heating pipes – Pre-insulated bonded pipe systems for directly buried hot water networks – Surveillance systems.

EN 15698 - District heating pipes – Pre-insulated bonded twin pipe systems for directly buried hot water networks.

EN ISO 9001 - Quality management systems.

EN ISO 14001 - Environmental management systems.

AGFW FW 401 - Design and installation of pre-insulated bonded pipes for district heating networks.

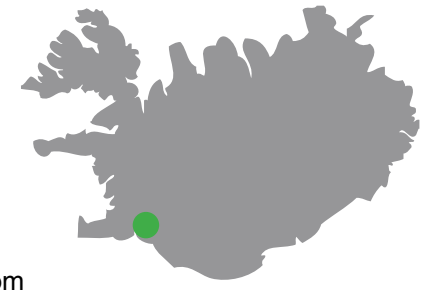
The standards listed above do not represent an exhaustive list, many other standards relate to our product manufacturing in one way or another. Individual countries have additional standards that Set Pipes can use in cooperation with the customer. All information in this manual are based on the relevant EN standards.

CHAPTER 1.6
COMPANY LOCATIONS

ICELAND - SET EHF.

Eyravegur 41,
800 Selfoss

+354 480 2700
+354 482 2099
set@set.is
www.set.is / www.setpipes.com



GERMANY - SET PIPES GMBH

Zum Ikenkamp 8,
D-45721 Haltern Am See

+49 (0) 2364 508894-0
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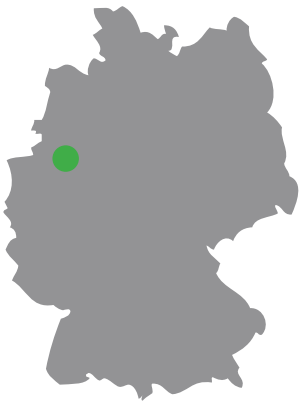
info@setpipes.de
www.setpipes.de



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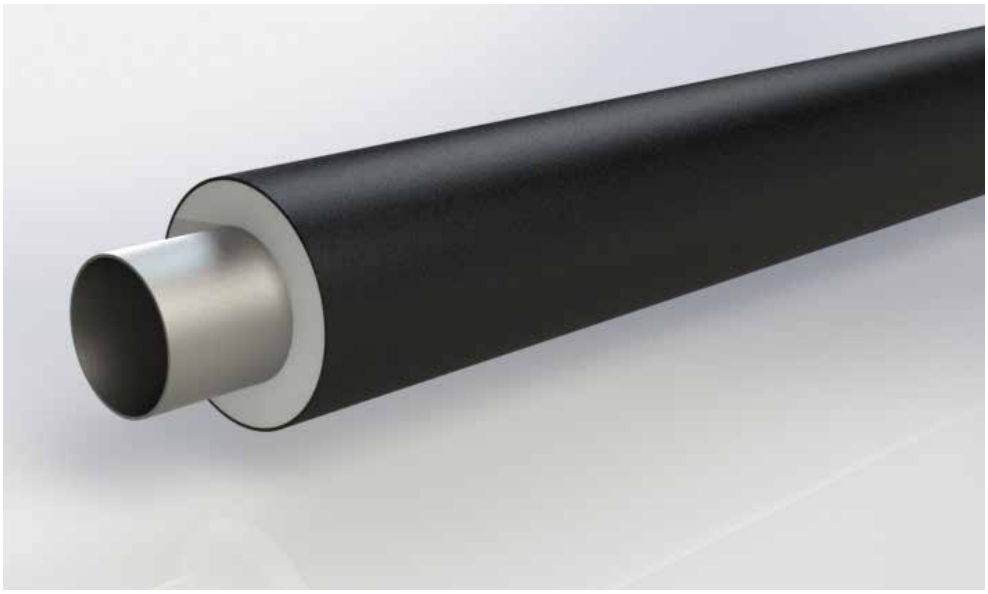
CHAPTER 2.0
PRE-INSULATED SINGLE STEEL PIPES



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]
- ρw = 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:

$$\dot{m} = \frac{14000\ W}{978\ \frac{kg}{m^3} \cdot 4191\ \frac{J}{kg \cdot K} \cdot 40K} = 85{,}4x10^{-6}\ \frac{m^3}{s} = \mathbf{0{,}0854\ \frac{l}{s}}$$

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:

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

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]
- ρw = 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:

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

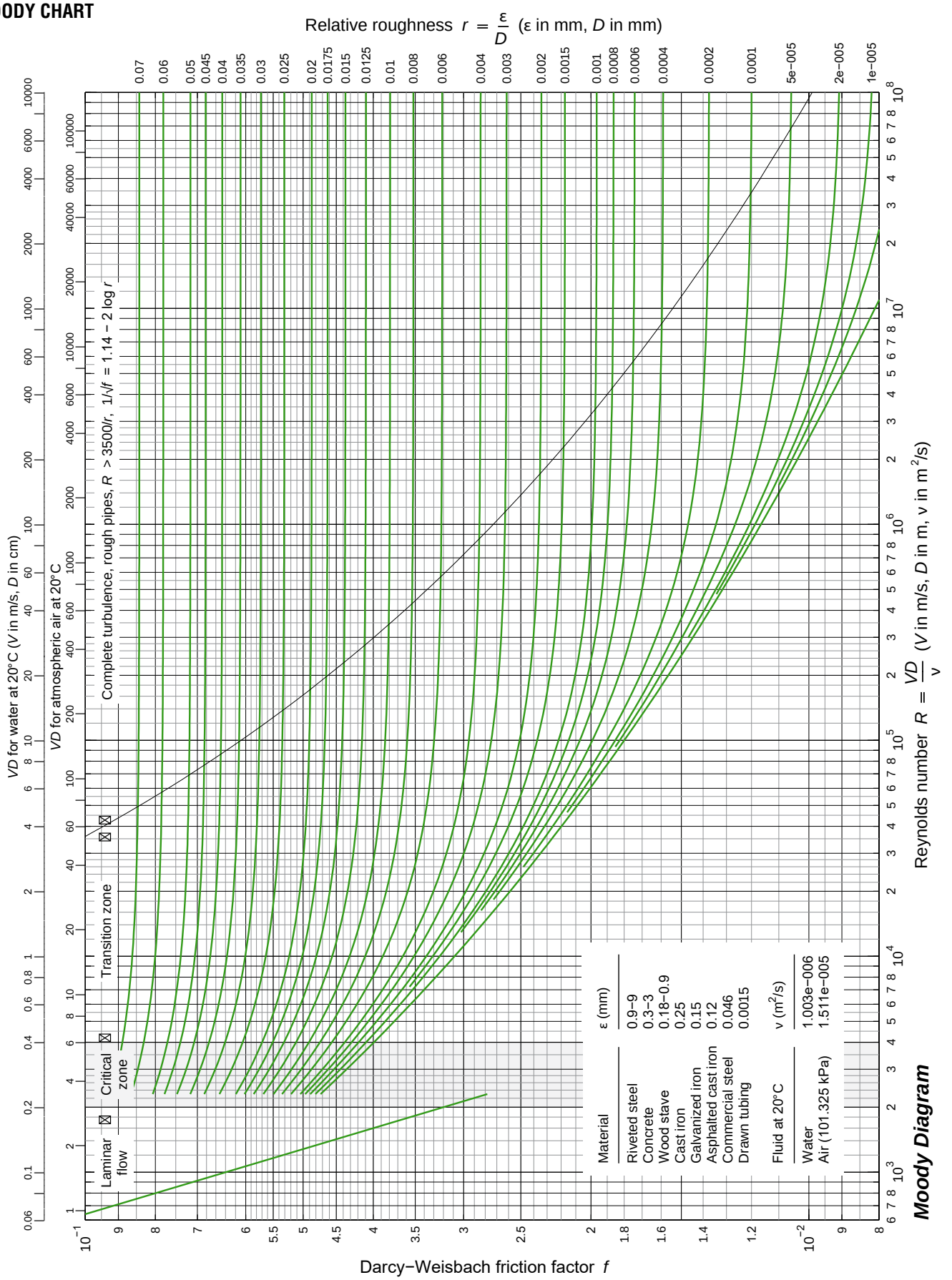
THUS:

ν = Kinematic viscosity for water: 0,366 x 10^{-6} m^2/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.

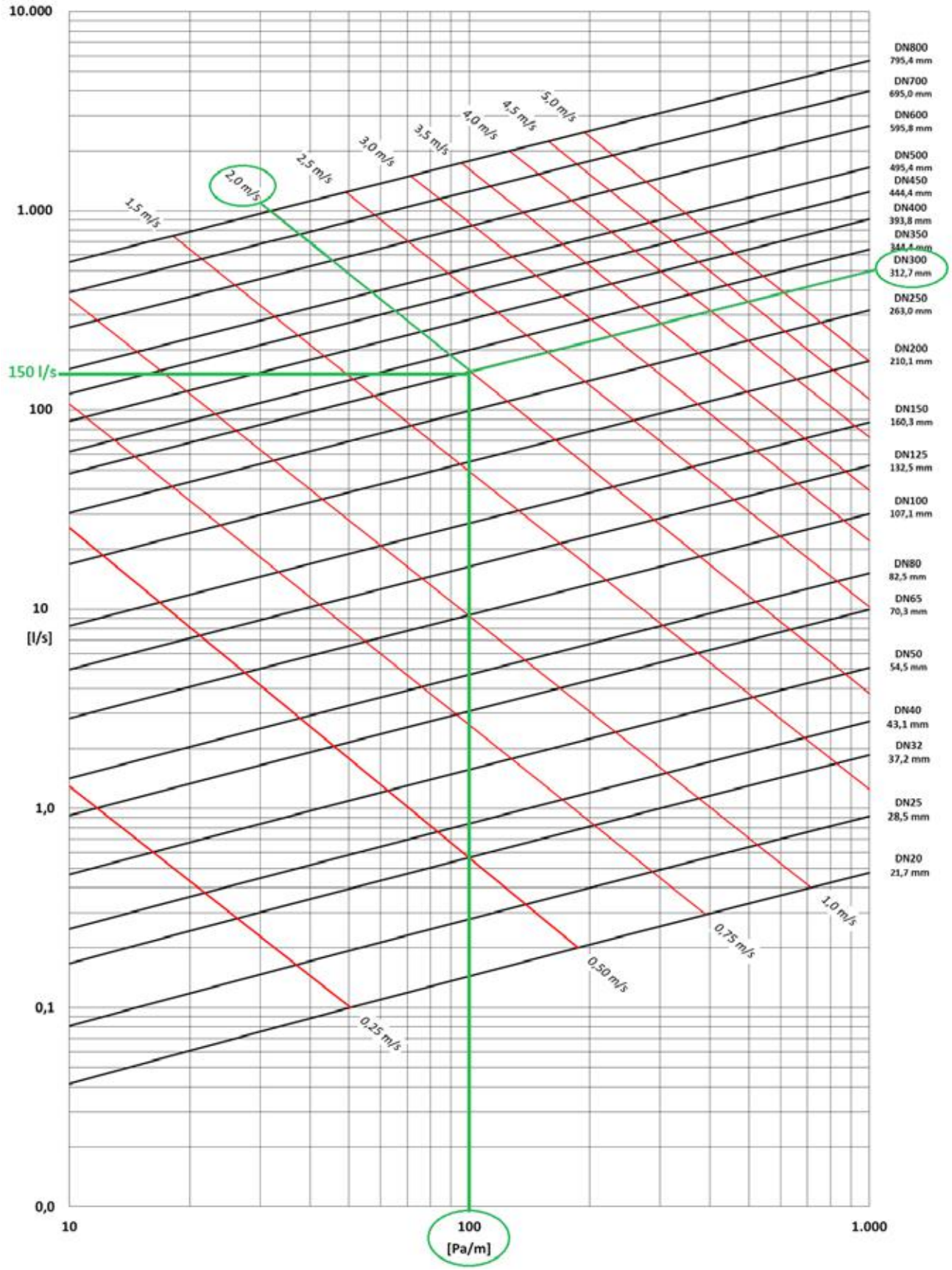
Graph 2.1.1.2 shows pressure loss in a single flow pipe taking into consideration water need, pipe dimension, and average water velocity. Also there is an example on how to use the graph.

GRAPH 2.1.1.1
MOODY CHART

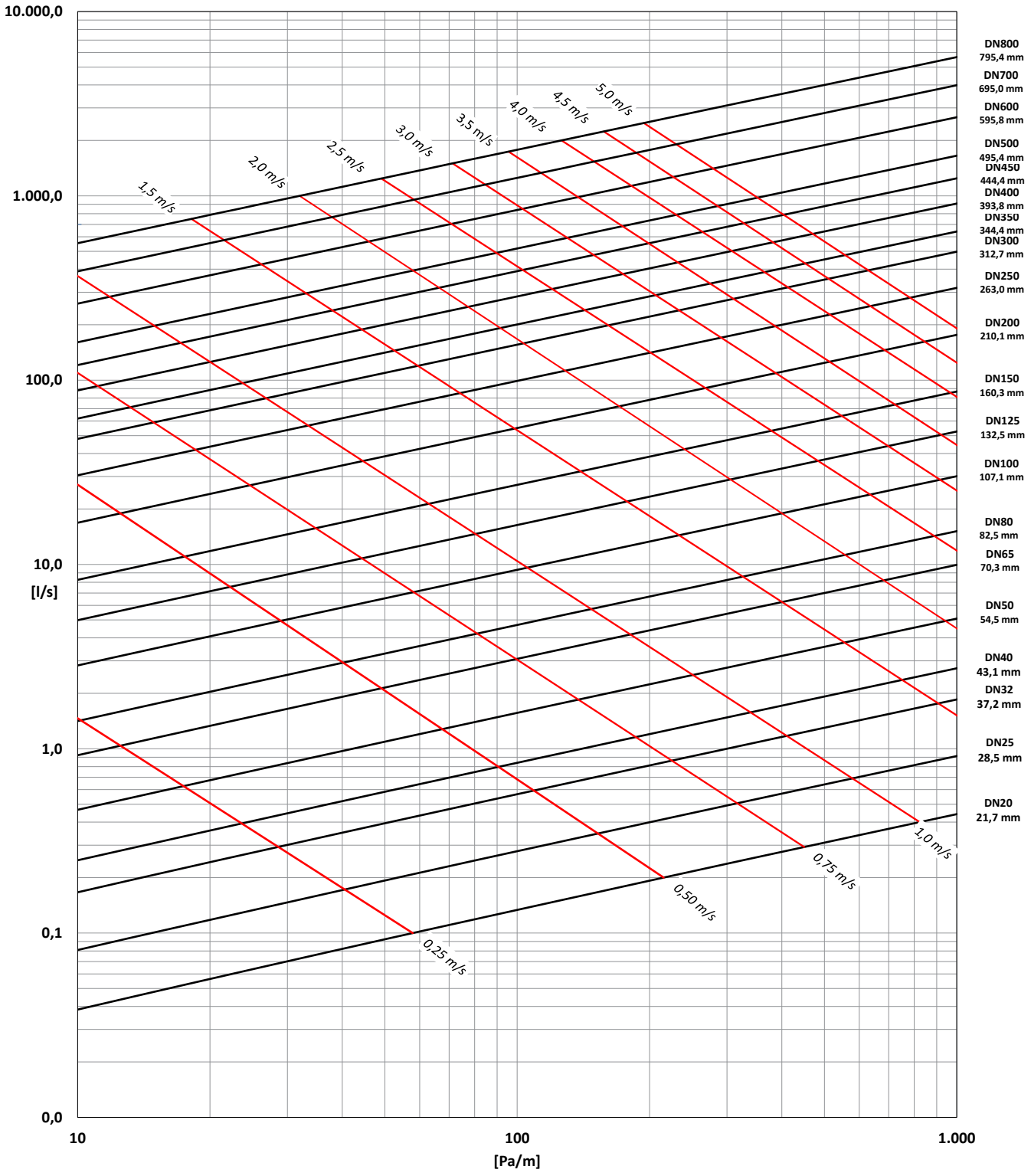


AN EXAMPLE HOW TO USE THE PRESSURE LOSS GRAPH

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:

$$\Delta L = \alpha \cdot \Delta T \cdot L \; [mm]$$

THUS:

L = Total length of the steel pipe [mm]

α = Expansion coefficient for steel = 12,6 x 10^{-6} 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:

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

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						
	[mm²]	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/m^3
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 [mm^2]

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

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

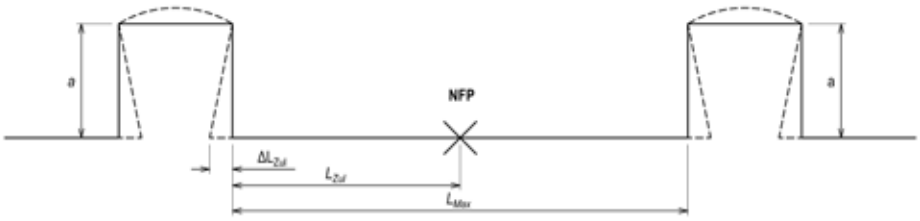


FIG 2.1.4.1
Maximum length between expansion

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 continously 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 resisteance (R) for each material which is then used to calculate overall heat loss coefficient ($U_{pipe\ in\ ground}$).

THERMAL RESISTANCE OF STEEL PIPE

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

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

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

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

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

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:

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

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 insolence 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 $m^2 \cdot K/W$

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:

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

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:

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

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

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

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 [m]

$U_{Rör\ í\ jörð}$ = 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	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]

$U_{Rör\ í\ jörð}$ = 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	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]

$U_{Rör\ í\ jörð}$ = 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

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.

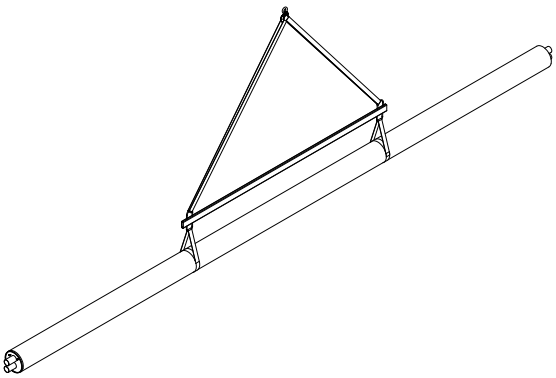


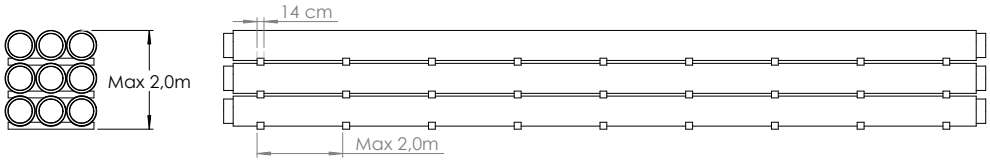
FIG 2.2.1
LOADING WITH SLINGS
Use wide nylon web slings while loading and for further handling. Ropes, chains or other lifting equipment are prohibited

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).

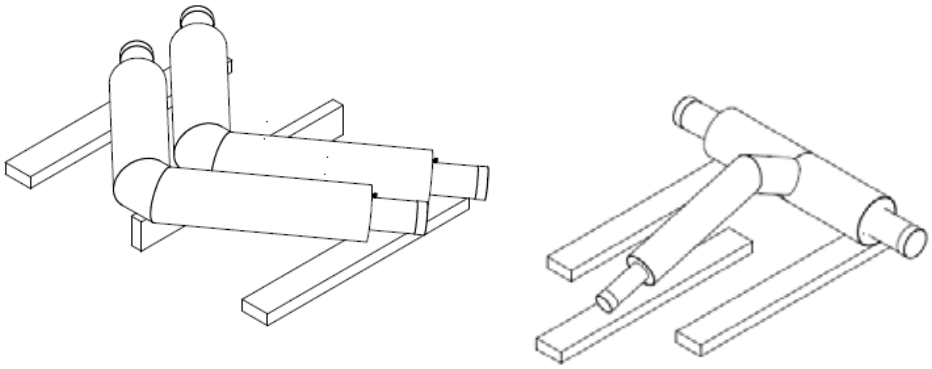
FIG 2.2.2
STACKS WITH WOODEN SPACING STRIPS
Stack pipes so the maximum. pressure does not exceed <0,3 N/mm² or 3 kg/cm²



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

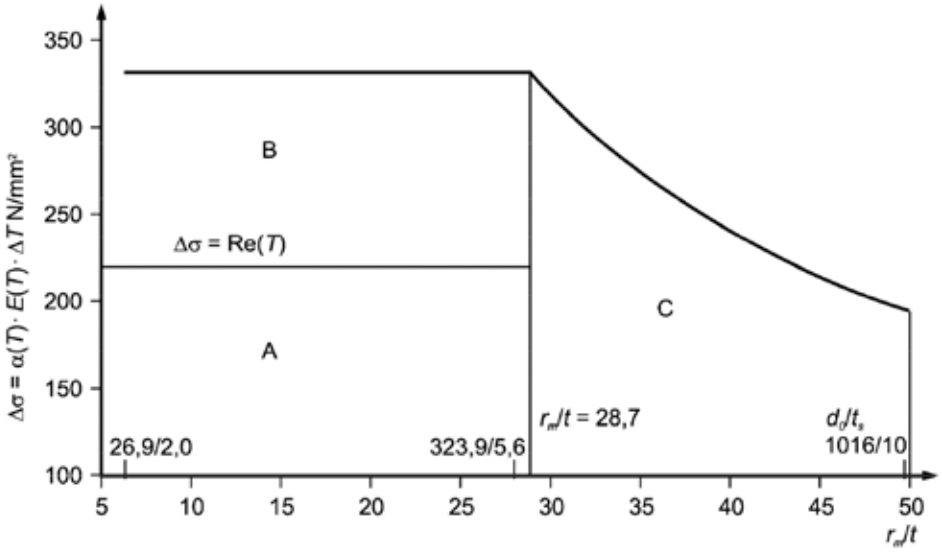
EXPANSION FACTORS

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°C and is then classified in class A. In class B the axial stresses are high and temperature is between 85° < T < 130°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/mm^2]
E_{St} = Modulus of elasticity for steel = 210 GPa
α = Expansion coefficient for steel = 12,6 x 10^{-6} 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

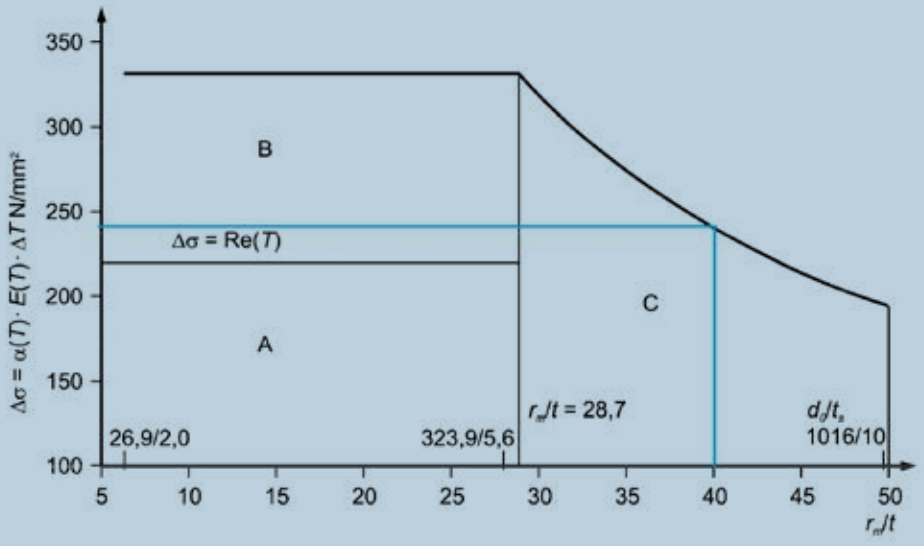
$r_{m/t}$ = Diameter and wall thickness ratio

DN	d_0 [mm]	t [mm]	T_{VL} [°C]	ΔT [K]	σ [N/mm²]	$r_{m/t}$	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.

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

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



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°C. Expansion foam pads on bends are needed in order to absorb movement.

FIG 2.3.2.1
U and Z compensators

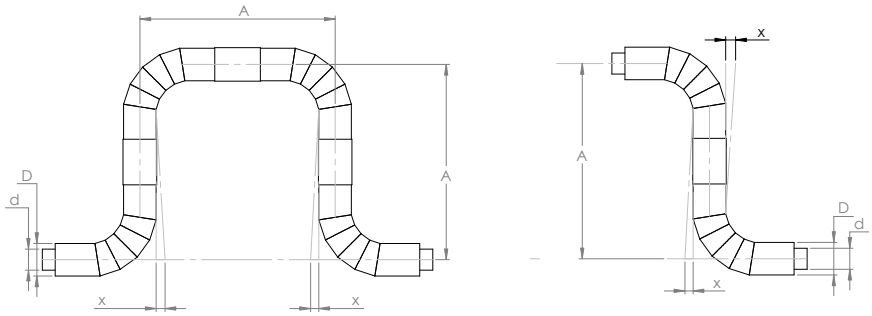


TABLE 2.3.2.1
Maximum length between expansions for double pipe [m] series 1

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.

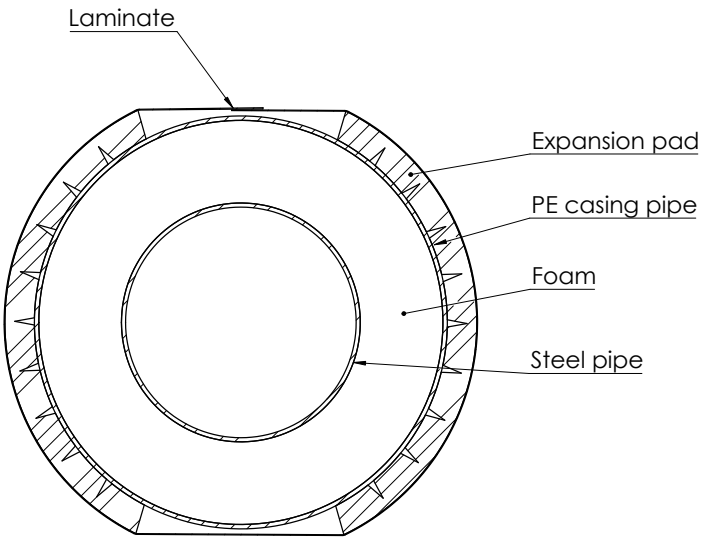
TABLE 2.3.3.1
Cutting size of expansion foam pad

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



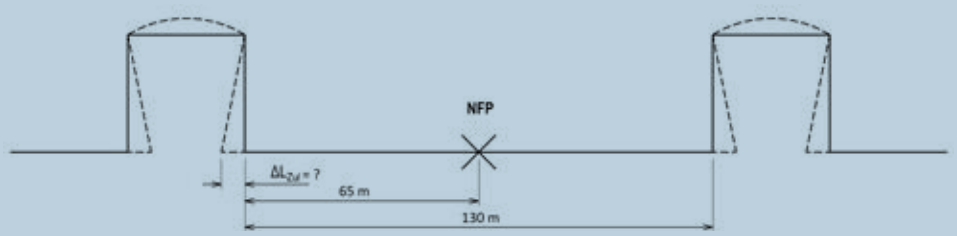
To determine the thickness of the expansion foam pad needed it is necessary to know how much extension ΔL is occurring by using the following equation:

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

THUS:

ΔL_{zul} = Extension of the steel pipe [m]
α = Expansion coefficient for steel = 12,6 x 10^{-6} K^{-1}
ΔT = Starting temperature – finishing temperature [°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.



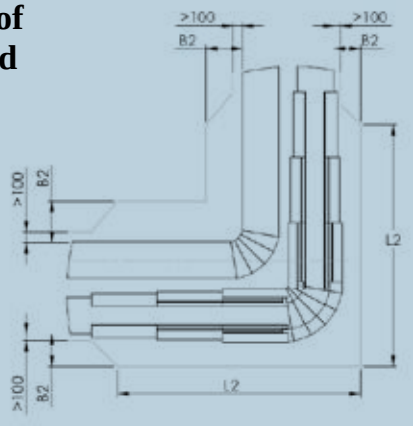
Using the following equation:

$$\Delta L_{zul} = 12{,}6x10^{-6}\ K^{-1} \cdot (105 - 10)°C \cdot 65m - \left(\frac{5730\ N \cdot (65m)^2}{2 \cdot 2{,}0647x10^{-3}\ m^2 \cdot 2{,}1x10^{12}\ \frac{N}{m^3}} \right)$$

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

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:

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



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 [mm2]	[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

CHAPTER 2.3.4
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 (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 ± strain the following equations are used:

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

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 x 10^{-6} 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.

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

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

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

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

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

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

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 ±152 N/mm².

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]

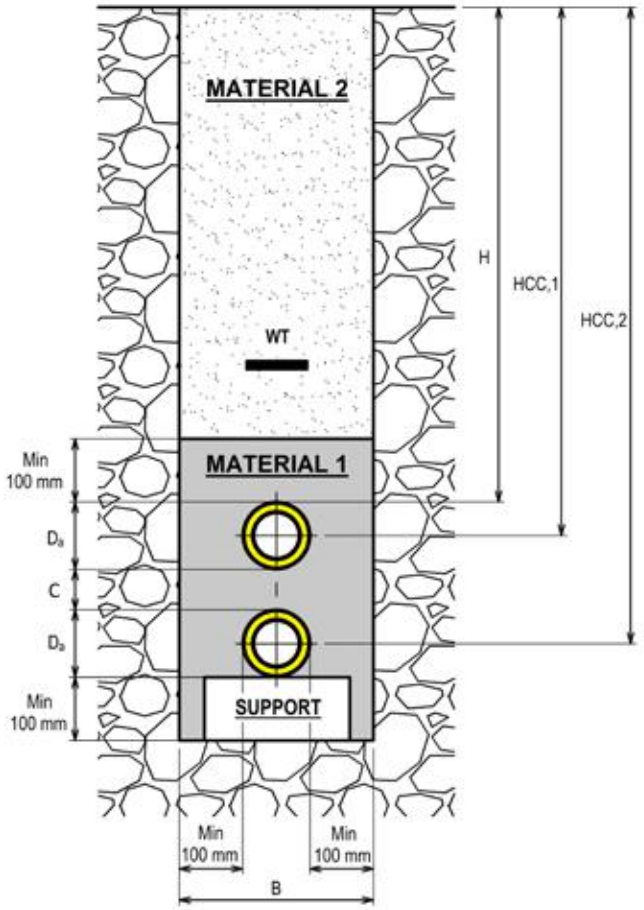


TABLE 2.3.7.1
Minimum trench width with vertical parallel pipes [mm]

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

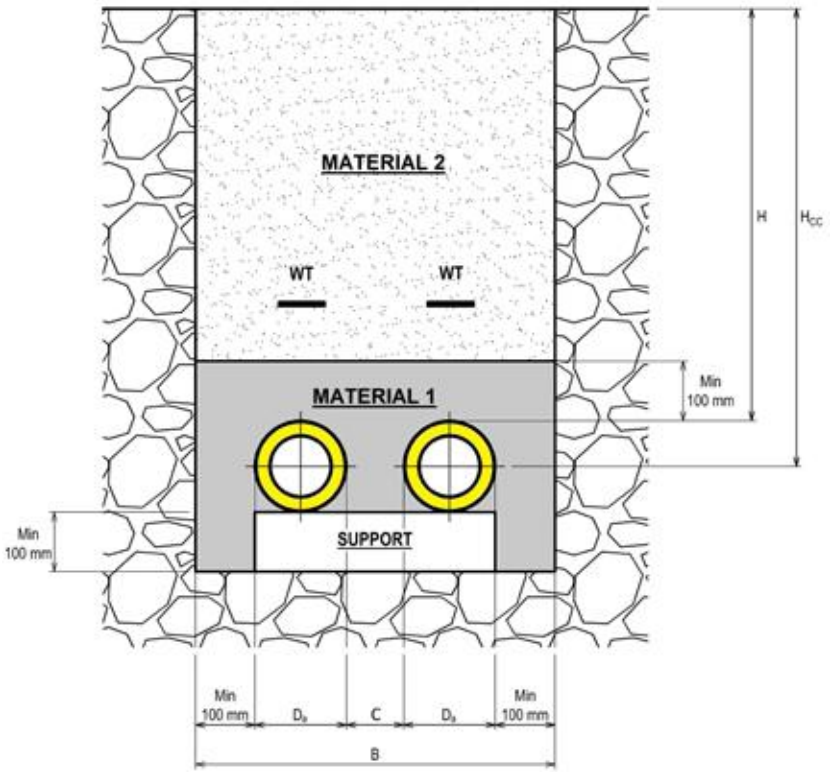


TABLE 2.3.7.2
Minimum trench width with horizontal parallel pipes [mm]

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	$^{d60}/_{d10} > 1,8$

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 similtaneously 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/cm^2. 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

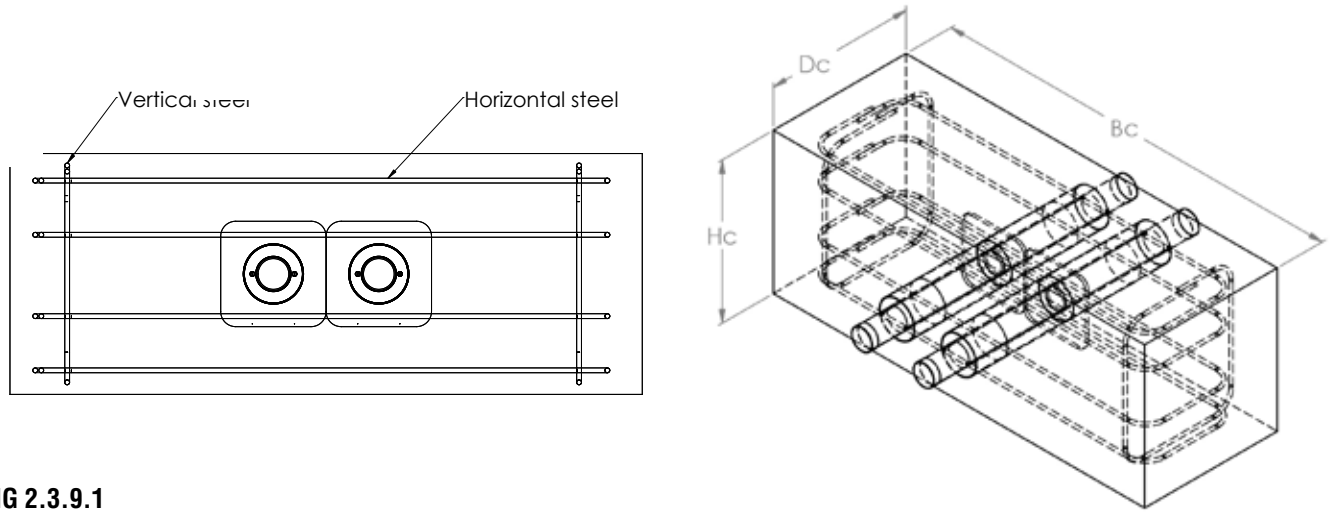


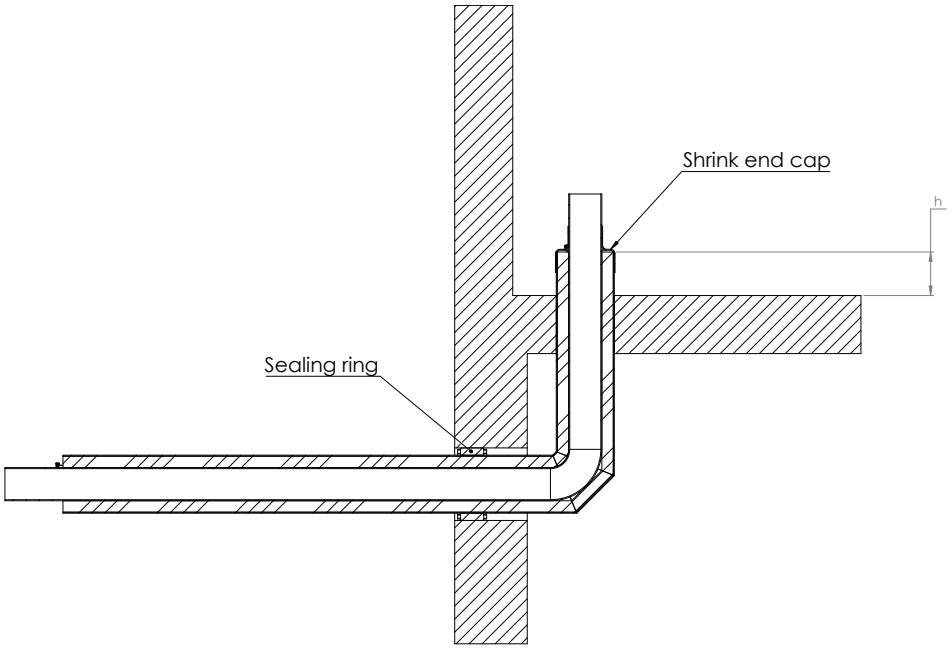
FIG 2.3.9.1
Anchor

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 weldet together to the radius R_{1min}.

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

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

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

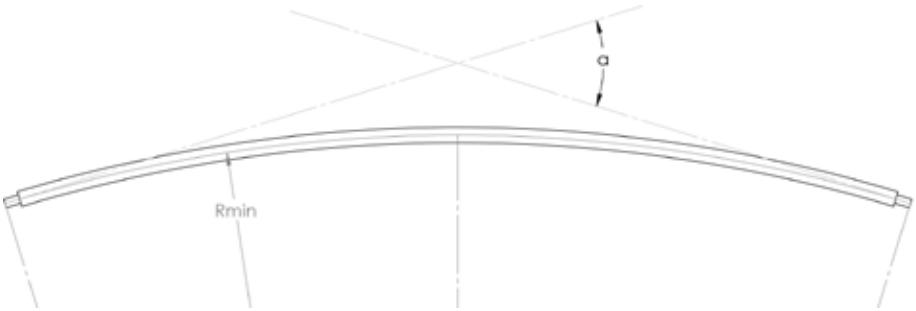
α_1 = Curve angle R_1

α_2 = Curve angle R_2

STEEL DN	D_0 [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

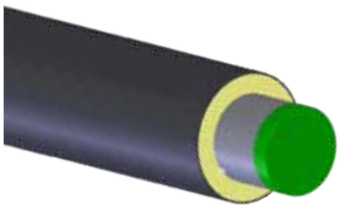
FIG 2.3.12.1

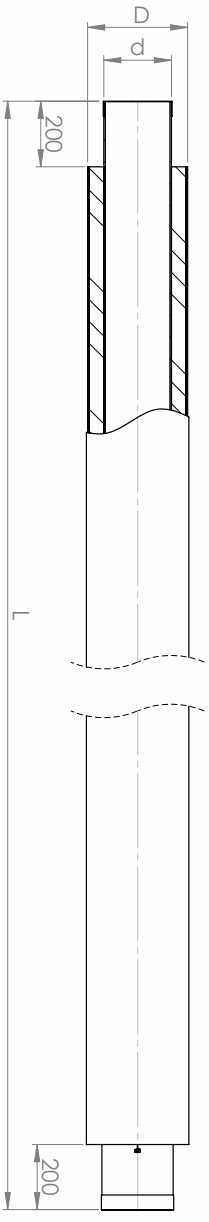
Curved pipe



CHAPTER 2.9
PRODUCT CATALOGUE

CHAPTER 2.9.1
PRE-INSULATED STEEL PIPES
INSULATION SERIES 1



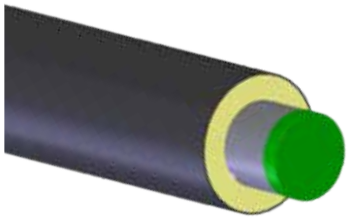


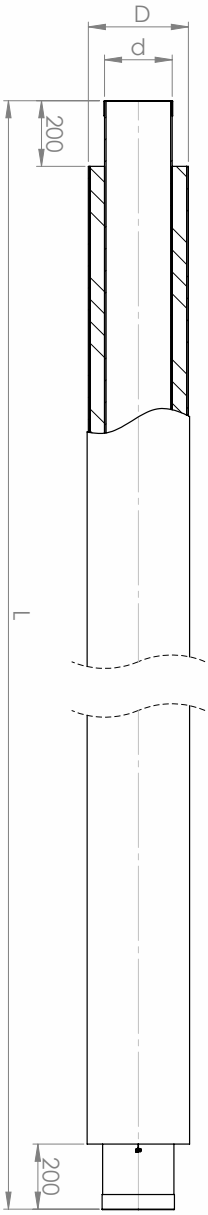
6 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t_1[mm]	D [mm]	t_2 [mm]		
1.101.020	20	26,9	2,6	90	3,0	28,6	16,4
1.101.025	25	33,7	2,6	90	3,0	25,2	18,9
1.101.032	32	42,4	2,6	110	3,0	30,8	24,5
1.101.040	40	48,3	2,6	110	3,0	27,9	26,6
1.101.050	50	60,3	2,9	125	3,0	29,4	35,2
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



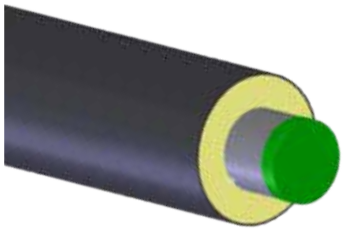


6 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t_1[mm]	D [mm]	t_2 [mm]		
1.201.020	20	26,9	2,6	110	3,0	38,6	18,9
1.201.025	25	33,7	2,6	110	3,0	35,2	21,4
1.201.032	32	42,4	2,6	125	3,0	38,3	26,6
1.201.040	40	48,3	2,6	125	3,0	35,4	28,6
1.201.050	50	60,3	2,9	140	3,0	36,9	37,4
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

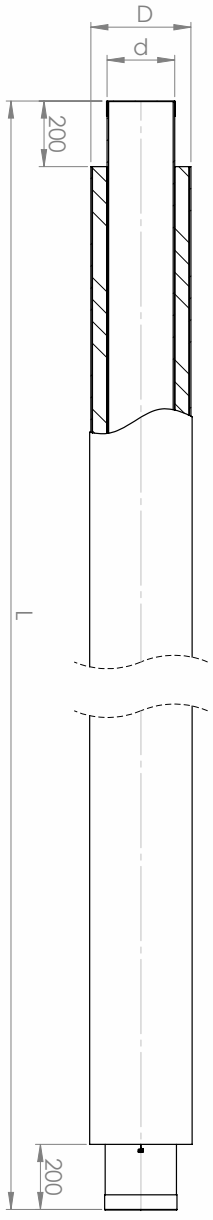
12 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t_1[mm]	D [mm]	t_2 [mm]		
1.202.020	20	26,9	2,6	110	3,0	38,6	37,9
1.202.025	25	33,7	2,6	110	3,0	35,2	42,8
1.202.032	32	42,4	2,6	125	3,0	38,3	53,1
1.202.040	40	48,3	2,6	125	3,0	35,4	57,3
1.202.050	50	60,3	2,9	140	3,0	36,9	74,9
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

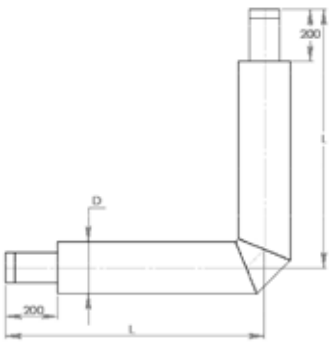
16 meters Art no.	Steel Pipe			Casing pipe		PUR [mm]	Weight [kg/pc]
	DN	d [mm]	t_1[mm]	D [mm]	t_2 [mm]		
1.303.100	100	114,3	3,6	250	3,6	64,3	184,5
1.303.125	125	139,7	3,6	280	3,9	66,3	225,0
1.303.150	150	168,3	4,0	315	4,1	69,3	290,0
1.303.200	200	219,1	4,5	400	4,8	85,7	432,9
1.303.250	250	273,0	5,0	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

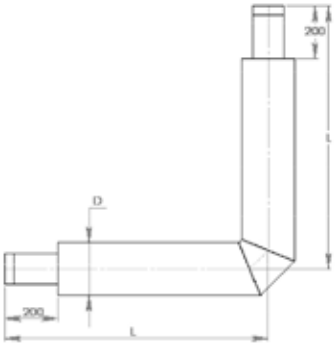
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.110.020	20	90	1000	5,9
1.110.025	25	90	1000	6,8
1.110.032	32	110	1000	8,8
1.110.040	40	110	1000	9,6
1.110.050	50	125	1000	12,7
1.110.065	65	140	1000	15,6
1.110.080	80	160	1000	19,8
1.110.100	100	200	1000	28,6
1.110.125	125	225	1000	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

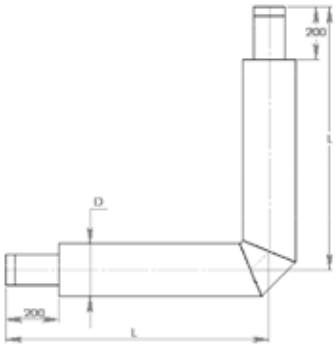


Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.111.020	20	90	500	3,0
1.111.025	25	90	500	3,4
1.111.032	32	110	500	4,4
1.111.040	40	110	500	4,8
1.111.050	50	125	500	6,3
1.111.065	65	140	500	7,8
1.111.080	80	160	500	9,9
1.111.100	100	200	500	14,3

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

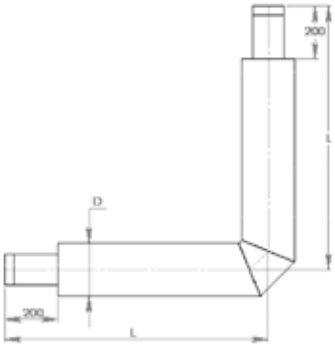
BEND 30°, 45° & 60°
INSULATION SERIES 2



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

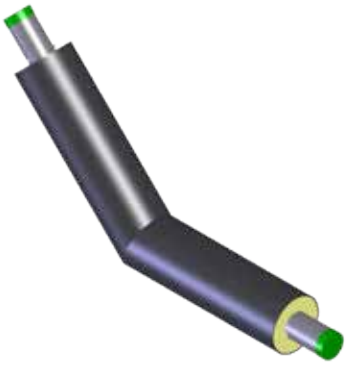
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.211.020	20	110	500	3,2
1.211.025	25	110	500	3,6
1.211.032	32	125	500	4,4
1.211.040	40	125	500	4,8
1.211.050	50	140	500	6,2
1.211.065	65	160	500	7,8
1.211.080	80	180	500	9,8
1.211.100	100	225	500	14,3

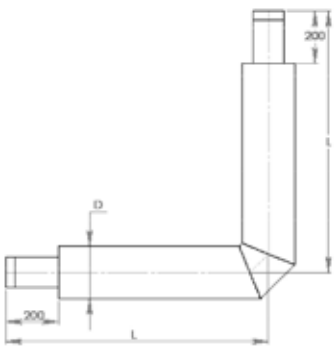


BEND 90°
INSULATION SERIES 3

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

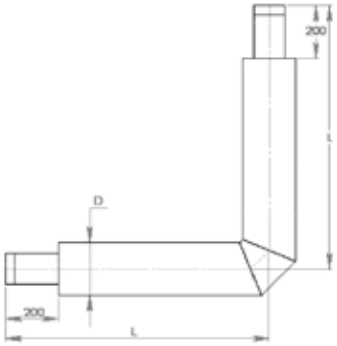
BEND 30°, 45° & 60°
INSULATION SERIES 3





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

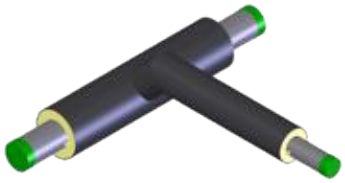


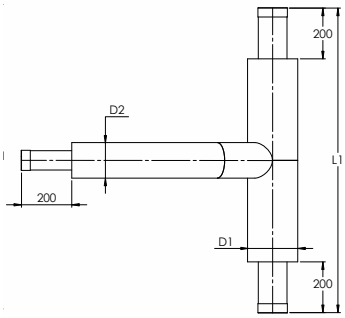
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Weight [kg/pc]
1.311.020	20	125	500	2,8
1.311.025	25	125	500	3,2
1.311.032	32	140	500	4,0
1.311.040	40	140	500	4,3
1.311.050	50	160	500	5,5
1.311.065	65	180	500	6,7
1.311.080	80	200	500	8,3

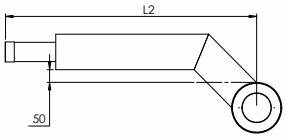
CHAPTER 2.9.3

BRANCH 45°

INSULATION SERIES 1

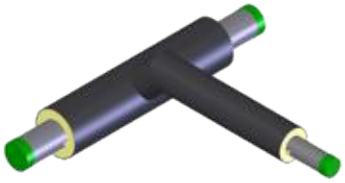


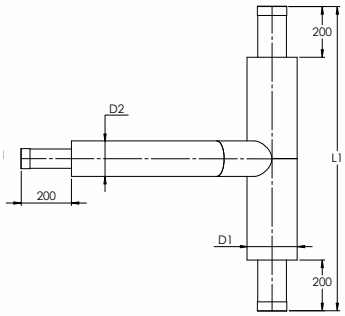


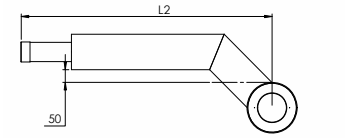


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.020.020	20	90	20	90	1000/1000	4,7
1.124.025.020	25	90	20	90	1000/1000	5,1
1.124.025.025	25	90	25	90	1000/1000	5,6
1.124.032.020	32	110	20	90	1000/1000	5,8
1.124.032.025	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

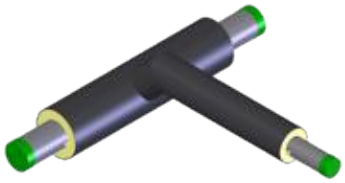


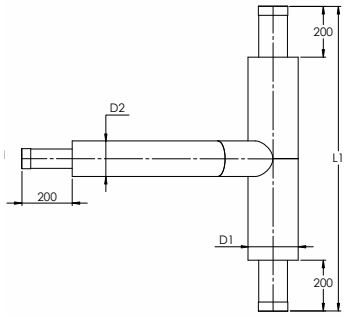


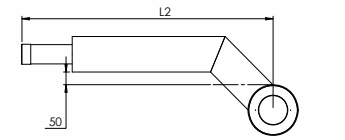


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.150.080	150	250	80	160	1000/1000	28,1
1.124.150.100	150	250	100	200	1200/1000	36,4
1.124.150.125	150	250	125	225	1200/1000	39,3
1.124.150.150	150	250	150	250	1200/1000	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

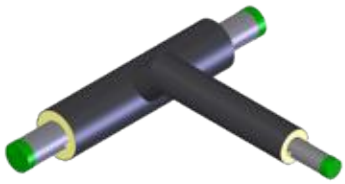


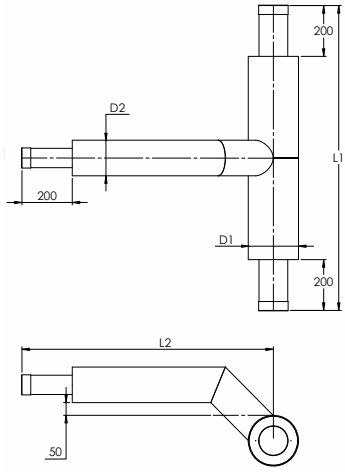




Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.350.250	350	500	250	400	1400/1200	139,9
1.124.350.300	350	500	300	450	1600/1300	168,2
1.124.350.350	350	500	350	500	1600/1300	179,7
1.124.400.040	400	560	40	110	1200/1000	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

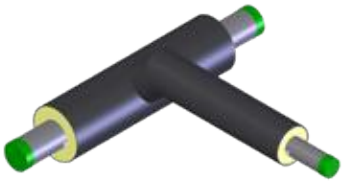
BRANCH 45°
INSULATION SERIES 1

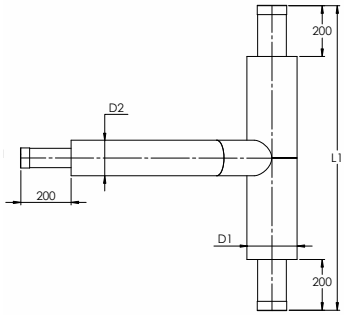


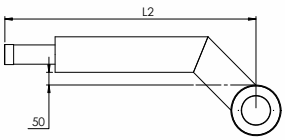


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.124.600.250	600	800	250	400	1600/1400	265,8
1.124.600.300	600	800	300	450	1600/1500	276,9
1.124.600.350	600	800	350	500	1600/1500	287,4
1.124.600.400	600	800	400	560	1800/1500	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

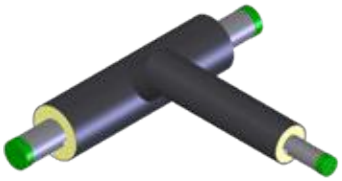


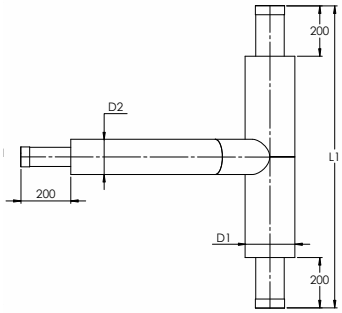


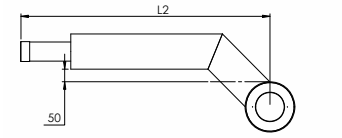


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.020.020	20	110	20	110	1000/1000	5,3
1.224.025.020	25	110	20	110	1000/1000	5,7
1.224.025.025	25	110	25	110	1000/1000	6,1
1.224.032.020	32	125	20	110	1000/1000	6,4
1.224.032.025	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

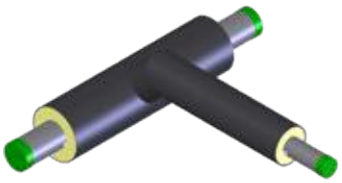


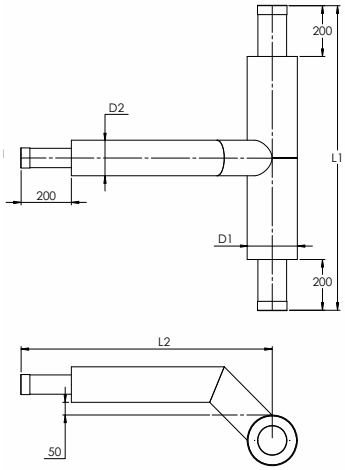




Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.150.065	150	280	65	160	1000/1000	27,8
1.224.150.080	150	280	80	180	1200/1000	32,7
1.224.150.100	150	280	100	225	1200/1000	38,8
1.224.150.125	150	280	125	250	1200/1000	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

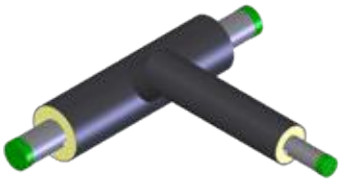
BRANCH 45°
INSULATION SERIES 2

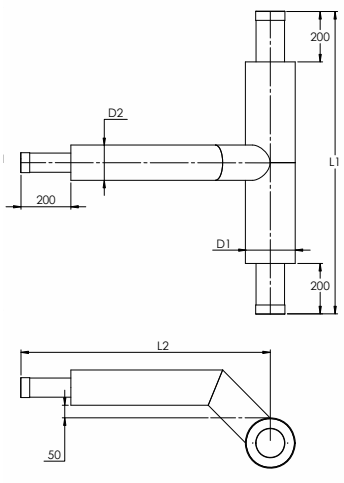




Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.350.200	350	560	200	355	1400/1200	133,9
1.224.350.250	350	560	250	450	1600/1200	154,1
1.224.350.300	350	560	300	500	1600/1300	175,3
1.224.350.350	350	560	350	560	1800/1300	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

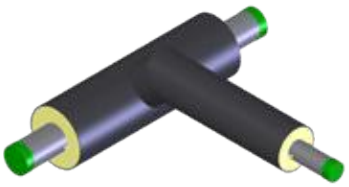
BRANCH 45°
INSULATION SERIES 2

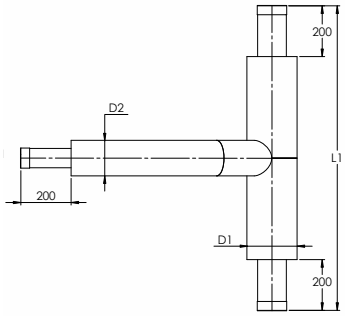


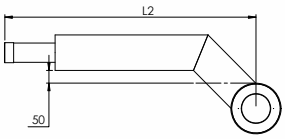


Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.224.600.125	600	900	125	250	1400/1200	211,6
1.224.600.150	600	900	150	280	1400/1200	217,5
1.224.600.200	600	900	200	355	1600/1400	267,4
1.224.600.250	600	900	250	450	1600/1400	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

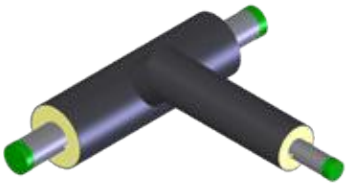


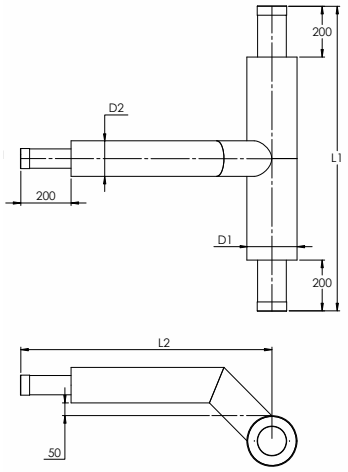




Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.020.020	20	125	20	125	1000/1000	6,0
1.324.025.020	25	125	20	125	1000/1000	6,4
1.324.025.025	25	125	25	125	1000/1000	6,8
1.324.032.020	32	140	20	125	1000/1000	7,1
1.324.032.025	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

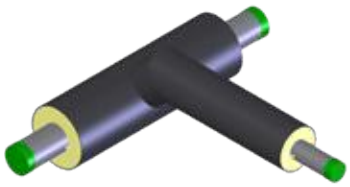
BRANCH 45°
INSULATION SERIES 3

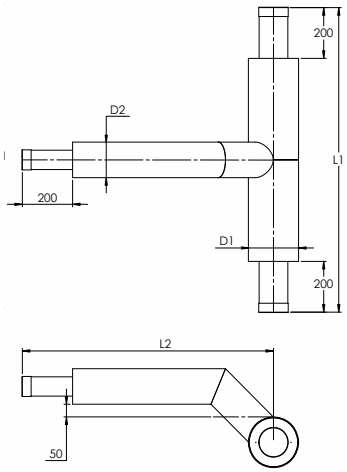




Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.150.065	150	315	65	180	1200/1000	31,8
1.324.150.080	150	315	80	200	1200/1000	33,7
1.324.150.100	150	315	100	250	1200/1000	41,9
1.324.150.125	150	315	125	280	1200/1000	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

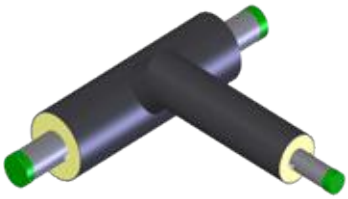
BRANCH 45°
INSULATION SERIES 3

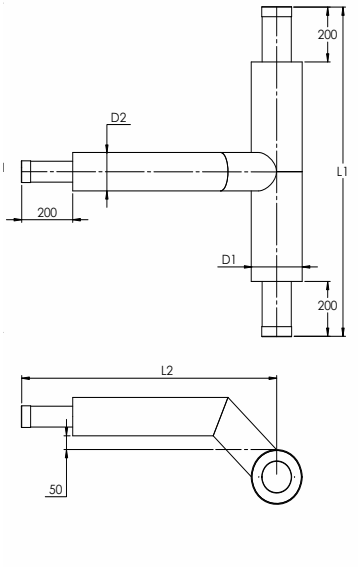




Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.350.200	350	630	200	400	1400/1200	147,6
1.324.350.250	350	630	250	500	1600/1200	161,5
1.324.350.300	350	630	300	560	1600/1300	184,2
1.324.350.350	350	630	350	630	1800/1300	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

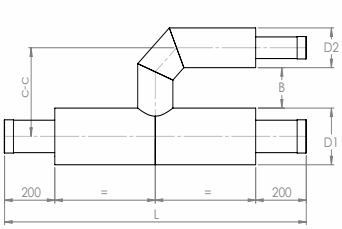
BRANCH 45°
INSULATION SERIES 3





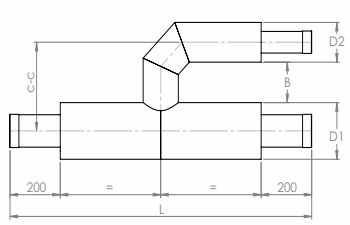
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.324.600.150	600	1000	150	315	1400/1200	236,6
1.324.600.200	600	1000	200	400	1600/1400	292,4
1.324.600.250	600	1000	250	500	1600/1400	315,6
1.324.600.300	600	1000	300	560	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



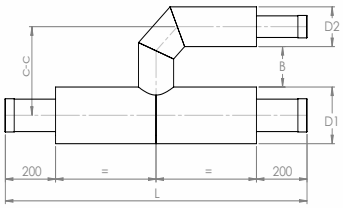
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.020.020	20	90	20	90	1000	240	3,9
1.125.025.020	25	90	20	90	1000	240	4,4
1.125.025.025	25	90	25	90	1000	240	4,6
1.125.032.020	32	110	20	90	1000	250	5,0
1.125.032.025	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



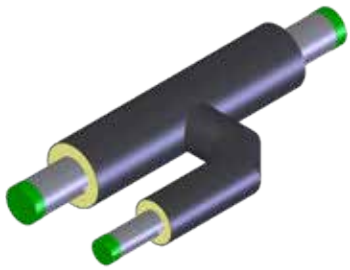
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.150.065	150	250	65	140	1200	345	29,3
1.125.150.080	150	250	80	160	1200	355	31,0
1.125.150.100	150	250	100	200	1200	375	34,7
1.125.150.125	150	250	125	225	1200	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

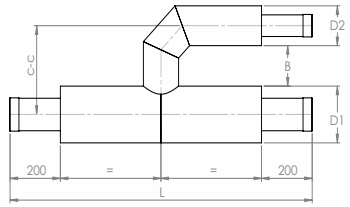
BRANCH PARALLEL INSULATION SERIES 1



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

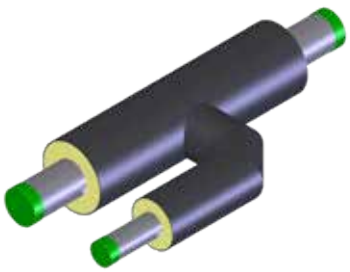
BRANCH PARALLEL
INSULATION SERIES 1

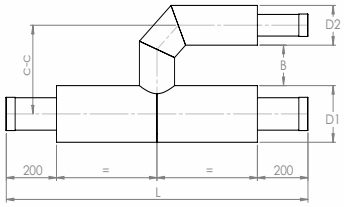




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.125.600.150	600	800	150	250	1400	630	199,7
1.125.600.200	600	800	200	315	1600	663	241,3
1.125.600.250	600	800	250	400	1600	705	258,8
1.125.600.300	600	800	300	450	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

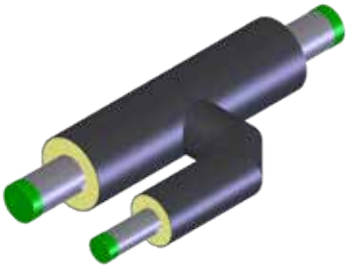
BRANCH PARALLEL INSULATION SERIES 2

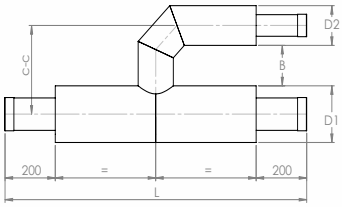




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.020.020	20	110	20	110	1000	260	4,5
1.225.025.020	25	110	20	110	1000	260	4,9
1.225.025.025	25	110	25	110	1000	260	5,2
1.225.032.020	32	125	20	110	1000	260	5,5
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

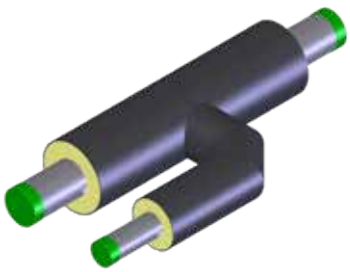
BRANCH PARALLEL
INSULATION SERIES 2

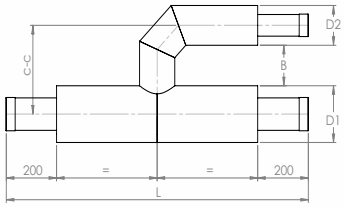




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.150.050	150	280	50	140	1200	360	30,0
1.225.150.065	150	280	65	160	1200	370	31,4
1.225.150.080	150	280	80	180	1200	380	33,2
1.225.150.100	150	280	100	225	1200	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

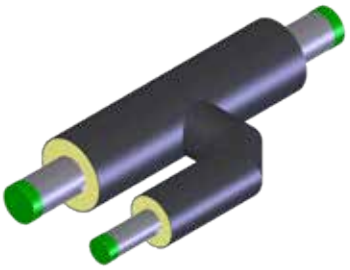
BRANCH PARALLEL INSULATION SERIES 2

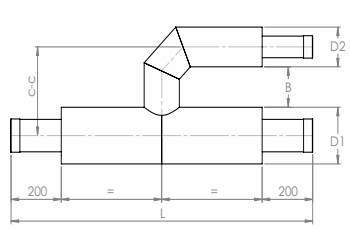




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.350.150	350	560	150	280	1400	570	117,8
1.225.350.200	350	560	200	355	1400	608	131,0
1.225.350.250	350	560	250	450	1600	655	170,0
1.225.350.300	350	560	300	500	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

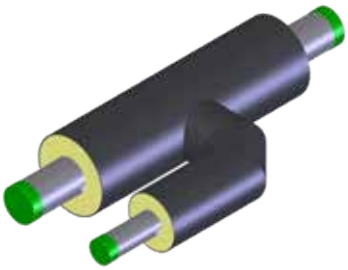
BRANCH PARALLEL
INSULATION SERIES 2

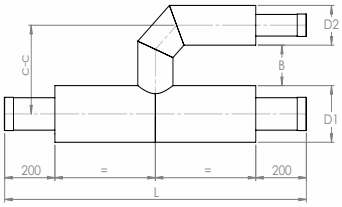




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.225.600.125	600	900	125	250	1400	675	210,2
1.225.600.150	600	900	150	280	1400	690	216,0
1.225.600.200	600	900	200	355	1600	728	262,6
1.225.600.250	600	900	250	450	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

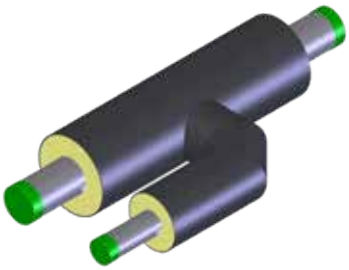
BRANCH PARALLEL INSULATION SERIES 3

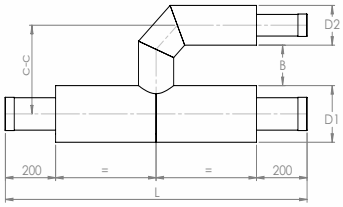




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.020.020	20	125	20	125	1000	275	5,1
1.325.025.020	25	125	20	125	1000	275	5,5
1.325.025.025	25	125	25	125	1000	275	5,8
1.325.032.020	32	140	20	125	1000	275	6,2
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

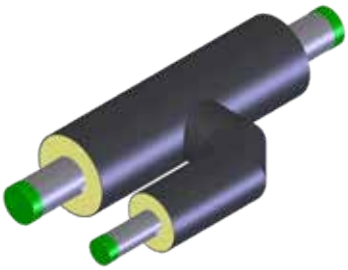
BRANCH PARALLEL INSULATION SERIES 3

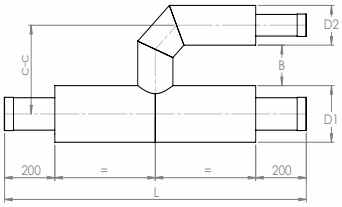




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.150.065	150	315	65	180	1200	398	34,0
1.325.150.080	150	315	80	200	1200	408	35,9
1.325.150.100	150	315	100	250	1200	433	40,6
1.325.150.125	150	315	125	280	1200	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

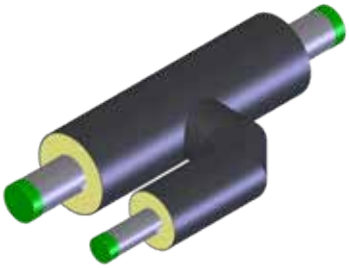
BRANCH PARALLEL INSULATION SERIES 3

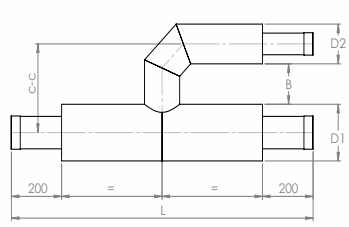




Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.350.200	350	630	200	400	1400	665	146,0
1.325.350.250	350	630	250	500	1600	715	190,2
1.325.350.300	350	630	300	560	2000	745	260,6
1.325.350.350	350	630	350	630	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

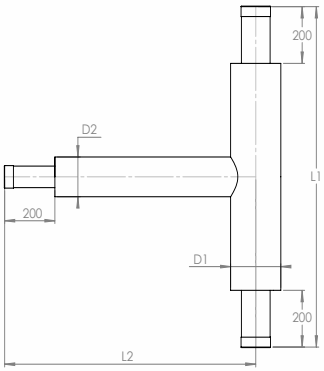
BRANCH PARALLEL
INSULATION SERIES 3





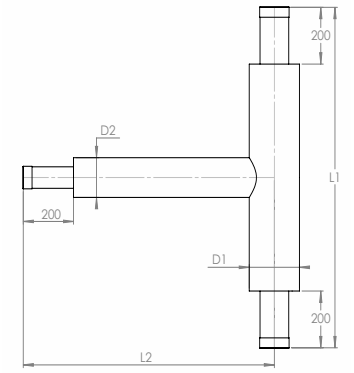
Art no.	Main pipe		Branch		Length L [mm]	C-C [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]			
1.325.600.150	600	1000	150	315	1400	758	236,1
1.325.600.200	600	1000	200	400	1600	800	288,9
1.325.600.250	600	1000	250	500	1600	850	312,7
1.325.600.300	600	1000	300	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



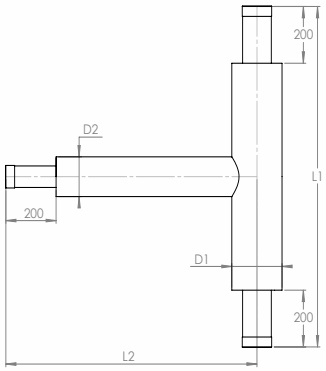
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.020.020	20	90	20	90	1000/800	4,1
1.120.025.020	25	90	20	90	1000/800	4,5
1.120.025.025	25	90	25	90	1000/800	4,8
1.120.032.020	32	110	20	90	1000/800	5,2
1.120.032.025	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



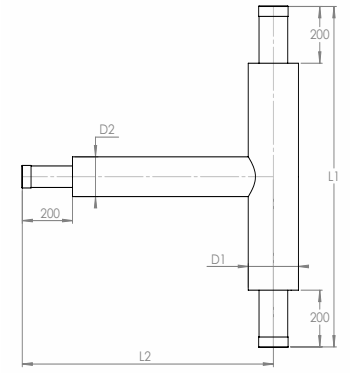
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.150.065	150	250	65	140	1000/800	24,0
1.120.150.080	150	250	80	160	1000/800	25,3
1.120.150.100	150	250	100	200	1200/800	32,2
1.120.150.125	150	250	125	225	1200/800	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



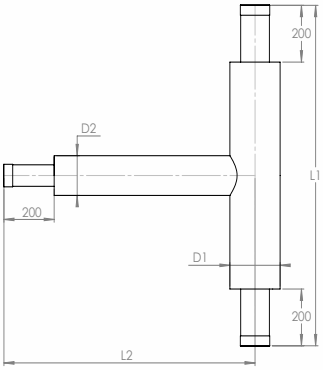
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.350.200	350	500	200	315	1400/1000	107,8
1.120.350.250	350	500	250	400	1400/1000	114,7
1.120.350.300	350	500	300	450	1600/1100	162,0
1.120.350.350	350	500	350	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



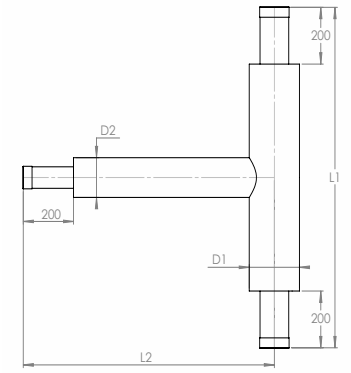
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.120.600.150	600	800	150	250	1400/1200	197,2
1.120.600.200	600	800	200	315	1600/1200	233,3
1.120.600.250	600	800	250	400	1600/1200	245,0
1.120.600.300	600	800	300	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



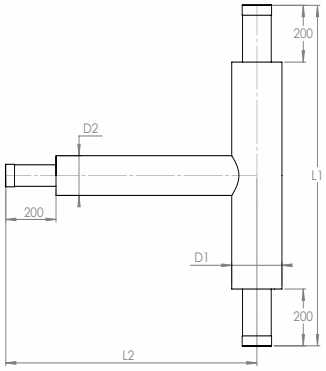
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.020.020	20	110	20	110	1000/800	4,5
1.220.025.020	25	110	20	110	1000/800	4,9
1.220.025.025	25	110	25	110	1000/800	5,3
1.220.032.020	32	125	20	110	1000/800	5,6
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



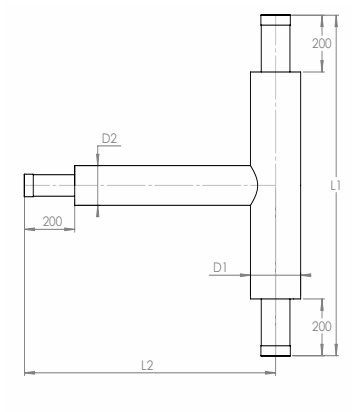
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.150.065	150	280	65	160	1000/800	25,4
1.220.150.080	150	280	80	180	1200/800	32,6
1.220.150.100	150	280	100	225	1200/800	34,1
1.220.150.125	150	280	125	250	1200/800	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



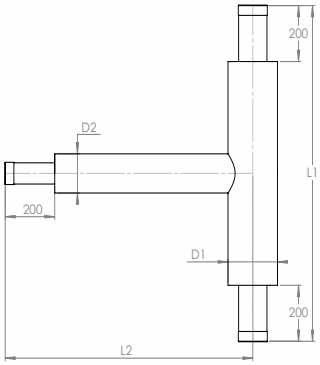
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.350.200	350	560	200	355	1400/1000	116,3
1.220.350.250	350	560	250	500	1600/1000	151,8
1.220.350.300	350	560	300	560	1600/1100	175,6
1.220.350.350	350	560	350	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



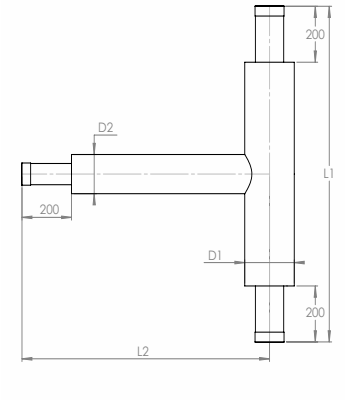
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.220.600.150	600	900	150	280	1400/1200	211,8
1.220.600.200	600	900	200	355	1600/1200	251,3
1.220.600.250	600	900	250	450	1600/1200	263,9
1.220.600.300	600	900	300	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



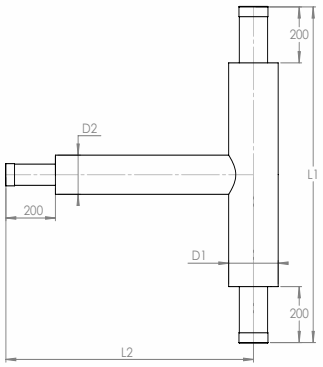
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.020.020	20	125	20	125	1000/800	5,1
1.320.025.020	25	125	20	125	1000/800	5,5
1.320.025.025	25	125	25	125	1000/800	5,8
1.320.032.020	32	140	20	125	1000/800	6,2
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



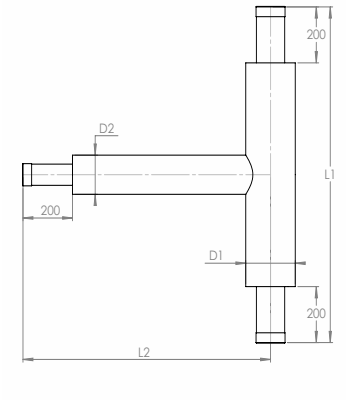
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.150.065	150	315	65	180	1000/800	27,1
1.320.150.080	150	315	80	200	1200/800	35,3
1.320.150.100	150	315	100	250	1200/800	26,6
1.320.150.125	150	315	125	280	1200/800	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



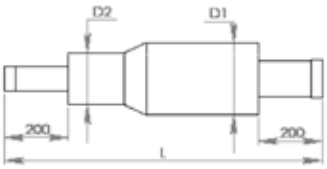
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.350.200	350	630	200	400	1400/1000	126,9
1.320.350.250	350	630	250	500	1600/1000	168,1
1.320.350.300	350	630	300	560	1600/1100	194,6
1.320.350.350	350	630	350	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



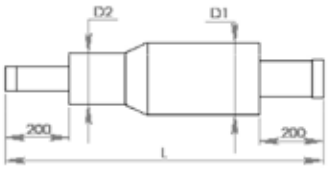
Art no.	Steel Pipe		Casing pipe		Length L1/L2 [mm]	Weight [kg/pc]
	Steel pipe DN	Casing pipe D1 [mm]	Steel pipe DN	Casing pipe D2 [mm]		
1.320.600.150	600	1000	150	315	1400/1200	239,7
1.320.600.200	600	1000	200	400	1600/1200	285,2
1.320.600.250	600	1000	250	500	1600/1200	298,1
1.320.600.300	600	1000	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



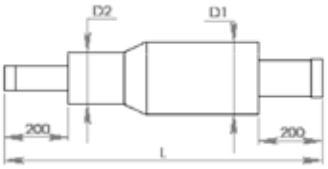
Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.130.025.020	25-20	90/90	1000	3,0
1.130.032.020	32-20	110/90	1000	3,5
1.130.032.025	32-25	110/90	1000	3,7
1.130.040.025	40-25	110/90	1000	3,8
1.130.040.032	40-32	110/110	1000	4,3
1.130.050.025	50-25	125/90	1000	4,6
1.130.050.032	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



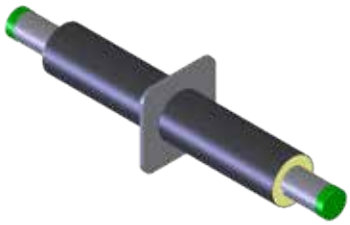
Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.230.025.020	25-20	110/110	1000	3,4
1.230.032.020	32-20	125/110	1000	3,7
1.230.032.025	32-25	125/110	1000	3,9
1.230.040.025	40-25	125/110	1000	4,2
1.230.040.032	40-32	125/125	1000	4,5
1.230.050.025	50-25	140/110	1000	5,0
1.230.050.032	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



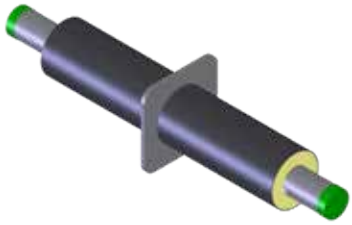
Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.330.025.020	25-20	125/125	1000	3,8
1.330.032.020	32-20	140/125	1000	4,1
1.330.032.025	32-25	140/125	1000	4,3
1.330.040.025	40-25	140/125	1000	4,6
1.330.040.032	40-32	140/140	1000	4,9
1.330.050.025	50-25	160/125	1000	5,5
1.330.050.032	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

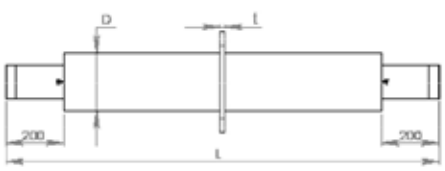


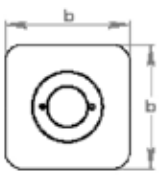
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Anchor plate		Weight [kg/pc]
				b [mm]	t [mm]	
1.140.032	32	110	2000	260,0	15	13,9
1.140.040	40	110	2000	260,0	15	14,6
1.140.050	50	125	2000	260,0	20	19,6
1.140.065	65	140	2000	260,0	20	21,8
1.140.080	80	160	2000	260,0	20	24,9
1.140.100	100	200	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



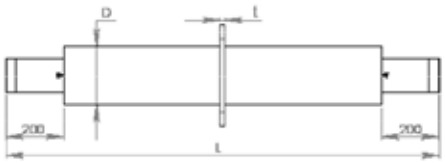
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L [mm]	Anchor plate		Weight [kg/pc]
				b [mm]	t [mm]	
1.240.032	32	125	2000	260,0	15	14,3
1.240.040	40	125	2000	260,0	15	14,9
1.240.050	50	140	2000	260,0	20	20,0
1.240.065	65	160	2000	260,0	20	22,4
1.240.080	80	180	2000	300,0	20	29,2
1.240.100	100	225	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

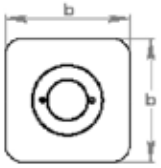




ANCHOR
INSULATION SERIES 3

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





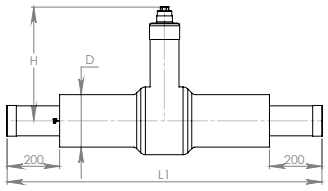
CHAPTER 2.9.8

VALVE
INSULATION SERIES 1

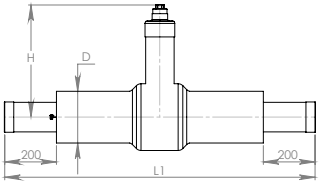
Art no.	Steel Pipe DN	Casing pipe D [mm]	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.145.025	25	90	382	1500	7,9
1.145.032	32	110	388	1500	10,5
1.145.040	40	110	401	1500	11,4
1.145.050	50	125	411	1500	13,9
1.145.065	65	140	415	1500	19,2
1.145.080	80	160	426	1500	23,9
1.145.100	100	200	450	1500	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

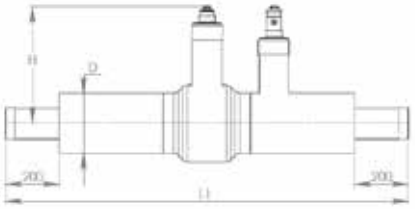
CHAPTER 2.9.9

VALVE – 1 SERVICE VALVE INSULATION SERIES 1

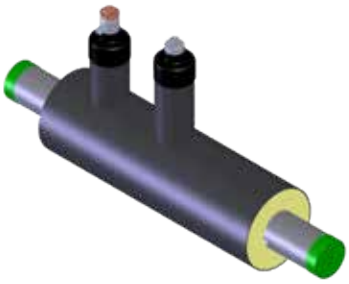
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.146.025	25	90	25	382	1500	8,8
1.146.032	32	110	25	388	1500	11,3
1.146.040	40	110	25	401	1500	12,2
1.146.050	50	125	40	411	1500	15,4
1.146.065	65	140	40	415	1500	20,7
1.146.080	80	160	40	426	1500	25,3
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

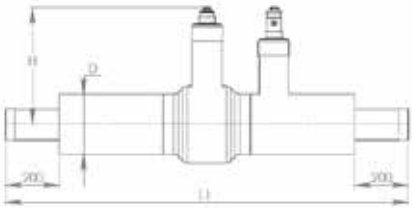
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.246.025	25	110	25	382	1500	9,4
1.246.032	32	125	25	388	1500	11,8
1.246.040	40	125	25	401	1500	12,8
1.246.050	50	140	40	411	1500	16,0
1.246.065	65	160	40	415	1500	21,6
1.246.080	80	180	40	426	1500	26,3
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

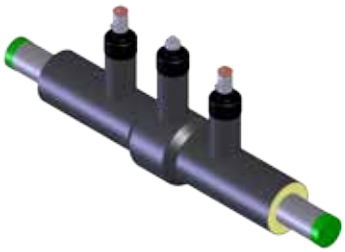


Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L1 [mm]	Weight [kg/pc]
1.346.025	25	125	25	382	1500	9,9
1.346.032	32	140	25	388	1500	12,4
1.346.040	40	140	25	401	1500	13,3
1.346.050	50	160	40	411	1500	16,8
1.346.065	65	180	40	415	1500	22,5
1.346.080	80	200	40	426	1500	27,4
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

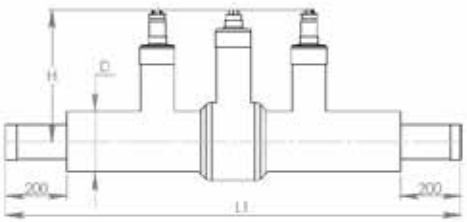
VALVE – 2 SERVICE VALVE INSULATION SERIES 1



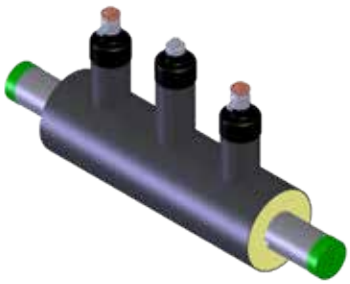
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.147.025	25	90	25	382	1500	10,1
1.147.032	32	110	25	388	1500	12,6
1.147.040	40	110	25	401	1500	13,5
1.147.050	50	125	40	411	1500	17,5
1.147.065	65	140	40	415	1500	22,8
1.147.080	80	160	40	426	1500	27,4
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

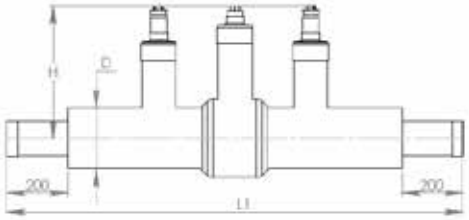
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.247.025	25	110	25	382	1500	10,7
1.247.032	32	125	25	388	1500	13,1
1.247.040	40	125	25	401	1500	14,1
1.247.050	50	140	40	411	1500	18,1
1.247.065	65	160	40	415	1500	23,7
1.247.080	80	180	40	426	1500	28,3
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



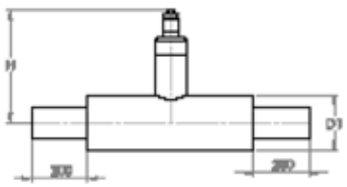
CHAPTER 2.9.11

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

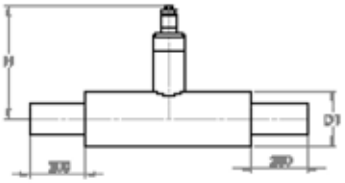
SERVICE VALVE
INSULATION SERIES 2

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

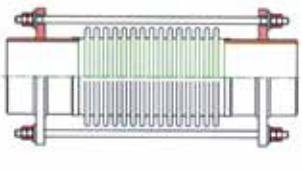
Art no.	Diameter DN	Casing pipe D [mm]	Length L [mm]	Compensator Length L1 [mm]	Elongation L2 [mm]	Weight [kg]
1.830.065	65	140	1400	610	100	15,0
1.830.080	80	160	1400	610	100	18,0
1.830.100	100	200	1400	700	125	26,0
1.830.125	125	225	1400	700	125	34,0
1.830.150	150	250	1400	700	125	44,0
1.830.200	200	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

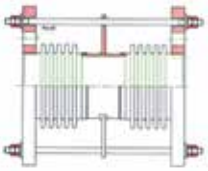
CONTINUOS COMPENSATOR

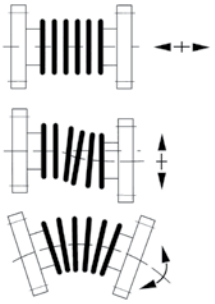
Art no.	DN	Elongation L2 [mm]	Weight [kg/pc]
1.810.040	40	100	6,4
1.810.050	50	100	8,1
1.810.065	65	100	9,7
1.810.080	80	100	12,4
1.810.100	100	125	19,7
1.810.125	125	125	25,0
1.810.150	150	125	33,5
1.810.200	200	125	50,2
1.810.250	250	125	70,9
1.810.300	300	125	83,0
1.810.350	350	125	95,0

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.







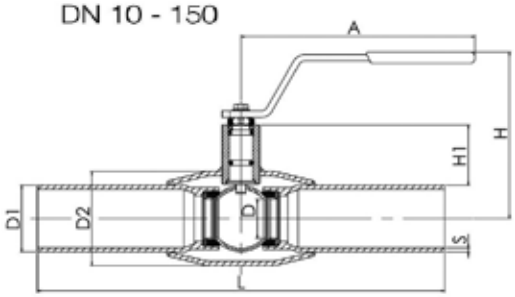
ONE-STEP EXPANSION JOINTS

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

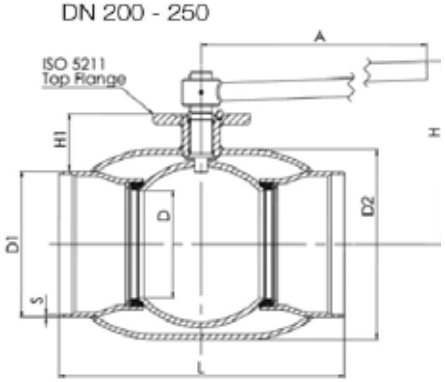
CHAPTER 2.9.13

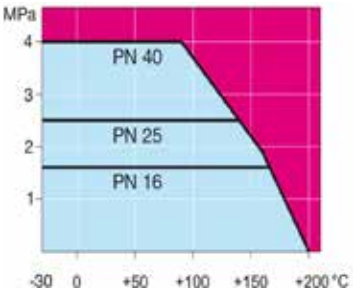
STEEL BALL VALVES
WELDING/WELDING

DN 10 - 150



DN 200 - 250

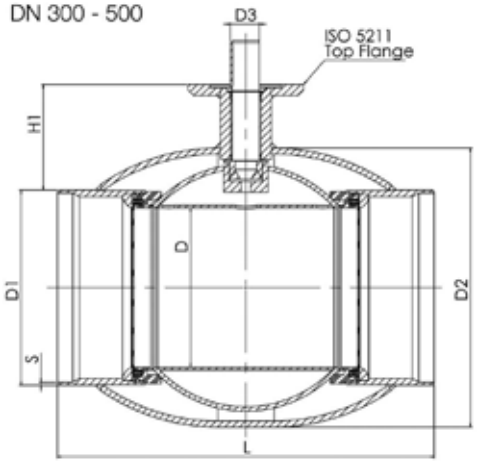




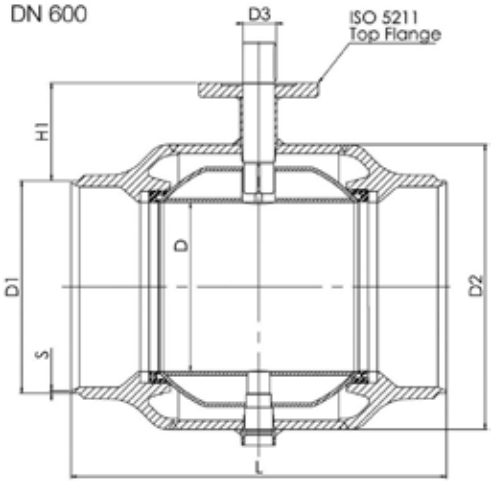
Art no.	DN	PN	A [mm]	D1 [mm]	D2 [mm]	H [mm]	H1 [mm]	L [mm]	S [mm]	Weight [kg/pc]
1.910.015	15	40	145	21,3	33,7	98	22	230	2,0	0,60
1.910.020	20	40	145,0	26,9	42,4	103	23	230	2,3	0,80
1.910.025	25	40	145,0	33,7	48,3	118	34	230	2,6	1,0
1.910.032	32	40	145,0	42,4	60,3	121	33	260	2,6	1,4
1.910.040	40	40	188,0	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

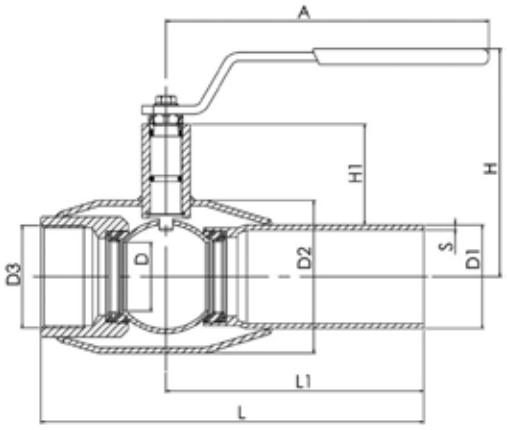


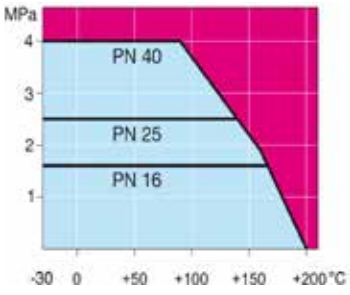
DN 600



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

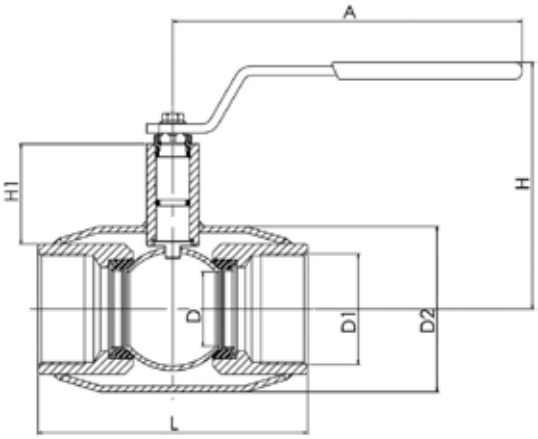
STEEL BALL VALVES
FEMALE THREADS/WELDING

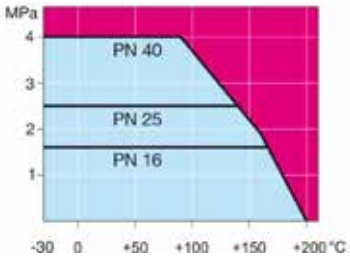




Art no.	DN	PN	A [mm]	D [mm]	D1 [mm]	D2 [mm]	D3 [BSP]	H [mm]	L [mm]	L1 [mm]	S [mm]	Weight [kg/pc]
1.911.015	15	40	145	10	21,3	33,7	R ½	98	158	115	2,0	0,60
1.911.020	20	40	145	15	26,9	42,4	R ¾	103	165	115	2,3	0,80
1.911.025	25	40	145	20	33,7	48,3	R 1	118	172	115	2,6	1,1
1.911.032	32	40	145	25	42,4	60,3	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

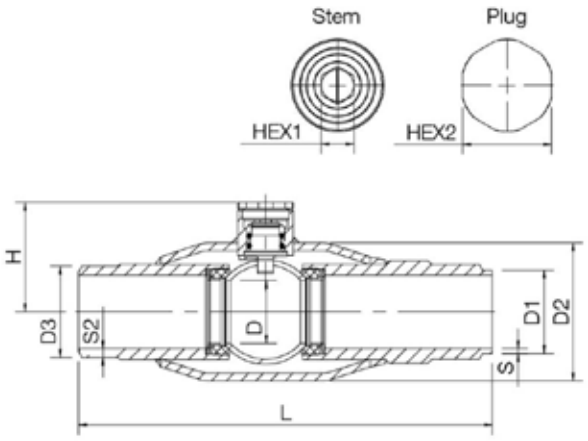
STEEL BALL VALVES FEMALE THREADS/ FEMALE THREADS





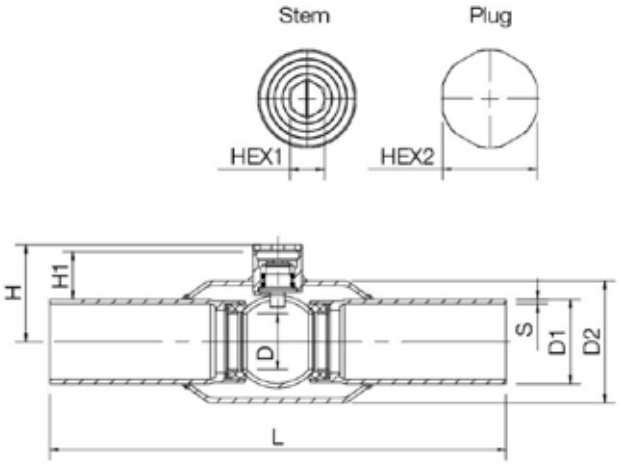
Art no.	DN	PN	A [mm]	D [mm]	D1 [BSP]	D2 [mm]	H [mm]	H1 [mm]	L [mm]	Weight [kg/pc]
1.912.015	15	40	145,0	10	R ½	33,7	98	22	85	0,50
1.912.020	20	40	145,0	15	R ¾	42,4	103	23	100	0,80
1.912.025	25	40	145,0	20	R 1	48,3	118	34	115	1,0
1.912.032	32	40	145,0	25	R 1 ¼	60,3	121	33	130	1,2
1.912.040	40	40	188,0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

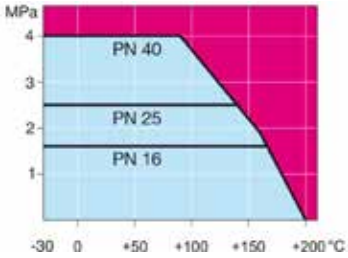
SPECIAL PURPOSE BALL VALVES – HOT TAPPING VALVES



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

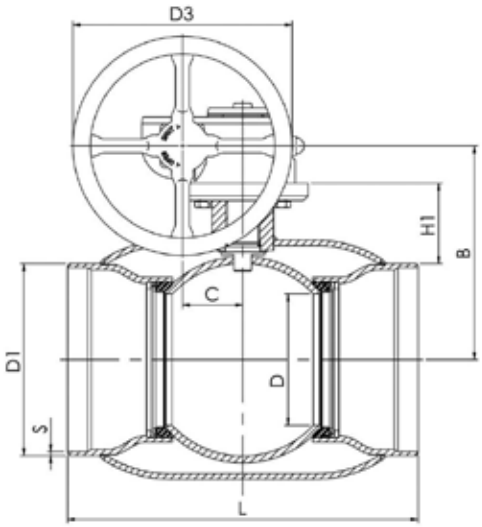
SPECIAL PURPOSE BALL VALVES – BRANCHING VALVE

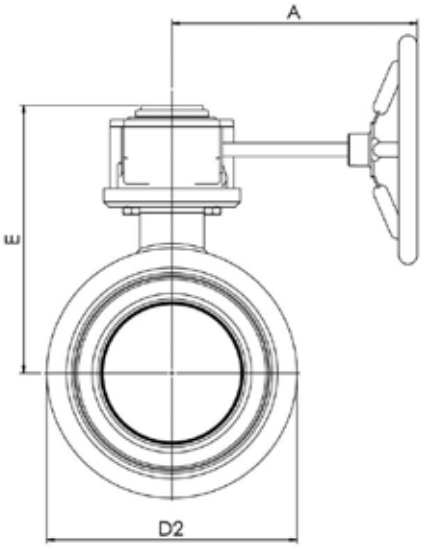


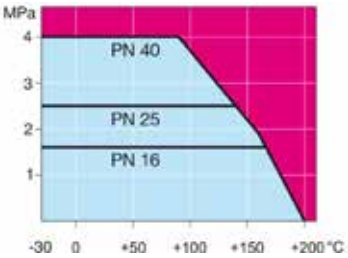


Art no.	DN	PN	D [mm]	D1 [mm]	D2 [mm]	H [mm]	L [mm]	S [mm]	HEX 1	HEX 2	Weight [kg/pc]
1.908.020	20	40	15	26,9	42,4	36	230	2,3	-	19,0	0,80
1.908.025	25	40	20	33,7	48,3	42	230	2,6	9	22,0	1,1
1.908.032	32	40	25	42,4	60,3	46	260	2,6	9	22,0	1,3
1.908.040	40	40	32	48,3	70,0	55	260	2,6	10	27,0	1,5
1.908.050	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

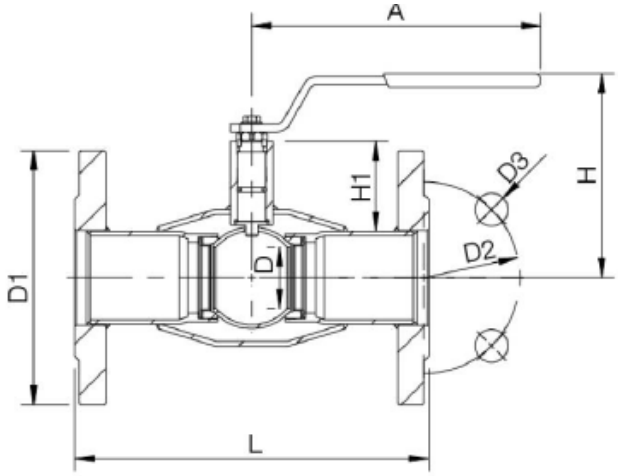


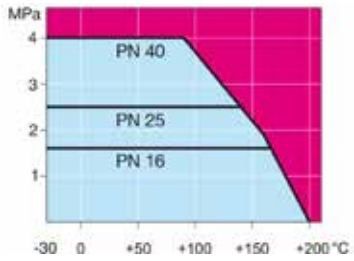




Art no.	DN	PN	A [mm]	C [mm]	D1 [mm]	D2 [mm]	D3 [mm]	E [mm]	L [mm]	S [mm]	Weight [kg/pc]
1.915.100	100	25	186	53	114,3	146	125	239	325	3,6	18
1.915.125	125	25	224	53	139,7	177,8	200	259	325	4,0	20
1.915.150	150	25	224	53	168,3	219,1	200	279	350	4,1	25
1.915.200	200	25	268	69	219,1	273,0	250	293	400	4,5	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

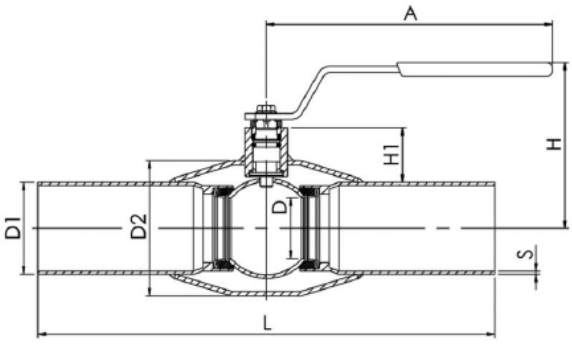
STEEL BALL VALVES
FLANGE/FLANGE





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

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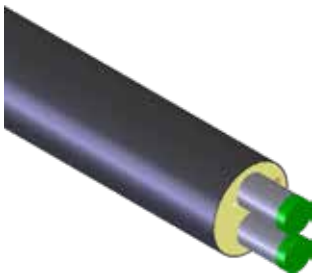
CHAPTER 3.0
PRE-INSULATED DOUBLE STEEL PIPES



SPECIFICATION

Pre-insulated single steel pipes are insulated with polyurethanefoam (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:

TABLE 3.0.1
Line 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]
- ρw = 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:

$$\dot{m} = \frac{14000\ W}{978\ \frac{kg}{m^3} \cdot 4191\ \frac{J}{kg \cdot K} \cdot 40K} = 85{,}4x10^{-6}\ \frac{m^3}{s} = \mathbf{0{,}0854}\ \frac{\mathbf{l}}{\mathbf{s}}$$

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:

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

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]
- ρw = 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:

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

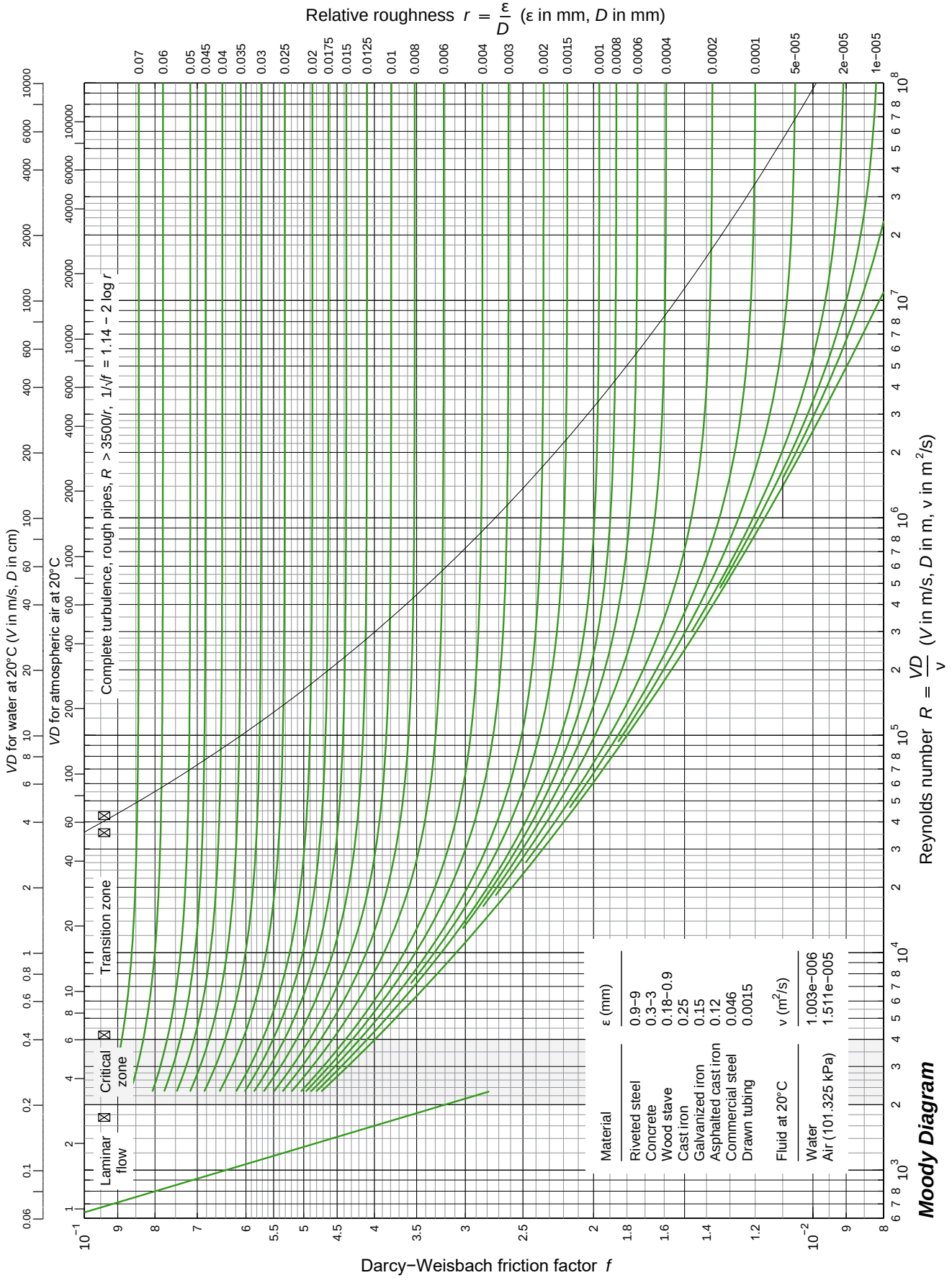
THUS:

ν = Kinematic viscosity for water (0,366 x 10^{-6} m^2/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.

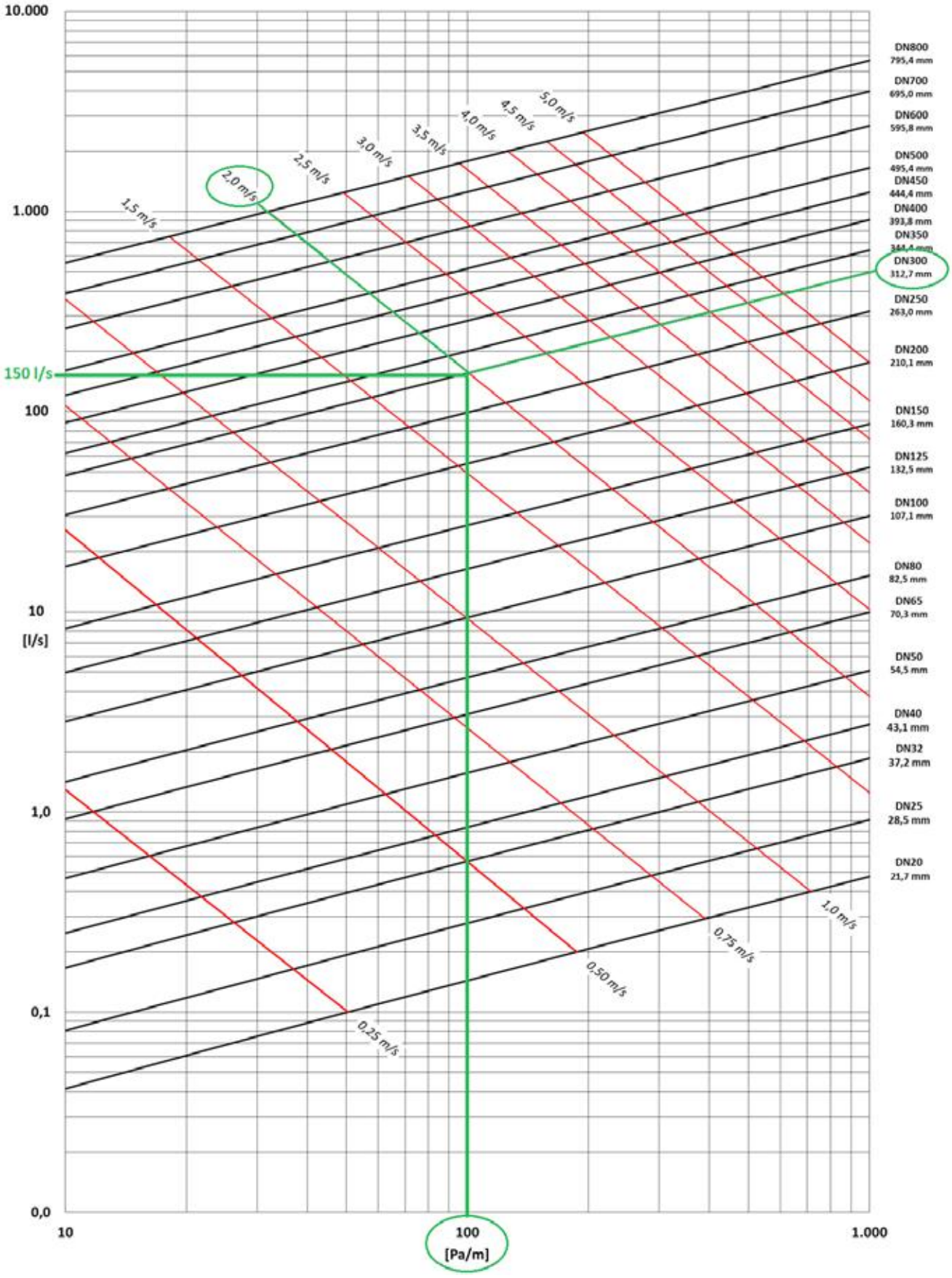
Graph 3.1.1.2 shows pressure loss in a single flow pipe taking into consideration water need, pipe dimension, and average water velocity. Also there is an example on how to use the graph.

GRAPH 3.1.1.1 - MOODY GRAPH

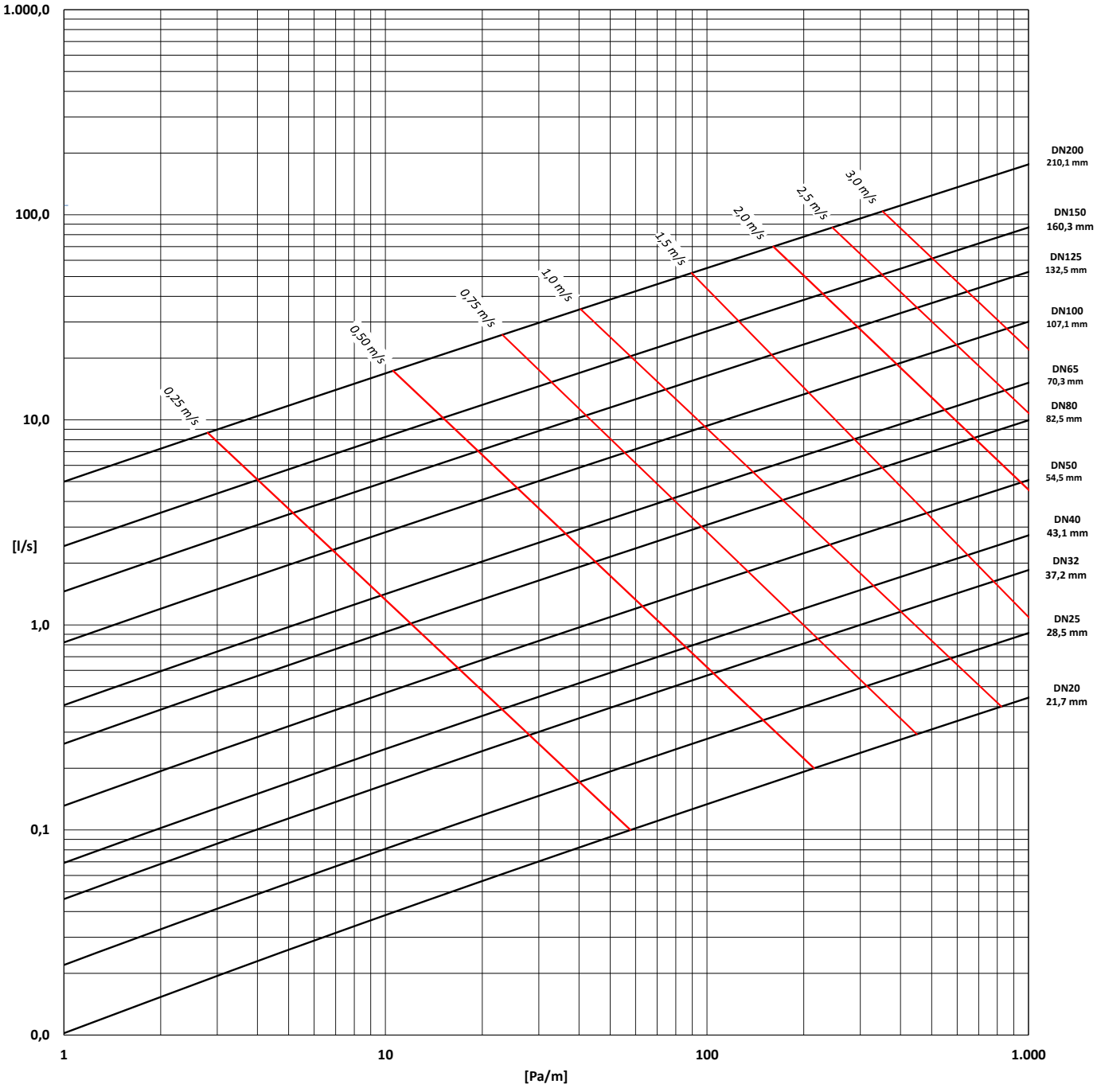


AN EXAMPLE HOW TO USE THE PRESSURE DROP GRAPH

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 CO_2 emission.

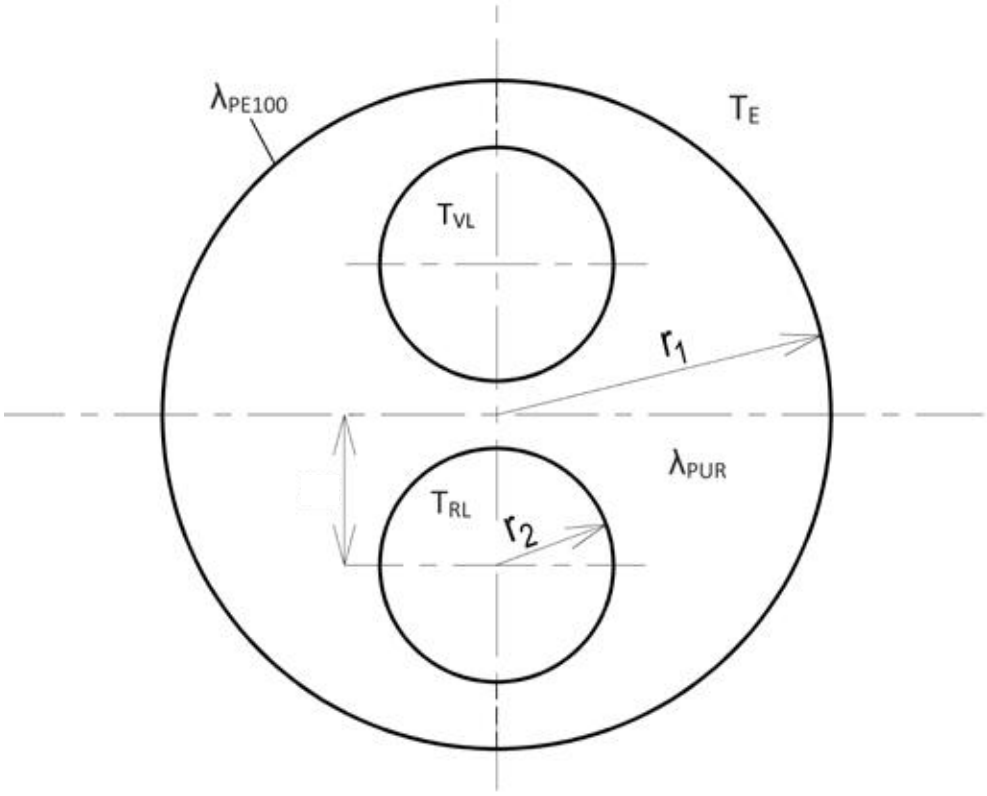


FIG 3.1.3.1
Cross section of double pipe

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]
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = The average temperature

DN	D_o [mm]	$U_{PIPE\ IN\ SOIL}$ [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]

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

T_M = The average temperature

DN	D_o [mm]	$U_{PIPE\ IN\ SOIL}$ [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]

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

T_M = The average temperature

DN	D_o [mm]	$U_{PIPE\ IN\ SOIL}$ [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	LENGTHS			
OUTER DIAMETER [mm]	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

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.

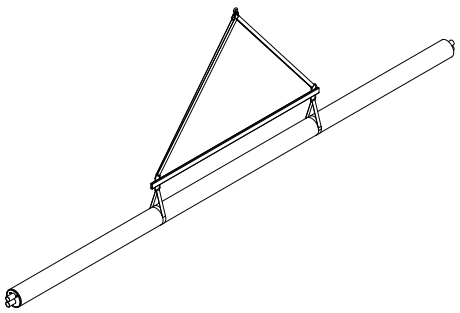


FIG 3.2.1
UNLOADING WITH SLINGS
Use wide nylon web slings while unloading and for further handling. Ropes, chains or other lifting equipment are prohibited.

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 N/mm² (3 kg/cm²).

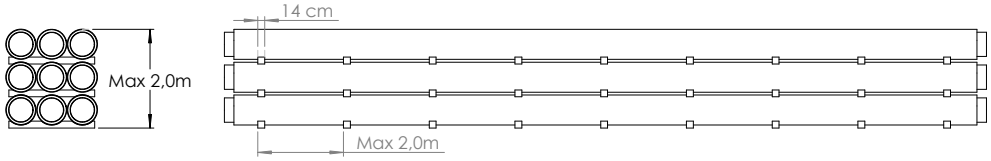


FIG 3.2.2
STACKS WITH WOODEN SPACING STRIPS
Stack pipes so the max. pressure does not exceed be <0,3 N/mm² (3 kg /cm²)

FITTINGS

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

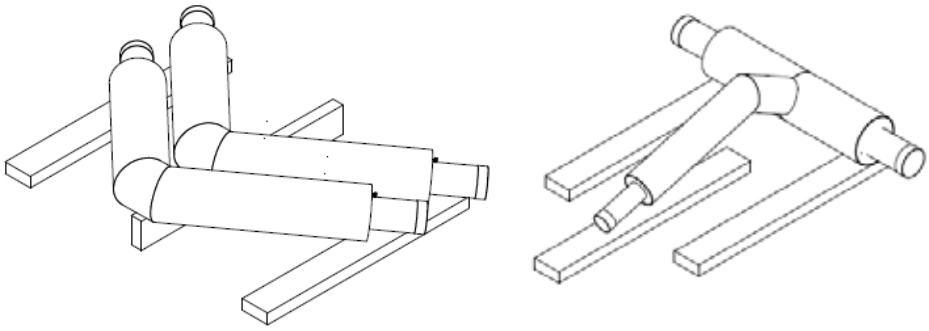


FIG 3.2.3
BENDS AND T-PIECES
Allow insulation surface to lean downward

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°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°C. Expansion foam pads on bends are needed in order to absorb movement.

FIG 3.3.1.1
U and Z compensators

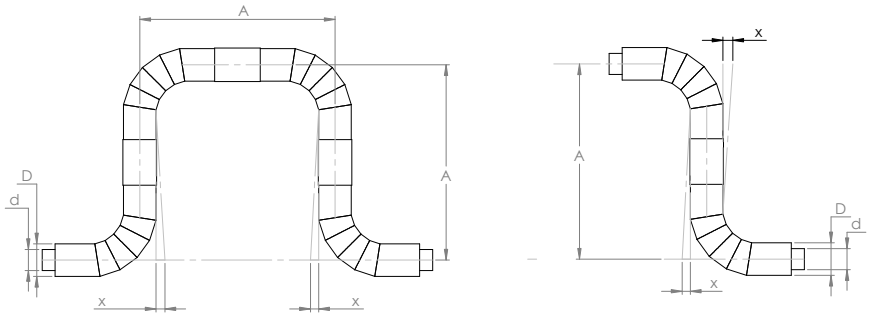


TABLE 3.3.1.1

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.

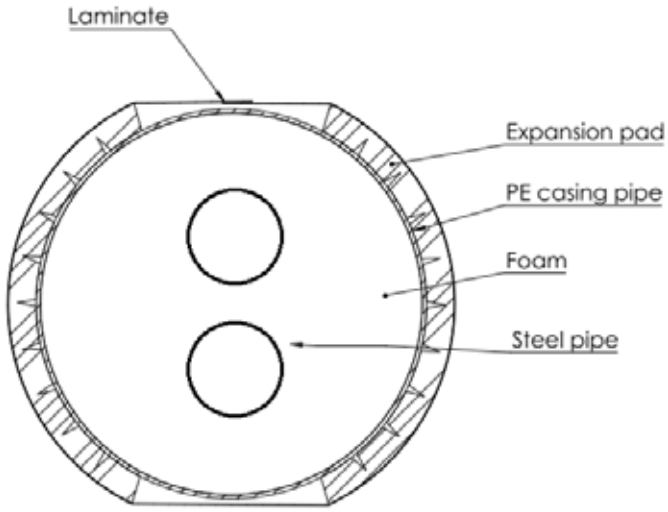
TABLE 3.3.2.1
Expansion foam pad cutting

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

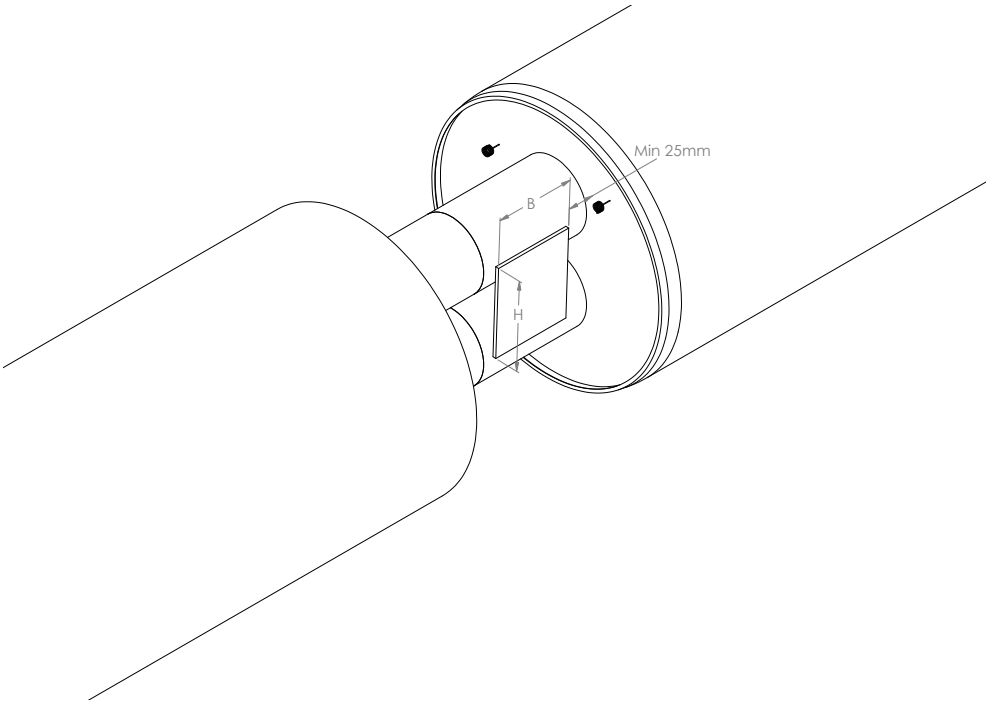
FIXING PLATES

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 (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 ± strain the following equations are used :

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

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:

α_{St} = Tensile and compressive stress [N/mm²]
E_{St} = Modulus of elasticity for steel = 210 GPa
σ = Expansion coefficient for steel = 12,6 x 10^{-6} 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.

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

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

$$\Delta L = 12{,}6x10^{-6}K^{-1} \cdot 37{,}5\ K \cdot 250\ m$$

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

$$\sigma_{st} = 2{,}1x10^{5}\frac{N}{mm^2} \cdot 12{,}6\ x\ 10^{-6}K^{-1} \cdot 37{,}5\ K$$

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

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 ±99 N/mm² < 190 N/mm².

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]

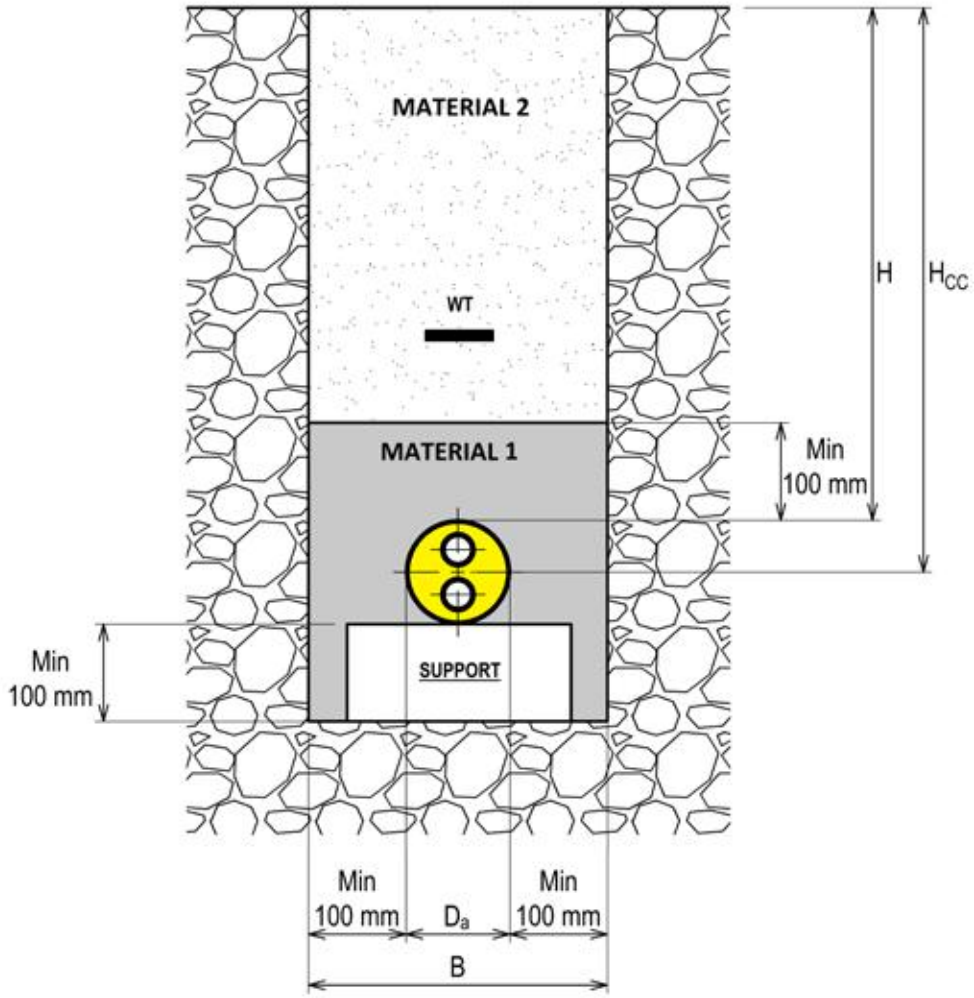


TABLE 3.3.6.1
Minimum width for a trench with double pipe [mm]

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	$^{d60}/_{d10} > 1,8$

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 similtanously 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/cm^2. 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

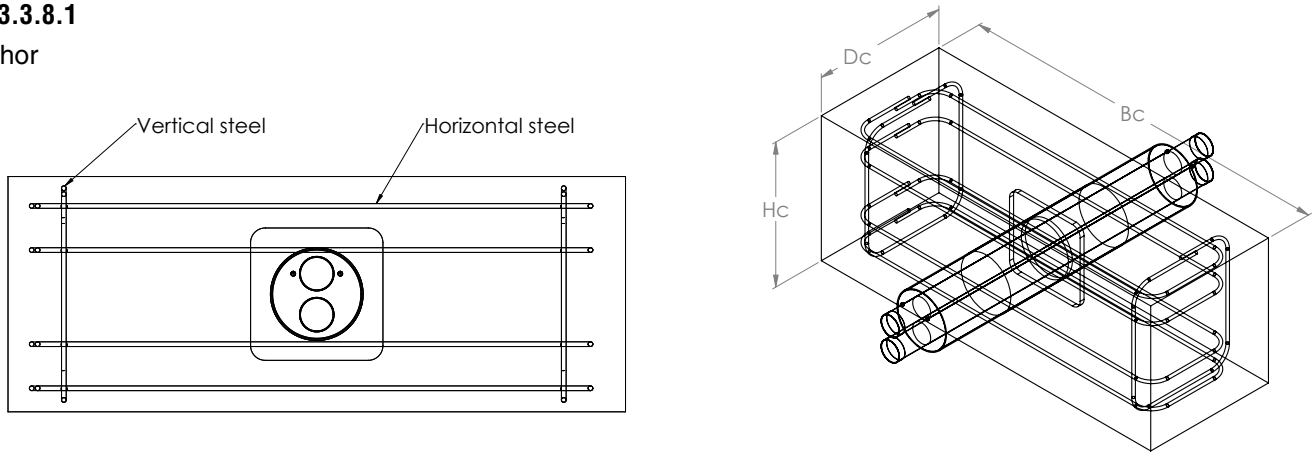
ANCHOR INSTALLATION

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/m^2 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 weldet together to the radius R_{1min}.

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

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

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

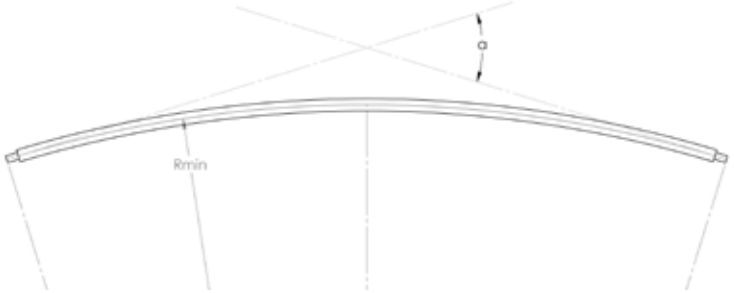
Curved pipe dimensions

d_o = Outer diameter of the steel pipe
R_{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_0 [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

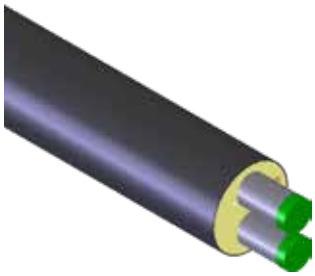
FIG 3.3.10.1

Curved pipe

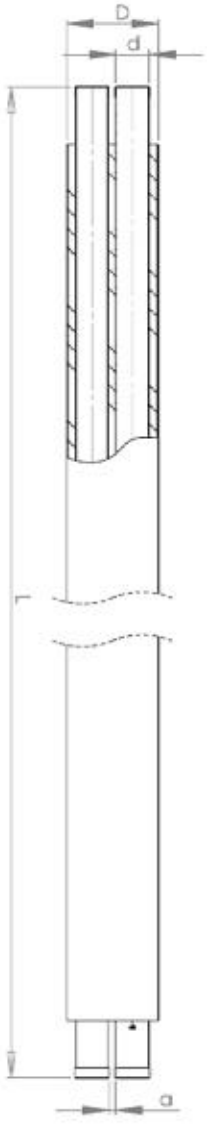


CHAPTER 3.9
PRODUCT CATALOGUE

CHAPTER 3.9.1
PRE-INSULATED DOUBLE STEEL PIPES
INSULATION SERIES 1



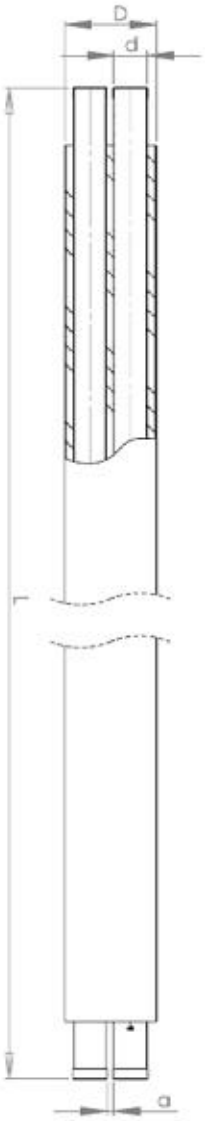
6 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t_1[mm]	D [mm]	t_2 [mm]		
1.4101.020	20-20	26,9	2,6	125	3,0	19,0	30,4
1.4101.025	25-25	33,7	2,6	140	3,0	19,0	40,2
1.4101.032	32-32	42,4	2,6	160	3,0	19,0	50,4
1.4101.040	40-40	48,3	2,6	160	3,0	19,0	54,9
1.4101.050	50-50	60,3	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

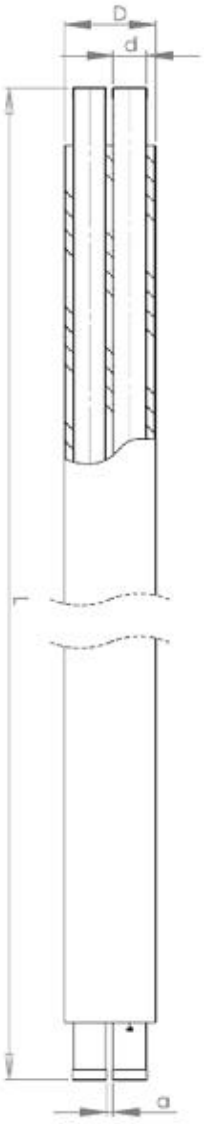


6 meters Art no.	Steel Pipe			Casing pipe		PUR a [mm]	Weight [kg/pc]
	DN	d [mm]	t_1[mm]	D [mm]	t_2 [mm]		
1.4201.020	20-20	26,9	2,6	140	3,0	19,0	32,8
1.4201.025	25-25	33,7	2,6	160	3,0	19,0	43,7
1.4201.032	32-32	42,4	2,6	180	3,0	19,0	54,3
1.4201.040	40-40	48,3	2,6	180	3,0	19,0	58,7
1.4201.050	50-50	60,3	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

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

DOUBLE BEND 90°
VERTICAL
INSULATION SERIES 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

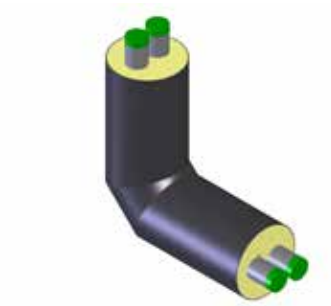
DOUBLE BEND 30°, 45° & 60°
HORIZONTAL
INSULATION SERIES 1

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

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]
1.4115.020	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

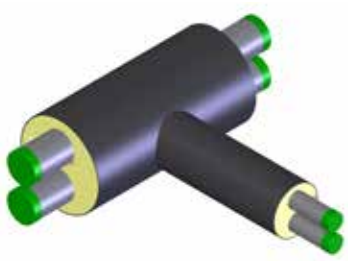
DOUBLE BEND 30°, 45° & 60° VERTICAL ISOLATION SERIES 2

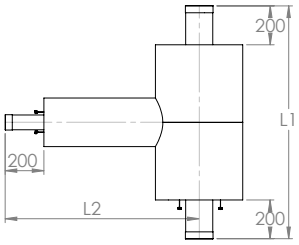
Art no.	Steel Pipe DN	Casing pipe D [mm]	Length L1/L2 [mm]	Weight [kg/pc]
1.4215.020	20-20	140	1000	9,7
1.4215.025	25-25	160	1000	11,0
1.4215.032	32-32	180	1000	13,6
1.4215.040	40-40	180	1000	15,6
1.4215.050	50-50	225	1000	20,5
1.4215.065	65-65	250	1000	26,3
1.4215.080	80-80	280	1000	33,1
1.4215.100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

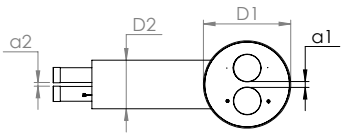
CHAPTER 3.9.3

DOUBLE T-PIECES

INSULATION SERIES 1

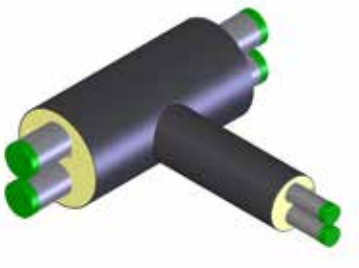




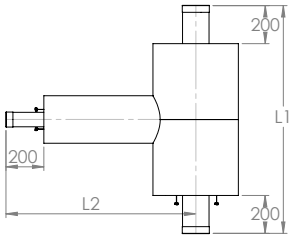


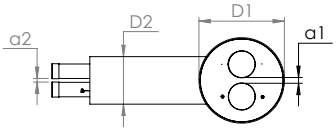
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.120.020.020	20-20	125	20-20	125	1000/800	9,4
14.120.025.020	25-25	140	20-20	125	1000/800	9,4
14.120.025.025	25-25	140	25-25	140	1000/800	9,7
14.120.032.020	32-32	160	20-20	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

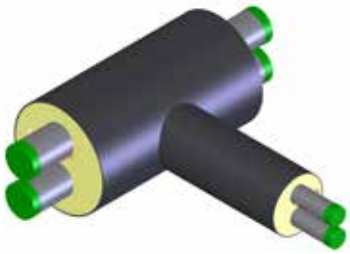


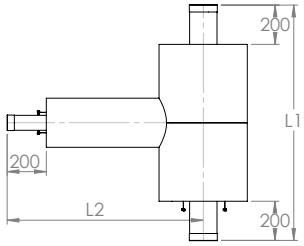
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.120.150.100	150-150	450	100-100	315	1400/900	84,8
14.120.150.125	150-150	450	125-125	400	1400/900	91,3
14.120.150.150	150-150	450	150-150	450	1400/900	99,4
14.120.200.025	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

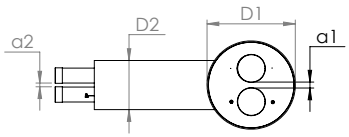




DOUBLE T-PIECES
INSULATION SERIES 2

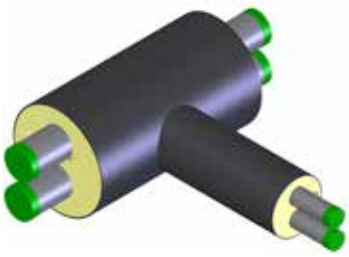




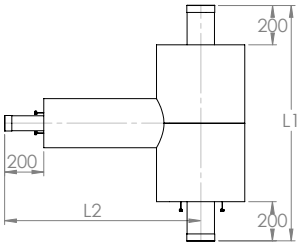


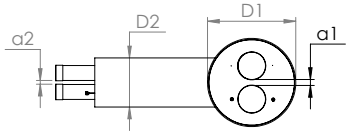
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.220.020.020	20-20	140	20-20	140	1000/800	9,4
14.220.025.020	25-25	160	20-20	140	1000/800	9,9
14.220.025.025	25-25	160	25-25	160	1000/800	10,4
14.220.032.020	32-32	180	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



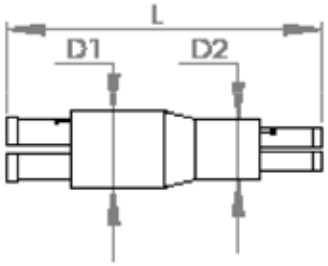
Art no.	Main pipe		Branch		Length L1/L2 [mm]	Weight [kg/pc]
	Steel Pipe DN	Casing pipe D1 [mm]	Steel Pipe DN	Casing pipe D2 [mm]		
14.220.150.065	150-150	500	65-65	250	1200/900	69,9
14.220.150.080	150-150	500	80-80	280	1200/900	73,1
14.220.150.100	150-150	500	100-100	355	1400/900	91,5
14.220.150.125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





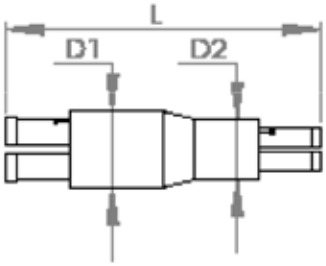
CHAPTER 3.9.4

DOUBLE REDUCTION
INSULATION SERIES 1



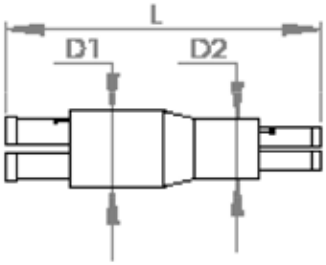
Art no.	Steel Pipe DN	Casing pipe D1/D2 [mm]	Length L [mm]	Weight [kg/pc]
1.4130.025.020	25-20	140/125	1000	3,2
1.4130.032.020	32-20	160/125	1000	3,6
1.4130.032.025	32-25	160/140	1000	3,8
1.4130.040.020	40-20	160/125	1000	4,0
1.4130.040.025	40-25	160/140	1000	4,2
1.4130.050.020	50-20	200/125	1000	4,8
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.

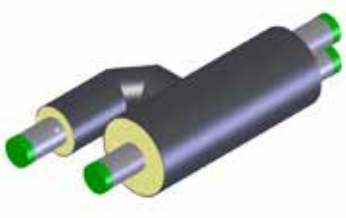
TRANSITION FORK DOUBLE TO SINGLE INSULATION SERIES 2

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

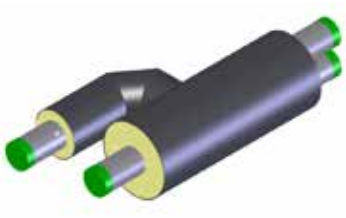
TRANSITION Y
FROM DOUBLE TO SINGLE
INSULATION SERIES 1



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.

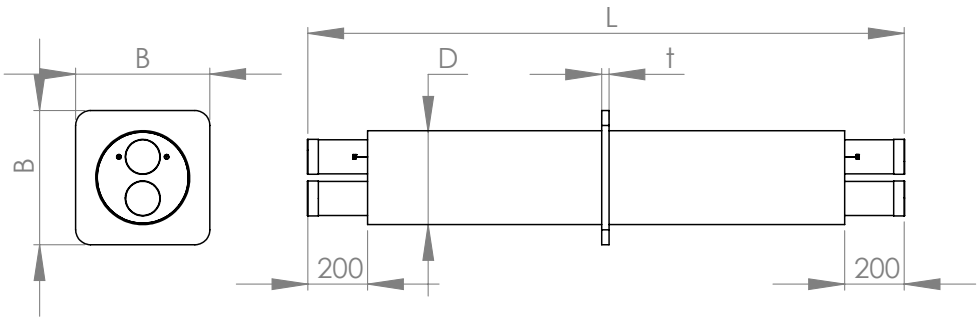
CHAPTER 3.9.8

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

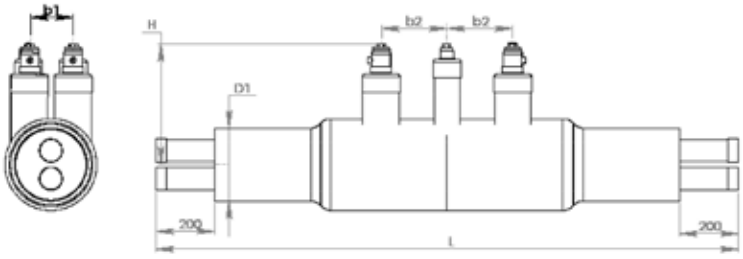
Art no.	Steel Pipe DN	Casing pipe D [mm]	Vent DN	Spindle height H [mm]	Length L [mm]	Weight [kg/pc]
1.4246.025	25-25	160	25	382	1700	17,8
1.4246.032	32-32	180	25	388	1700	20,5
1.4246.040	40-40	180	25	401	1700	22,5
1.4246.050	50-50	225	40	411	1700	31,2
1.4246.065	65-65	250	40	415	1700	38,5
1.4246.080	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



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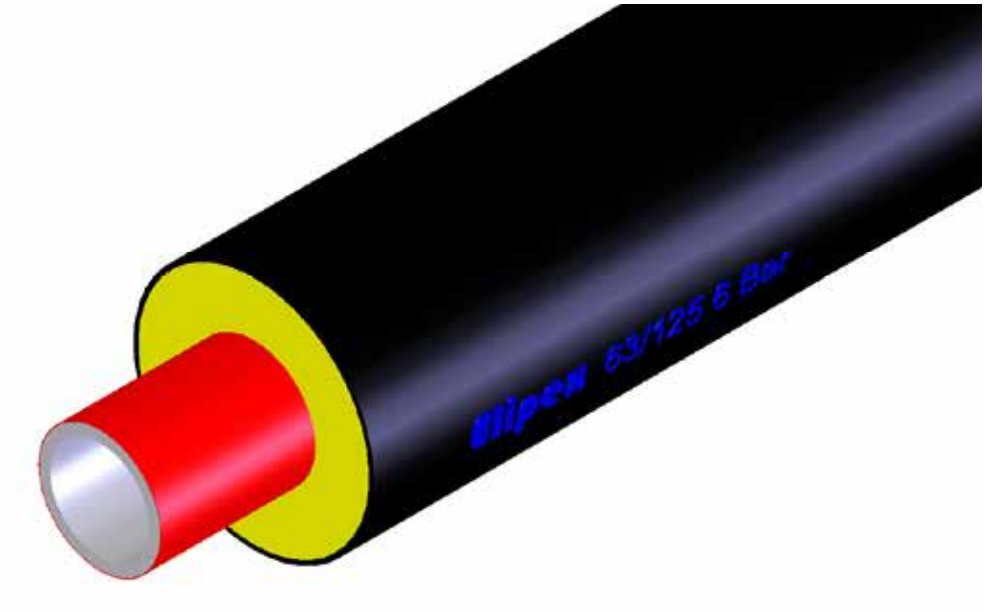
CHAPTER 4.0
FLEXIBLE PIPES

Set Pipes manufactures flexible pipes using continuous technology that ensures consistent insula-tions foam quality. The technology involves long service pipe units being insulated in a continuous process and the outer casing pipe produced in the same process. The insulated foam and casing pipe is the same for EliPex, EliCopp, EliSteel and EliAlpex, produced in insulations series 1 and 2. The pipes are flexible and are suitable for long pipelines and house connection.

CHAPTER 4.0.1
ELIPEX



EliPex pre-insulated flexible pipes are produced from PEX-a, polyurethane foam (PUR) and polyethylene casing pipe (PEL). Available in SDR 7,4 and SDR 11, single and double pipe coils in 20 mm to 125 mm. PEX-a pipe has significant advantages compared to other types of Pex pipes. In production it is guaranteed the cross binding is > 85%.

See chapter 4.9 for detailed descriptions of dimensions and sizes. Set Pipes can offer insulation of other products not specified in our product catalogue, for special requests please contact our technical department.

APPLICATION RANGE

This specification is made for pre-insulated Elipex single and double pipes for district heating.

DESCRIPTION

EliPex pipes are produced in accordance with European standards: EN 15632-1, EN 253 and EN 448 for pre-insulated flexible pipes.

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.

TABLE 4.0.1.1
Casing pipe properties

MATERIAL	Linear Low Density Polyethylene - PEL
COLOUR	Carbon black > 2,5% of the mass according to EN 15632-1 chapter 5.5.1
MELT FLOW INDEX	0,85 g/10 min. according to EN ISO 1133 (190°C / 2,16 kg)
THERMAL CONDUCTIVITY	0,40 W/m·K

TABLE 4.0.1.2
PUR foam properties

COMPRESSION STRENGTH	> 0,15 MPa at 10% deflection according to Set standards
THERMAL CONDUCTIVITY	0,0209 W/m·K acc. to EN 253 chapter 4.5.6
DENSITY	55 - 65 kg/m^3 acc. to EN 253 chapter 4.4.4
WATER ABSORPTION	< 10% water absorption of sample mass acc. to EN 253 chapter 4.4.5

TABLE 4.0.1.3
PEX service pipe properties

MATERIAL QUALITY	PEX-a, DIN 16892
DIMENSIONS AND WEIGHT	DIN 16893
HEAT RESISTANCE	Max 95°C, see table 4.0.1.8 and 4.0.1.9
DENSITY	944 kg/m^3
THERMAL CONDUCTIVITY	0,38 W/m·K

PRODUCTION CONTROL OF PRE-INSULATED FITTINGS

The control of pre-insulated fittings is in accordance to EN 448 table A.2.

DIMENSIONS FOR ELIPEX SINGLE PIPE

TABLE 4.0.1.4
Dimensions for EliPex single pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELIPEX SINGLE SDR 11		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20	1,9	75	2,2	90	2,2
25	2,3	75	2,2	90	2,2
32	2,9	75	2,2	90	2,2
40	3,7	90	2,2	110	2,5
50	4,6	110	2,5	125	2,5
63	5,8	125	2,5	140	3,0
75	6,8	140	3,0	160	3,0
90	8,2	160	3,0	180	3,0
110	10,0	180	3,0		

TABLE 4.0.1.5

Dimensions for EliPex single pipe SDR 7,4

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELIPEX SINGLE SDR 7,4		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20	2,8	75	2,2	90	2,2
25	3,5	75	2,2	90	2,2
32	4,4	75	2,2	90	2,2
40	5,5	90	2,2	110	2,5
50	6,9	110	2,5	125	2,5
63	8,6	125	2,5	140	3,0

DIMENSIONS FOR ELIPEX DOUBLE PIPE

TABLE 4.0.1.6

Dimensions for EliPex double pipe SDR 11

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELIPEX DOUBLE PIPE SDR 11		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20-20	1,9	90	2,2	110	2,2
25-25	2,3	90	2,2	110	2,5
32-32	2,9	110	2,5	125	2,5
40-40	3,7	125	2,5	140	3,0
50-50	4,6	160	3,0	180	3,0
63-63	5,8	180	3,0		

TABLE 4.0.1.7

Dimensions for EliPex double pipe SDR 7,4

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELIPEX DOUBLE PIPE SDR 7,4		CASING PIPE	
		ISO 1	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]
25-20	3,5	90	2,2
32-20	4,4	110	2,5
40-25	5,5	125	2,5
50-32	6,9	140	3,0
63-40	8,6	160	3,0

MAXIMUM OPERATING PRESSURE FOR ELIPEX

Table 4.0.1.8 and 4.0.1.9 gives an overview of the lifetime of the EliPex district heating pipes with regards to temperature and pressure according to DIN 16893.

TABLE 4.0.1.8
EliPex lifetime with regards to temperature and pressure

OPERATING TEMPERATURE [°C]	MAXIMUM OPERATING PRESSURE [BAR] FOR SDR 11					
	1 YEAR	5 YEARS	10 YEARS	25 YEARS	50 YEARS	100 YEARS
30	14,1	13,8	13,7	13,5	13,4	13,3
40	12,5	12,3	12,2	12,0	11,9	11,8
50	11,2	11,0	10,9	10,7	10,7	10,6
60	10,0	9,8	9,7	9,6	9,5	
70	8,9	8,8	8,7	8,6	8,5	
80	8,0	7,8	7,7	7,6		
90	7,2	7,0	6,9			
95	6,8	6,6				

TABLE 4.0.1.9
EliPex lifetime with regards to temperature and pressure

OPERATING TEMPERATURE [°C]	MAXIMUM OPERATING PRESSURE [BAR] FOR SDR 7,4					
	1 YEAR	5 YEARS	10 YEARS	25 YEARS	50 YEARS	100 YEARS
30	22,3	21,9	21,7	21,4	21,3	21,1
40	19,8	19,4	19,3	19,1	18,9	18,7
50	17,7	17,3	17,2	17,0	16,8	16,7
60	15,8	15,5	15,3	15,2	15,0	
70	14,1	13,8	13,7	13,6	13,4	
80	12,7	12,4	12,3	12,1		
90	11,4	11,1	11,0			
95	10,8	10,6				

PRODUCTION CONTROL OF ELIPEX

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

COIL DIMENSIONS FOR ELIPEX

EliPex pipes are delivered in coils to fit in both DC and HC containers. The EliPex pipe length can be customized by the request of the customers and Set Pipes can also provide longer coils. For special requests please contact our technical department.

TABLE 4.0.1.10
EliPex coil dimensions for 40 feet DC container, 11 coils in each container

CASING PIPE [mm]	INNER DIAMETER [mm]	OUTER DIAMETER [mm]	WIDTH [mm]	LENGTH [m]
75	1450 ± 30	2250 ± 50	1000 ± 50	342
90	1600 ± 30	2250 ± 50	1000 ± 50	253
110	1600 ± 30	2250 ± 50	1000 ± 50	155
125	1800 ± 30	2250 ± 50	1000 ± 50	95
140	2000 ± 30	2250 ± 50	1120 ± 50	56
160	2000 ± 30	2250 ± 50	1120 ± 50	45
180	1900 ± 30	2250 ± 50	1120 ± 50	39

TABLE 4.0.1.11
EliPex coil dimensions for 40 feet HC container, 8 coils in each container + one DC coil

CASING PIPE [mm]	INNER DIAMETER [mm]	OUTER DIAMETER [mm]	WIDTH [mm]	LENGTH [m]
75	1450 ± 30	2530 ± 50	1000 ± 50	530
90	1580 ± 30	2530 ± 50	1000 ± 50	407
110	1580 ± 30	2530 ± 50	1000 ± 50	280
125	1820 ± 30	2530 ± 50	1000 ± 50	154
140	2000 ± 30	2530 ± 50	1120 ± 50	105
160	1950 ± 30	2530 ± 50	1120 ± 50	91
180	1900 ± 30	2530 ± 50	1120 ± 50	80

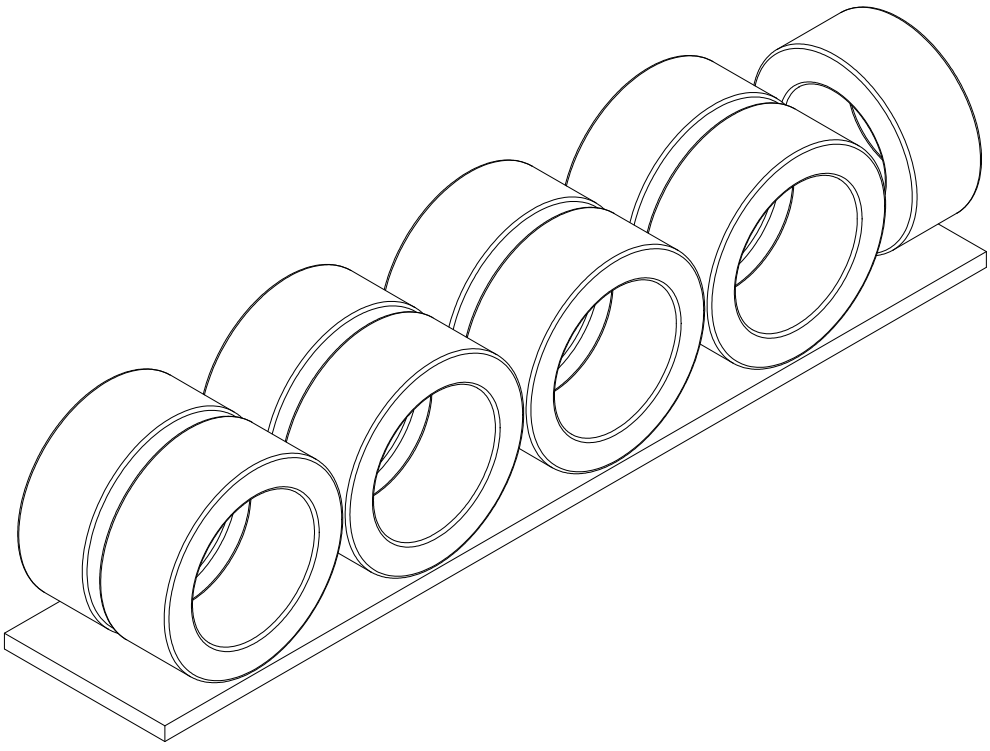
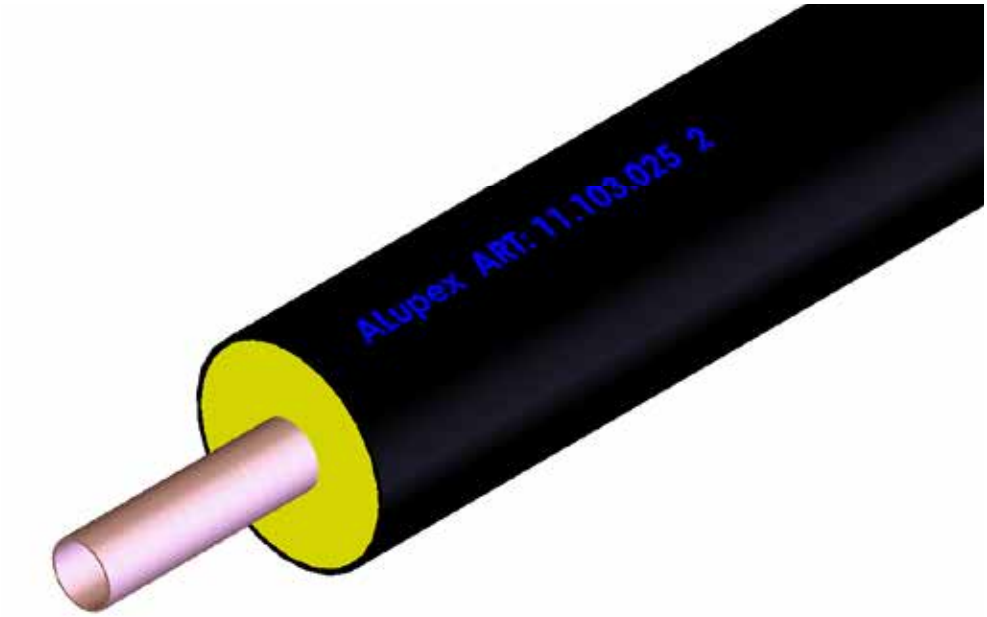


FIG 4.0.1.1
HC container load

CHAPTER 4.0.2
ELICOPP



EliCopp pre-insulated flexible pipes are produced from copper service pipes, polyurethane foam (PUR) and polyethylene casing pipe (PEL). Available in single and double pipe coils in 15 mm to 28 mm outer diameter.

See chapter 4.9 for detailed descriptions of dimensions and sizes. Set Pipes can offer insulation of other products not specified in our product catalogue, for special requests please contact our technical department.

APPLICATION RANGE

This specification is made for pre-insulated EliCopp single and double pipes for district heating. The temperature resistance of the copper pipes is higher than of plastic pipes and therefore suitable for temperatures above 95°C.

DESCRIPTION

EliCopp pipes are produced in accordance with European standards: EN 15632-4, EN 253.

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

TABLE 4.0.2.1
Casing pipe properties

MATERIAL	Linear Low Density Polyethylene - PEL
COLOUR	Carbon black > 2,5% of the mass according to EN 15632-1 chapter 5.5.1
MELT FLOW INDEX	0,85 g/10 min. according to EN ISO 1133 (190°C / 2,16 kg)
THERMAL CONDUCTIVITY	0,40 W/m·K

TABLE 4.0.2.2
PUR foam properties

COMPRESSION STRENGTH	> 0,15 MPa at 10% deflection according to Set standards
THERMAL CONDUCTIVITY	0,0209 W/m·K acc. to EN 253 chapter 4.5.6
DENSITY	55 - 65 kg/m³ acc. to EN 253 chapter 4.4.4
WATER ABSORPTION	< 10% water absorption of sample mass acc. to EN 253 chapter 4.4.5

TABLE 4.0.2.3
Copper service pipe properties

MATERIAL QUALITY	EN 1057
TECHNICAL REGULATIONS	R220
DENSITY	8910 kg/m³
THERMAL CONDUCTIVITY	293 W/m·K

DIMENSIONS FOR ELICOPP SINGLE PIPE

TABLE 4.0.2.4
Dimensions for EliCopp single pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

SINGLE COPPER PIPE		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
15	1,0	75	2,2	90	2,2
18	1,0	75	2,2	90	2,2
22	1,0	75	2,2	90	2,2
28	1,2	75	2,2	90	2,2

DIMENSIONS FOR ELICOPP DOUBLE PIPE

TABLE 4.0.2.5
Dimensions for EliCopp double pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

DOUBLE COPPER PIPE		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
15-15	1,0	90	2,2	110	2,5
18-18	1,0	90	2,2	110	2,5
22-22	1,0	90	2,2	110	2,5
28-28	1,2	110	2,5	125	2,5

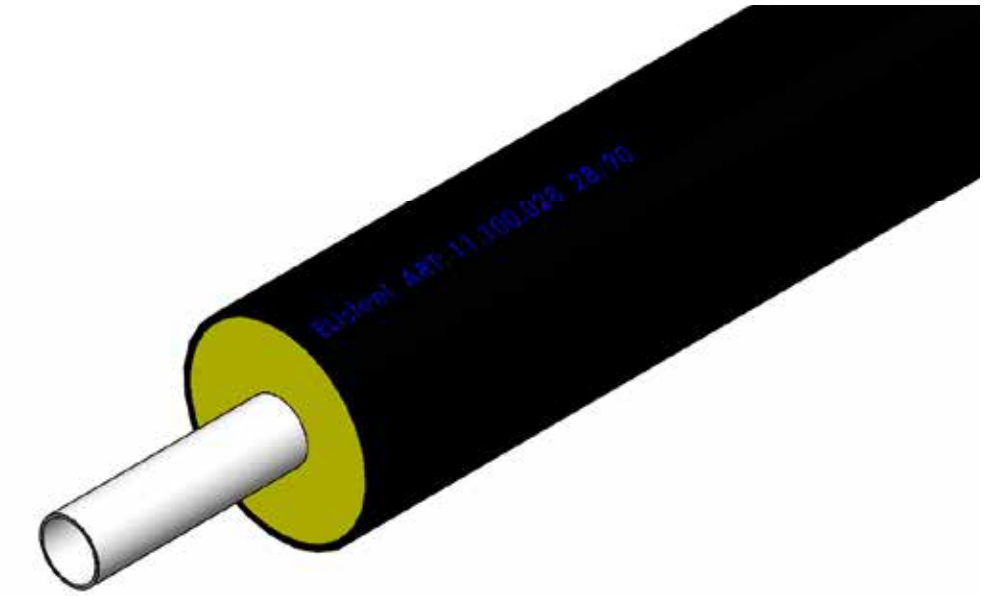
COIL DIMENSIONS FOR ELICOPP

EliCopp pipes are delivered in coils to fit in containers. The EliCopp pipe length can be customized by the request of the customers and Set Pipes can also provide longer coils. For special requests please contact our technical department.

TABLE 4.0.2.6
EliCopp coil dimensions for 40 feet DC container

CASING PIPE [mm]	INNER DIAMETER [mm]	OUTER DIAMETER [mm]	WIDTH [mm]	LENGTH [m]
75	1650 ± 30	2000 ± 50	500 ± 50	100
90	1650 ± 30	2150 ± 50	550 ± 50	100
110	1650 ± 30	2150 ± 50	550 ± 50	100
125	1800 ± 30	2250 ± 50	1000 ± 50	95

CHAPTER 4.0.3
ELISTEEL



EliSteel pre-insulated flexible pipes are produced from steel, polyurethane foam (PUR) and polyethylene casing pipe (PEL). Available in single and double pipe coils, in 20 mm to 28 mm outer diameter. See chapter 4.9 for detailed descriptions of dimensions and sizes. Set Pipes can offer insulation of other products not specified in our product catalogue, for special requests please contact our technical department.

APPLICATION RANGE
This specification is made for pre-insulated EliSteel single and double pipes for district heating. The temperature resistance of the steel pipes is higher than of plastic pipes and therefore suitable for temperatures above 95°C.

DESCRIPTION
EliSteel pipes are produced in accordance with European standards: EN 15632-4, and EN 253.

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

TABLE 4.0.3.1
Casing pipe properties

MATERIAL	Linear Low Density Polyethylene – PEL
COLOUR	Carbon black > 2,5% of the mass according to EN 15632-1 chapter 5.5.1
MELT FLOW INDEX	0,85 g/10 min. according to EN ISO 1133 (190°C / 2,16 kg)
THERMAL CONDUCTIVITY	0,40 W/m·K

TABLE 4.0.3.2
PUR foam properties

COMPRESSION STRENGTH	> 0,15 MPa at 10% deflection according to Set standards
THERMAL CONDUCTIVITY	0,0209 W/m·K acc. to EN 253 chapter 4.5.6
DENSITY	55 - 65 kg/m^3 acc. to EN 253 chapter 4.4.4
WATER ABSORPTION	< 10% water absorption of sample mass acc. to EN 253 chapter 4.4.5

TABLE 4.0.3.3
Steel service pipe properties

MATERIAL QUALITY	EN 10217-1
TECHNICAL REGULATIONS	P195
DENSITY	7850 kg/m^3
THERMAL CONDUCTIVITY	50,0 W/m·K

PRODUCTION CONTROL OF PRE-INSULATED FITTINGS

The control of pre-insulated fittings is in accordance to EN 448 table A.2.

DIMENSIONS FOR ELISTEEL SINGLE PIPE

TABLE 4.0.3.4
Dimensions for EliSteel single pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELISTEEL SINGLE PIPE		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20	2,0	75	2,2	90	2,2
25	2,0	75	2,2	90	2,2
28	2,0	75	2,2	90	2,2

DIMENSIONS FOR ELISTEEL DOUBLE PIPE

TABLE 4.0.3.5
Dimensions for Elisteel double pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELISTEEL DOUBLE PIPE		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20-20	2,0	90	2,2	110	2,5
25-25	2,0	90	2,2	110	2,5
28-28	2,0	110	2,5	125	2,5

COIL DIMENSIONS FOR ELISTEEL

EliSteel pipes are delivered in coils to fit in DC containers. The EliSteel pipe length can be customized by the request of the customers and Set Pipes can also provide longer coils. For special requests please contact our technical department.

TABLE 4.0.3.6
EliSteel coil dimensions for 40 feet DC container

CASING PIPE [mm]	INNER DIAMETER [mm]	OUTER DIAMETER [mm]	WIDTH [mm]	LENGTH [m]
75	1700 ± 30	2200 ± 50	450 ± 50	100
90	1700 ± 30	2200 ± 50	550 ± 50	100
110	1800 ± 30	2200 ± 50	940 ± 50	100
125	1830 ± 30	2250 ± 50	1000 ± 50	95

CHAPTER 4.0.4
ELIALPEX

EliAlpex pre-insulated flexible pipes are produced from AlPex, polyurethane foam (PUR) and PEL casing pipe. Available in single and double pipe coils in 20 mm to 40 mm outer diameter. See chapter 4.9 for detailed descriptions of dimensions and sizes. Set Pipes can offer insulation of other products not specified in our product catalogue, for special requests please contact our technical department.

APPLICATION RANGE
This specification is made for pre-insulated EliAlpex single and double pipes for district heating. The aluminium layer in the EliAlpex pipes has full oxygen barrier diffusion.

DESCRIPTION
EliAlpex pipes are produced in accordance with European standards: EN 15632-1 and EN 253.

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.

TABLE 4.0.4.1
PUR foam properties

MATERIAL	Linear Low Density Polyethylene - PEL
COLOUR	Carbon black > 2,5% of the mass according to EN 15632-1 chapter 5.5.1
MELT FLOW INDEX	0,85 g/10 min. according to EN ISO 1133 (190°C / 2,16 kg)
THERMAL CONDUCTIVITY	0,40 W/m·K

TABLE 4.0.4.2
Aluminium service pipe properties

COMPRESSION STRENGTH	> 0,15 MPa at 10% deflection according to Set standards
THERMAL CONDUCTIVITY	0,0209 W/m·K acc. to EN 253 chapter 4.5.6
DENSITY	55 - 65 kg/m^3 acc. to EN 253 chapter 4.4.4
WATER ABSORPTION	< 10% water absorption of sample mass acc. to EN 253 chapter 4.4.5

TABLE 4.0.4.3
Aluminium service pipe properties

MATERIAL QUALITY	DIN 16892
DIMENSIONS AND WEIGHT	DIN 16893
OXYGEN BARRIER	Oxygen diffusion 0% acc. to DIN 4726
DENSITY	944 kg/m^3
THERMAL CONDUCTIVITY	0,43 W/m·K

DIMENSIONS FOR ELIALPEX SINGLE PIPE

TABLE 4.0.4.4
Dimensions for EliAlpex single pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELIALPEX SINGLE PIPE SDR 7,4		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20	2,9	75	2,2	90	2,2
25	3,7	75	2,2	90	2,2
32	4,7	75	2,2	90	2,2
40	5,4	90	2,2	110	2,5

DIMENSIONS FOR ELIALPEX DOUBLE PIPE

TABLE 4.0.4.5
Dimensions for EliAlpex double pipe

D_o = Outer diameter of the casing pipe
d_o = Outer diameter of the service pipe
t_1 = Wall thickness service pipe
t_2 = Wall thickness casing pipe

ELIALPEX DOUBLE PIPE SDR 7,4		CASING PIPE			
		ISO 1		ISO 2	
d_0 [mm]	t_1 [mm]	D_0 [mm]	t_2 [mm]	D_0 [mm]	t_2 [mm]
20-20	14,2	90	2,2	110	2,5
25-25	17,6	90	2,2	110	2,2
32-32	22,6	110	2,5	125	2,5
40-40	29,2	125	2,5	140	3,0

COIL DIMENSIONS FOR ELIALPEX

EliAlpex pipes are delivered in coils to fit in DC containers. The EliAlpex pipe length can be customized by the request of the customers and Set Pipes can also provide longer coils. For special requests please contact our technical department.

TABLE 4.0.4.6
EliAlpex coil dimensions for 40 feet DC container

CASING PIPE [mm]	INNER DIAMETER [mm]	OUTER DIAMETER [mm]	WIDTH [mm]	LENGTH [m]
75	1700 ± 30	2200 ± 50	450 ± 50	100
90	1700 ± 30	2200 ± 50	550 ± 50	100
110	1800 ± 30	2200 ± 50	940 ± 50	100
125	1830 ± 30	2250 ± 50	1000 ± 50	95

CHAPTER 4.1
APPLICATION RANGE

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.

CHAPTER 4.1.1
HEAT DEMAND

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 [m^3/s]
Q = Thermal requirement [W]
ρw = Water density (978 kg/m^3 við 70°C)
c_p = Specific heat for water (4191 J/kg·K við 70°C)
ΔT = Temperature change between forward and return flow media ($T_{VL} - T_{RL}$) [K]

EXAMPLE: A house has the thermal requirement about 14 kW and temperature change between flow and return flow media 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:

$$\dot{m} = \frac{10000\,W}{978\,\frac{kg}{m^3} \cdot 4191\,\frac{J}{kg \cdot K} \cdot 40K} = 6{,}1x10^{-6}\,\frac{m^3}{s} = \mathbf{0{,}061}\,\frac{\mathbf{l}}{\mathbf{s}}$$

CHAPTER 4.1.2
TOTAL PRESSURE LOSS FOR PRE – INSULATED FLEXIBLE 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 the pipes should be in the range of 100 – 200 Pa/m. 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:

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

THUS:

- f = Friction factor [-]
- L = Length of the pipe [m]
- d_i = Inner diameter of the service pipe [m]
- V = Average water velocity [m/s]
- ρw = Water density (972 kg/m^3 við 80°C)
- Hm = 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 service pipes:
  - Steel = 100 µm
  - Pex and Alpex = 7,0 µm
  - Copper = 1,9 µm
- 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 4.1.2.1. However, to find this factor it is necessary to know what kind of flow is in the pipeline. The type of the pipe flow is determined with the Reynolds number (Re) equation:

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

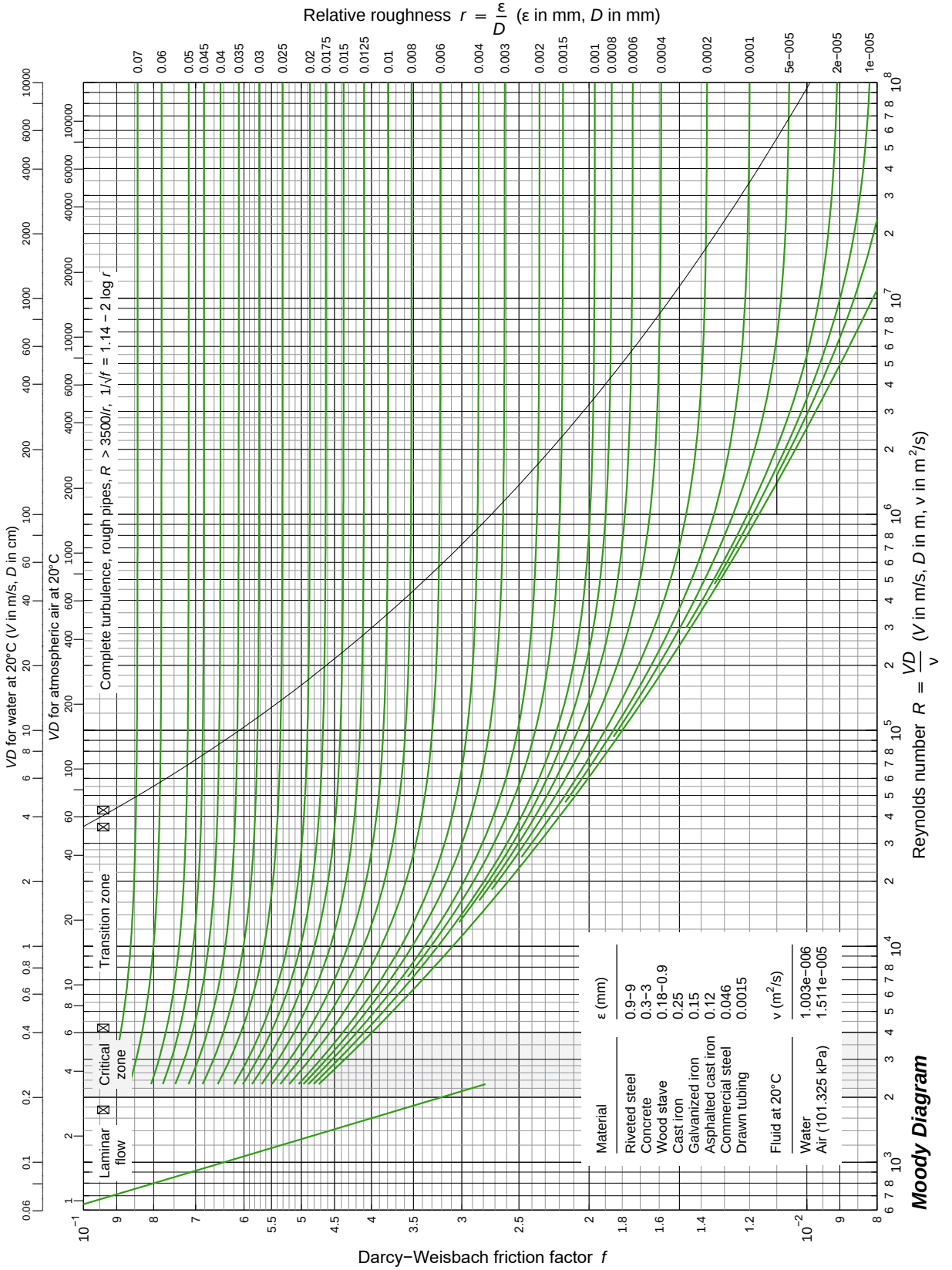
THUS:

V = Kinematic viscosity for water (0,366 x 10^{-6} m^2/s fyrir 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 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.

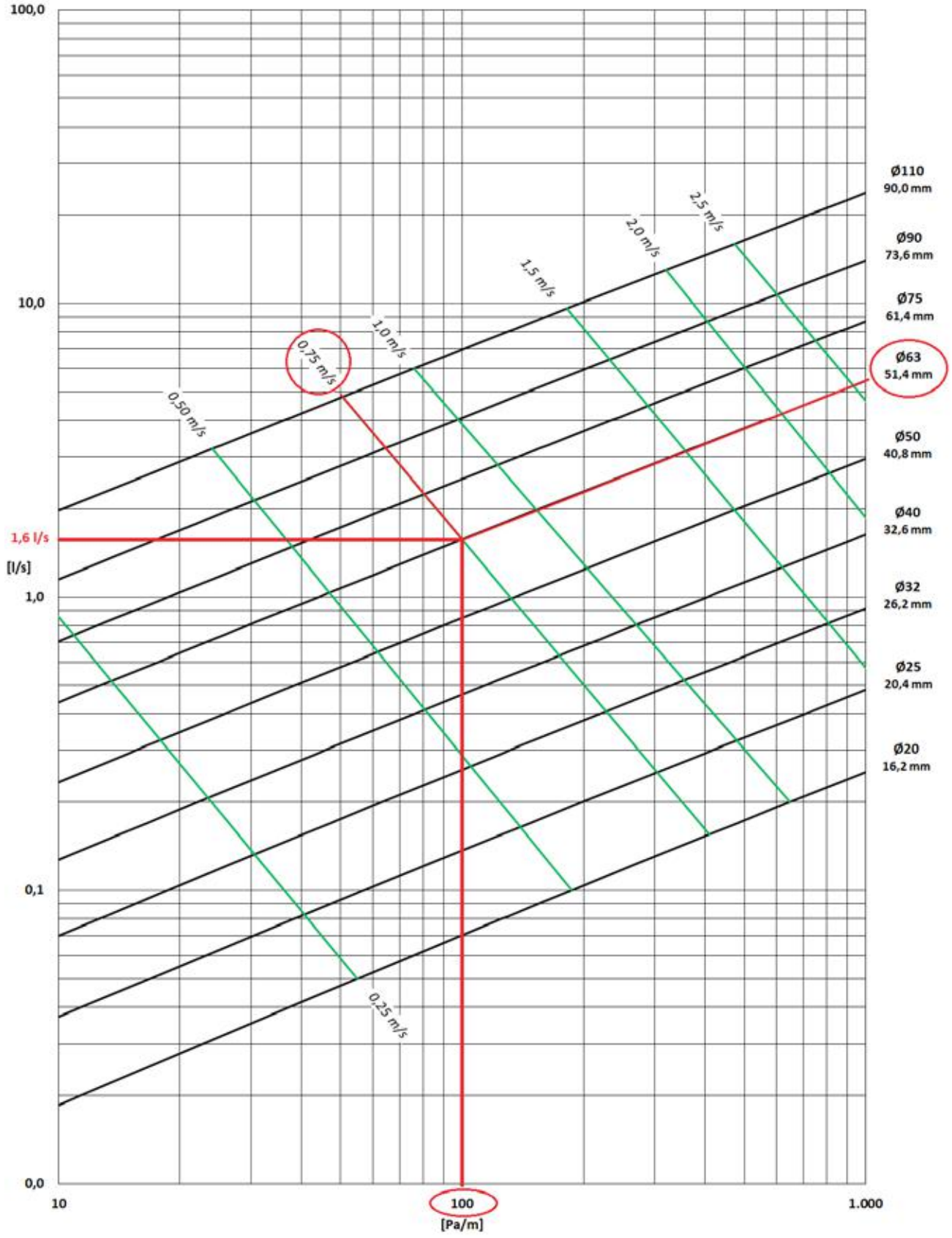
Graphs 4.1.2.2 - 4.1.2.6 shows pressure loss in a single flow pipe taking into consideration water need, pipe dimension, and average water velocity. Also there is an example on how to use the graph.

GRAPH 4.1.2.1 – MOODY CHART

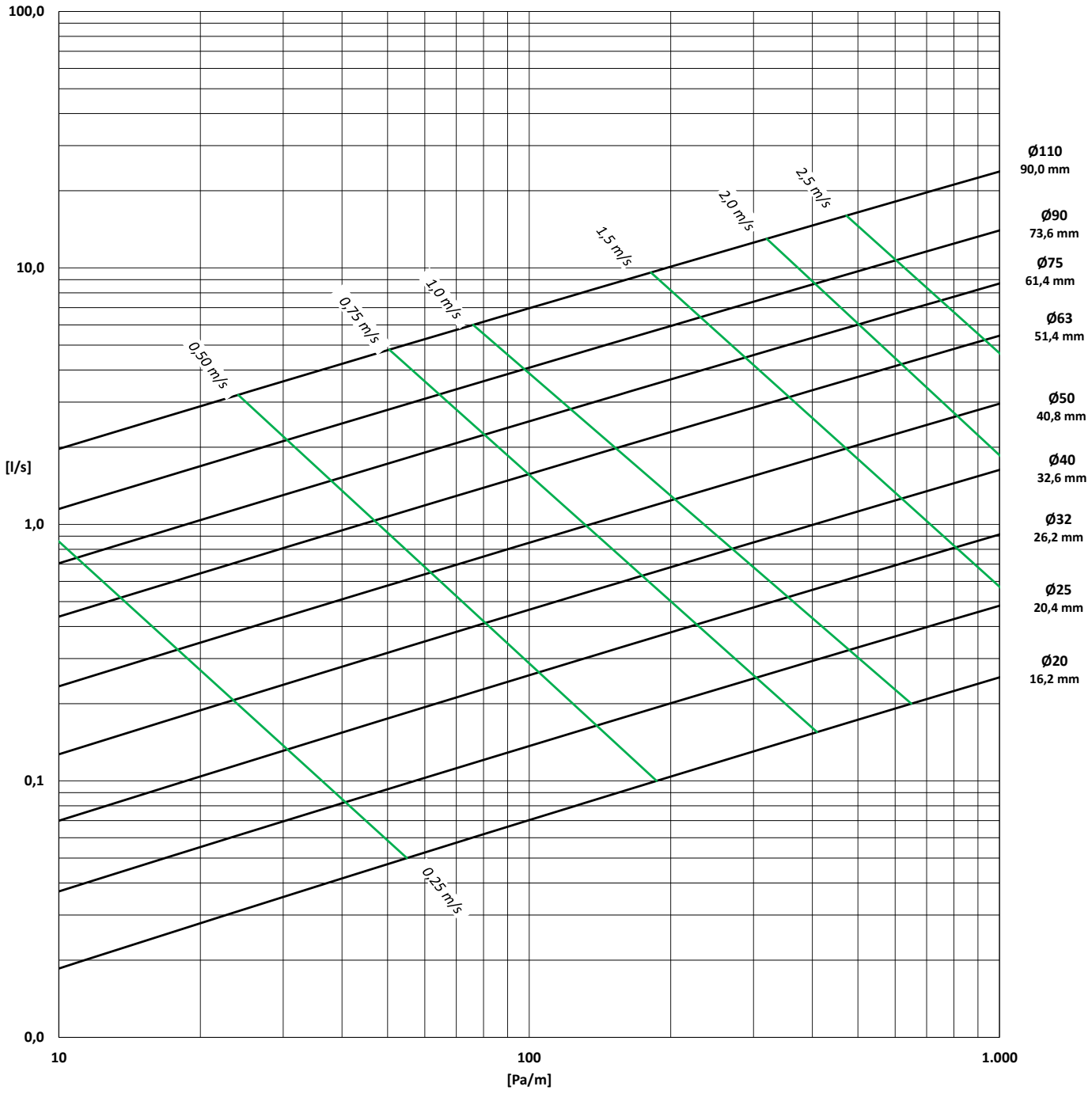


AN EXAMPLE HOW TO USE THE PRESSURE DROP GRAPH

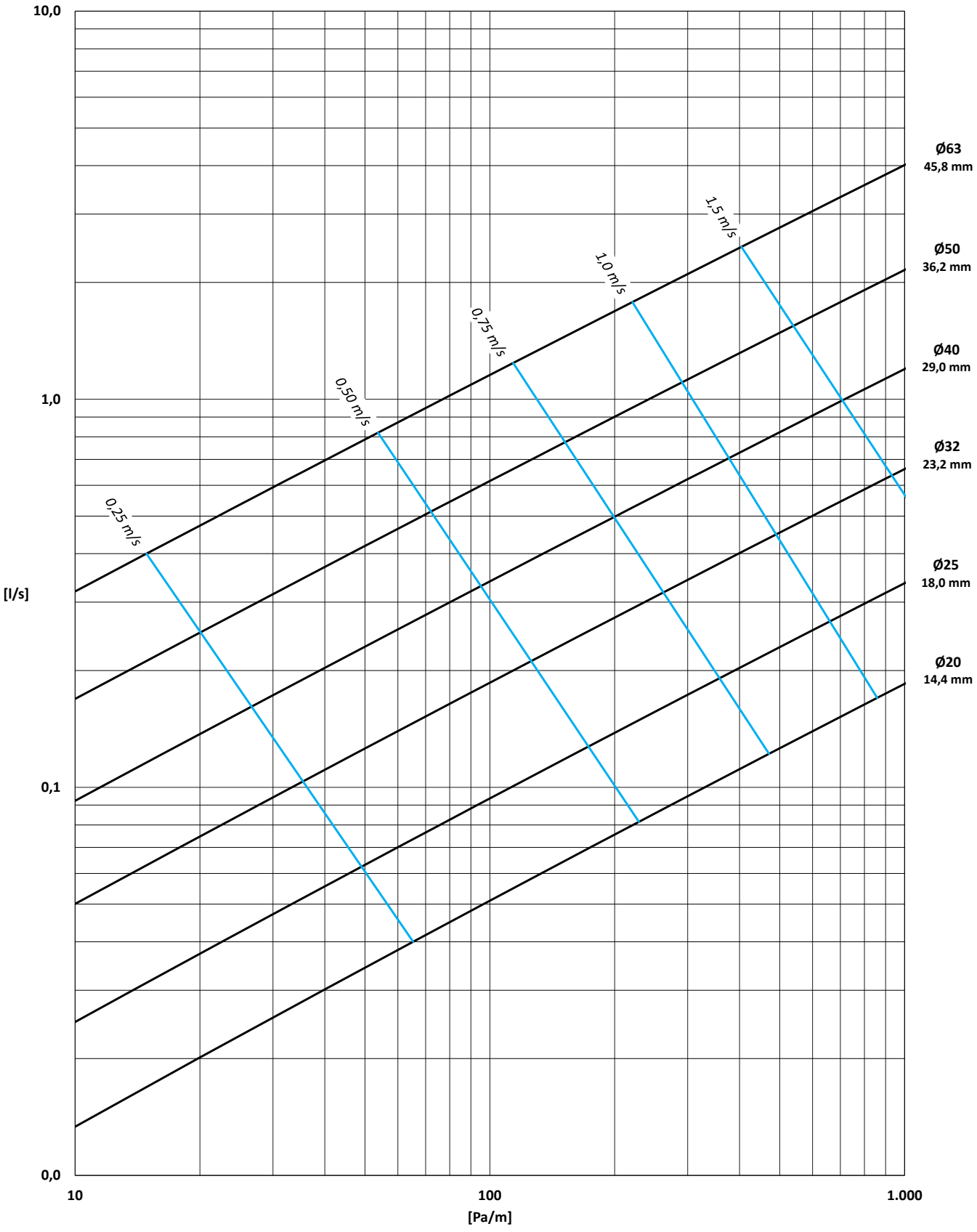
A residential area has a water demand of about 1,6 l/s. To determine what pipe dimension is suitable, the general rule for a suitable pressure loss in water pipes is between 100 – 150 Pa/m. In this example it is determined that 100 Pa/m results in an average water speed in the pipeline of about 0,75 m/s and the recommended pipe dimension would be Ø63mm.



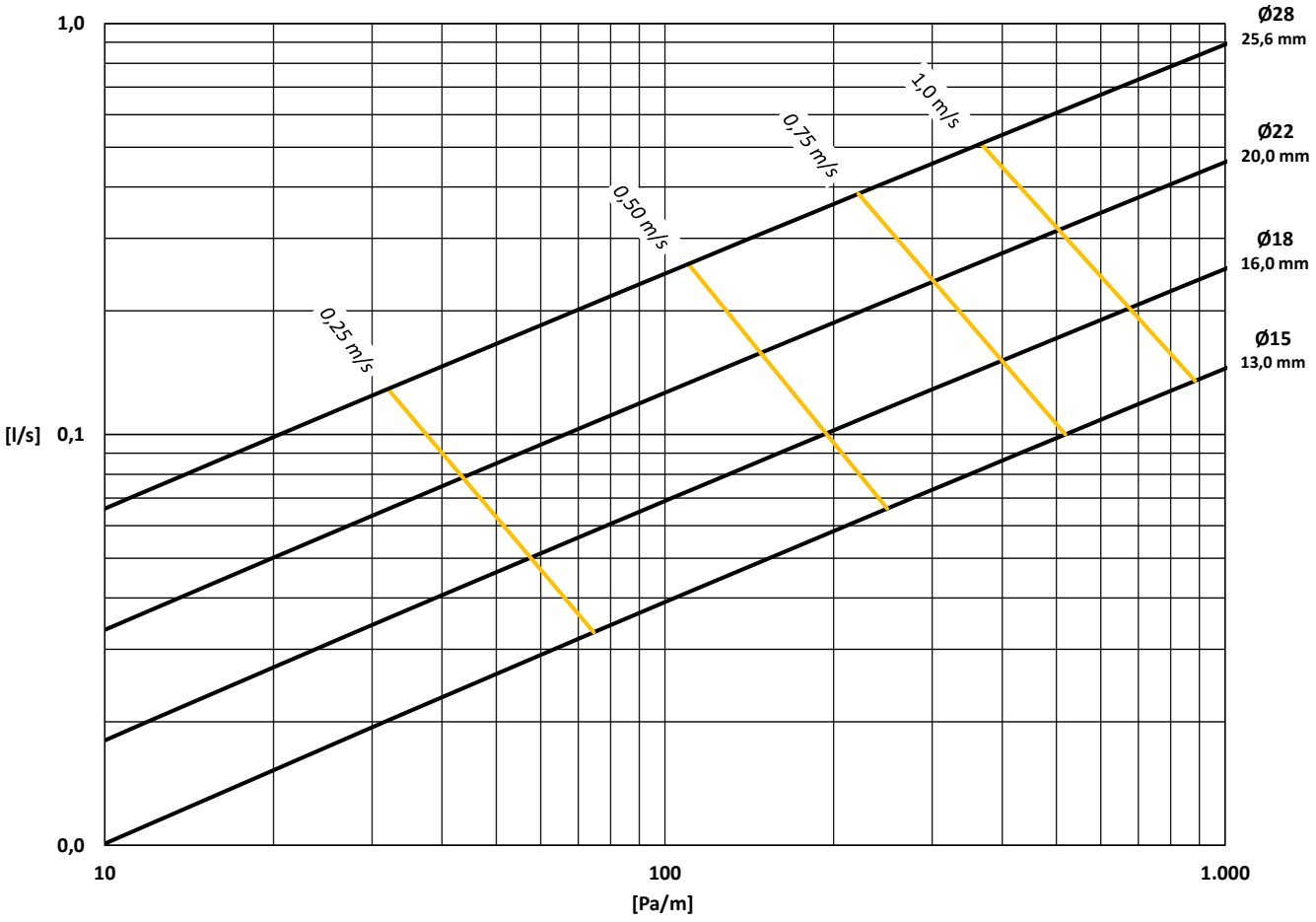
GRAPH 4.1.2.2 – PRESSURE LOSS IN ELIPEX SDR 11 SERVICE PIPE



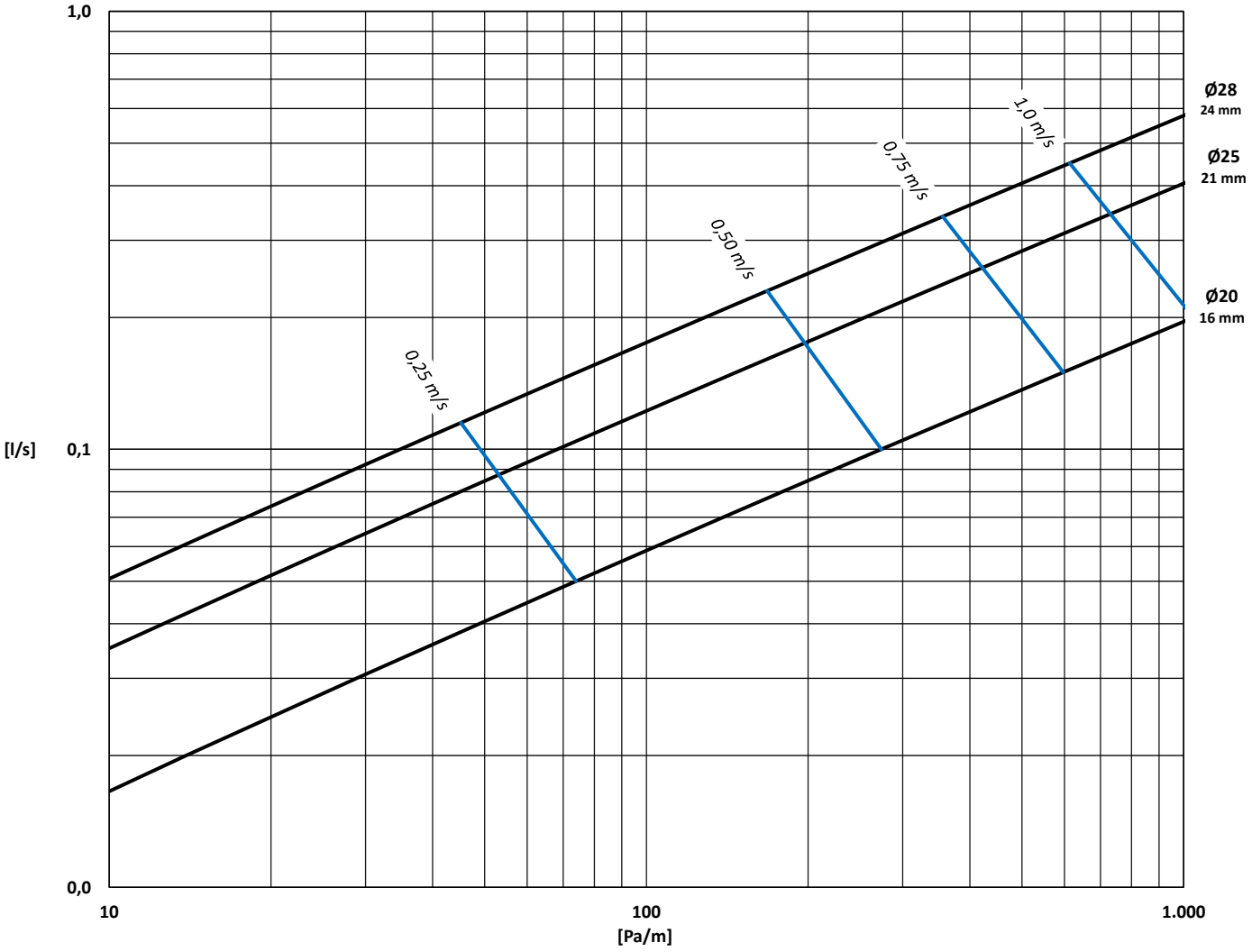
GRAPH 4.1.2.3 - – PRESSURE LOSS IN SDR 7,4 SERVICE PIPE



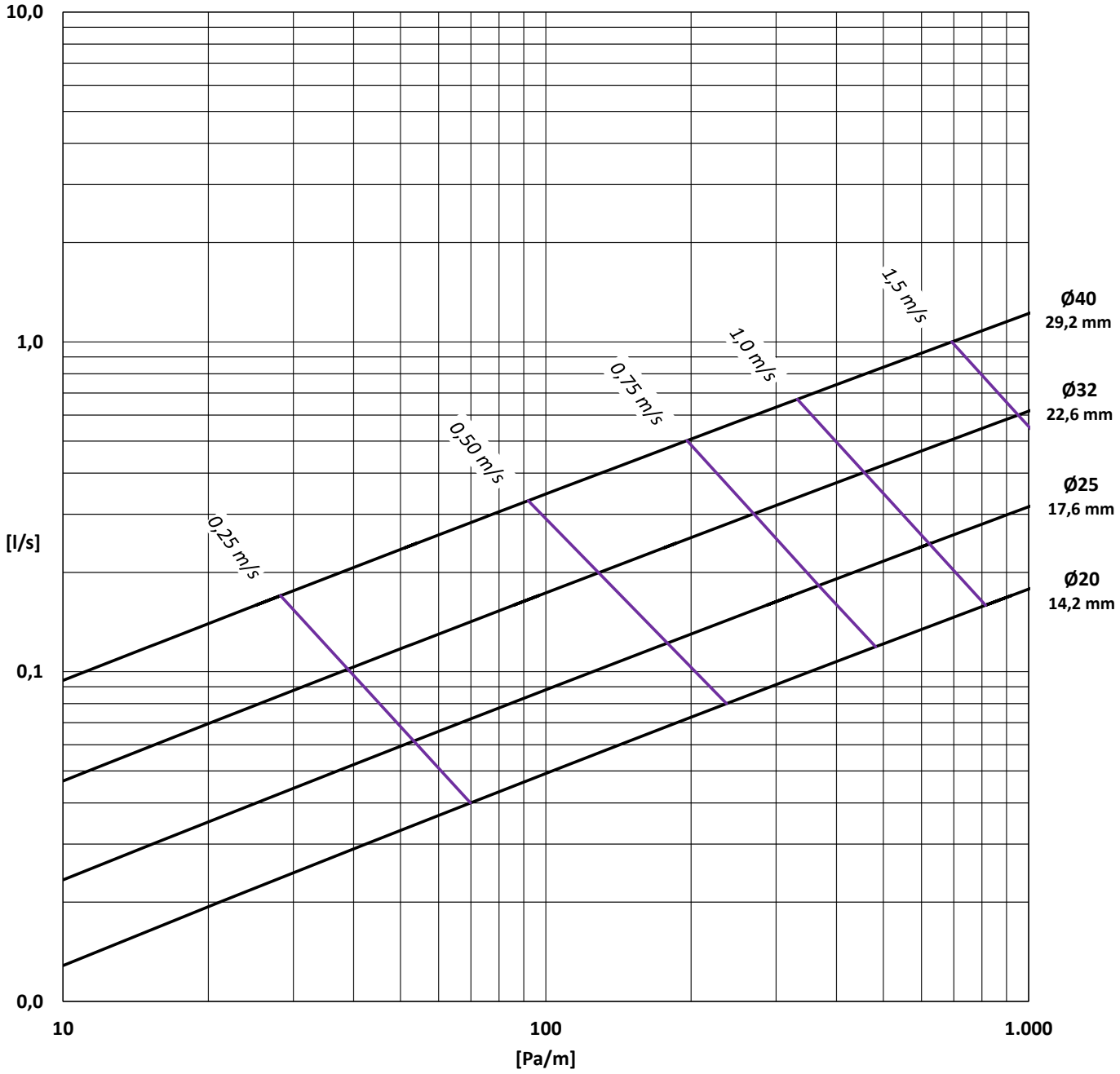
GRAPH 4.1.2.4 - PRESSURE LOSS IN ELICOPP SERVICE PIPE



GRAPH 4.1.2.5 - PRESSURE LOSS IN ELISTEEL SERVICE PIPE



GRAPH 4.1.2.6 - PRESSURE LOSS IN ELIALPEX SERVICE PIPE



CHAPTER 4.1.3
HEAT LOSS – PRE- INSULATED FLEXIBLE 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 CO^2 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 to be 80°C and for the return flow media to be 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 flexible pipes are made up of three components, casing pipe, PUR insulation foam and pipes. 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 ($U_{PIPE\ IN\ GROUND}$).

THERMAL RESISTANCE OF THE SERVICE PIPE

$$R_{St} = \frac{1}{2 \cdot \pi \cdot \lambda_P} \cdot In\left(\frac{d_a}{d_i}\right) \left[\frac{m \cdot K}{W}\right]$$

THUS:

λ_P = Coefficient of thermal conductivity for the service pipe:

PEX = 0,380 W/m·K
AlPex = 0,430 W/m·K
Steel = 50,0 W/m·K
Copper = 263 W/m·K

d_a = Outer diameter service pipe [m]
d_i = Inner diameter service pipe [m]

THERMAL RESISTANCE OF THE INSULATION MATERIAL

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

THUS:

λ_{PUR} = Coefficient of thermal conductivity for the PUR insulation in flexible pipes = 0,0209 W/m·K
D_{PUR} = Outer diameter of the insulation material [m]
d_a = Outer diameter of the service pipe [m]

THERMAL RESISTANCE OF THE CASING PIPE

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

THUS:

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

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

THUS:

λ_s = Coefficient of thermal conductivity for the soil = 1,20 W/m·K

D_O = Outer diameter of the casing pipe [m]

Z_c = Is a corrected value of depth z, so that the surface transition insolence 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.
(Compared with 0,60 m depth, plus the radios of the casing pipe)

R_0 = Surface transition insolence = 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:

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

THUS:

C = The distance between the center lines of the pipes [m]

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

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

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

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

HEAT LOSS FOR BURIED ELIPEX SDR 11 PIPE

In tables 4.1.3.1 - 4.1.3.10 the results for total heat loss for buried single flexible pipes in insulation series 1-2 in regards to overall heat loss coefficient and average water temperature T_M are shown.

TABLE 4.1.3.1

Heat loss for EliPex single pipe SDR 11 [W/m] series 1

d_a = Outer diameter of the service pipe

D_O = Outer diameter of the casing pipe

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

T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	75	0,0936	1,87	3,75	4,68	5,62	6,56	7,49
25	75	0,111	2,23	4,46	5,57	6,68	7,80	8,91
32	75	0,141	2,82	5,64	7,05	8,46	9,87	11,3
40	90	0,146	2,93	5,86	7,32	8,79	10,3	11,7
50	110	0,150	3,01	6,02	7,52	9,03	10,5	12,0
63	125	0,170	3,40	6,81	8,51	10,2	11,9	13,6
75	140	0,186	3,73	7,46	9,32	11,2	13,0	14,9
90	160	0,200	3,99	7,99	9,99	12,0	14,0	16,0
110	180	0,228	4,56	9,13	11,4	13,7	16,0	18,3

TABLE 4.1.3.2

Heat loss for EliPex single pipe SDR 11 [W/m] series 2

d_a = Outer diameter of the service pipe

D_O = Outer diameter of the casing pipe

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

T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	90	0,0826	1,65	3,30	4,13	4,96	5,78	6,61
25	90	0,0961	1,92	3,84	4,80	5,77	6,73	7,69
32	90	0,117	2,35	4,69	5,87	7,04	8,21	9,38
40	110	0,120	2,40	4,79	5,99	7,19	8,39	9,59
50	125	0,131	2,62	5,24	6,55	7,86	9,17	10,5
63	140	0,149	2,99	5,98	7,47	8,96	10,5	12,0
75	160	0,156	3,13	6,26	7,82	9,38	10,9	12,5
90	180	0,169	3,38	6,77	8,46	10,2	11,8	13,5

HEAT LOSS FOR BURIED ELIPEX SINGLE SDR 7,4 PIPE

TABLE 4.1.3.3
Heat loss for EliPex single pipe SDR 7,4 [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	75	0,0932	1,86	3,73	4,66	5,59	6,53	7,46
25	75	0,111	2,22	4,43	5,54	6,65	7,75	8,86
32	75	0,140	2,80	5,60	7,00	8,40	9,80	11,2
40	90	0,145	2,91	5,82	7,27	8,72	10,2	11,6
50	110	0,149	2,99	5,97	7,47	8,96	10,5	11,9
63	125	0,169	3,38	6,75	8,44	10,1	11,8	13,5

TABLE 4.1.3.4
Heat loss for EliPex single pipe SDR 7,4 [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	90	0,0822	1,64	3,29	4,11	4,93	5,76	6,58
25	90	0,0956	1,91	3,82	4,78	5,74	6,69	7,65
32	90	0,117	2,33	4,66	5,83	7,00	8,16	9,33
40	110	0,119	2,38	4,77	5,96	7,15	8,34	9,53
50	125	0,130	2,60	5,21	6,51	7,81	9,11	10,4
63	140	0,148	2,97	5,93	7,42	8,90	10,4	11,9

HEAT LOSS FOR BURIED ELISTEEL SINGLE PIPE

TABLE 4.1.3.5
Heat loss for EliSteel single pipe [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	75	0,0944	1,89	3,78	4,72	5,67	6,61	7,55
25	75	0,112	2,25	4,50	5,62	6,75	7,87	9,00
28	75	0,125	2,49	4,98	6,23	7,47	8,72	9,96

TABLE 4.1.3.6
Heat loss for EliSteel single pipe [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	90	0,0832	1,66	3,33	4,16	4,99	5,82	6,65
25	90	0,0969	1,94	3,88	4,84	5,81	6,78	7,75
28	90	0,106	2,11	4,23	5,29	6,34	7,40	8,46

HEAT LOSS FOR BURIED ELICOPP SINGLE PIPE

TABLE 4.1.3.7
Heat loss for EliCopp single pipe [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
15	75	0,0782	1,56	3,13	3,91	4,69	5,48	6,26
18	75	0,0878	1,76	3,51	4,39	5,27	6,14	7,02
22	75	0,101	2,03	4,05	5,07	6,08	7,10	8,11
28	75	0,125	2,49	4,98	6,23	7,47	8,72	9,97

TABLE 4.1.3.8
Heat loss for EliCopp single pipe [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
15	90	0,0704	1,41	2,81	3,52	4,22	4,93	5,63
18	90	0,0780	1,56	3,12	3,90	4,68	5,46	6,24
22	90	0,089	1,77	3,54	4,43	5,31	6,20	7,08
28	90	0,106	2,11	4,23	5,29	6,34	7,40	8,46

HEAT LOSS FOR A BURIED ELIALPEX SINGLE PIPE

TABLE 4.1.3.9
Heat loss for EliAlpex single pipe [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	75	0,0933	1,87	3,73	4,67	5,60	6,53	7,46
25	75	0,111	2,22	4,43	5,54	6,65	7,76	8,87
32	75	0,140	2,80	5,60	7,00	8,40	9,80	11,2
40	90	0,146	2,92	5,83	7,29	8,75	10,2	11,7

TABLE 4.1.3.10
Heat loss for EliAlpex single [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20	90	0,0823	1,65	3,29	4,12	4,94	5,76	6,59
25	90	0,0957	1,91	3,83	4,78	5,74	6,70	7,65
32	90	0,117	2,33	4,67	5,83	7,00	8,17	9,33
40	110	0,119	2,39	4,78	5,97	7,16	8,36	9,55

Total heat loss in double pipes is basically calculated as in single pipes according to EN 13941. T_M is used as previously described in 4.1.3.

HEAT LOSS FOR BURIED ELIPEX SDR 11 DOUBLE PIPE

TABLE 4.1.3.11
Heat loss for EliPex double pipe SDR 11 [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	90	0,160	3,20	6,40	8,60	9,60	11,2	12,8
25-25	90	0,213	4,26	8,51	11,7	12,8	14,9	17,0
32-32	110	0,213	4,26	8,51	11,7	12,8	14,9	17,0
40-40	125	0,242	4,84	9,68	13,4	14,5	16,9	19,4
50-50	160	0,220	4,39	8,78	12,0	13,2	15,4	17,6
63-63	180	0,268	5,35	10,7	14,8	16,1	18,7	21,4

TABLE 4.1.3.12
Heat loss for EliPex double pipe SDR 11 [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	110	0,127	2,54	5,07	6,34	7,61	8,88	10,1
25-25	110	0,155	3,10	6,20	7,75	9,31	10,9	12,4
32-32	125	0,172	3,44	6,88	8,60	10,3	12,0	13,8
40-40	140	0,194	3,88	7,76	9,70	11,6	13,6	15,5
50-50	180	0,178	3,56	7,12	8,89	10,7	12,5	14,2

HEAT LOSS FOR BURIED ELIPEX SDR 7,4 DOUBLE PIPE

TABLE 4.1.3.13
Heat loss for EliPex double pipe SDR 7,4 [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
25-20	90	0,213	4,256	8,51	10,6	12,8	14,9	17,0
32-20	110	0,213	4,257	8,51	10,6	12,8	14,9	17,0
40-25	125	0,242	4,838	9,68	12,1	14,5	16,9	19,4
50-32	140	0,306	6,117	12,2	15,3	18,3	21,4	24,5
63-40	160	0,400	7,992	16,0	20,0	24,0	28,0	32,0

HEAT LOSS FOR BURIED ELISTEEL DOUBLE PIPE

TABLE 4.1.3.14
Heat loss for EliSteel double pipe [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	90	0,160	3,20	6,40	8,60	9,60	11,2	12,8
25-25	90	0,213	4,26	8,51	10,6	12,8	14,9	17,0
28-28	110	0,176	3,53	7,05	8,82	10,6	12,3	14,1

TABLE 4.1.3.15
Heat loss for EliSteel double pipe [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	110	0,127	2,54	5,07	6,34	7,61	8,88	10,1
25-25	110	0,155	3,10	6,20	7,75	9,31	10,9	12,4
28-28	125	0,149	2,97	5,94	7,43	8,91	10,4	11,9

HEAT LOSS FOR BURIED ELICOPP DOUBLE PIPE

TABLE 4.1.3.16
Heat loss for EliCopp double pipe [W/m] series 1

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
15-15	90	0,124	2,49	4,98	6,58	7,47	8,71	9,95
18-18	90	0,144	2,89	5,78	7,70	8,66	10,1	11,6
22-22	90	0,178	3,56	7,13	9,66	10,7	12,5	14,3
28-28	110	0,176	3,53	7,05	9,51	10,6	12,3	14,1

TABLE 4.1.3.17
Heat loss for EliCopp double pipe [W/m] series 2

d_a = Outer diameter of the service pipe
D_O = Outer diameter of the casing pipe
$U_{Pipe\ in\ soil}$ = Overall heat loss coefficient
T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
15-15	110	0,104	2,08	4,16	5,44	6,25	7,29	8,33
18-18	110	0,117	2,35	4,69	6,16	7,04	8,21	9,38
22-22	110	0,137	2,75	5,49	7,28	8,24	9,61	11,0
28-28	125	0,149	2,97	5,94	7,90	8,91	10,40	11,9

HEAT LOSS FOR BURIED ELIALPEX DOUBLE PIPE

TABLE 4.1.3.18

Heat loss for EliAlpex double pipe [W/m] series 1

d_a = Outer diameter of the service pipe

D_O = Outer diameter of the casing pipe

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

T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	90	0,0823	1,646	3,293	4,12	4,94	5,76	6,59
25-25	90	0,0957	1,914	3,83	4,78	5,74	6,70	7,65
32-32	110	0,0991	1,983	3,966	4,96	5,95	6,94	7,93
40-40	125	0,107	2,136	4,271	5,34	6,41	7,47	8,54

TABLE 4.1.3.19

Total heat loss for EliAlpex double pipe [W/m] series 2

d_a = Outer diameter of the service pipe

D_O = Outer diameter of the casing pipe

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

T_M = Average temperature

d_a [mm]	D_0 [mm]	$U_{PIPE\ IN\ SOIL}$ [W/m·K]	T_M					
			20 K	40 K	50 K	60 K	70 K	80 K
20-20	110	0,0732	1,46	2,93	3,66	4,39	5,12	5,85
25-25	110	0,0833	1,67	3,33	4,16	5,00	5,83	6,66
32-32	125	0,0903	1,81	3,61	4,51	5,42	6,32	7,22
40-40	140	0,0982	1,96	3,93	4,91	5,89	6,87	7,86

CHAPTER 4.2
TRANSPORT AND STORAGE

Flexible pipes are produced in coils and different lengths depending on dimension and order request. Caution must be shown with loading and unloading the pipes to avoid damaging the PE casing. When using a fork-lift, it is necessary to cover the forks with protection. When using a crane it is recommended to use wide flat nylon web sling for hoisting. The loading area of transportation trucks should be a smooth, clean surfaces, void of any particles.

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. 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

Flexible Pipes should be stored lying down or standing on a flat surface, preferably on soft soil or sand. If storing pipes on a hard surface ensure it is clear of all rocks, stones and other foreign objects. Avoid water coming in contact with pipe ends or pipe ends will need to be cut before laying.

FITTINGS

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

FIG 4.2.1
Bends and T-pieces.
Allow insulation surface
to lean downward

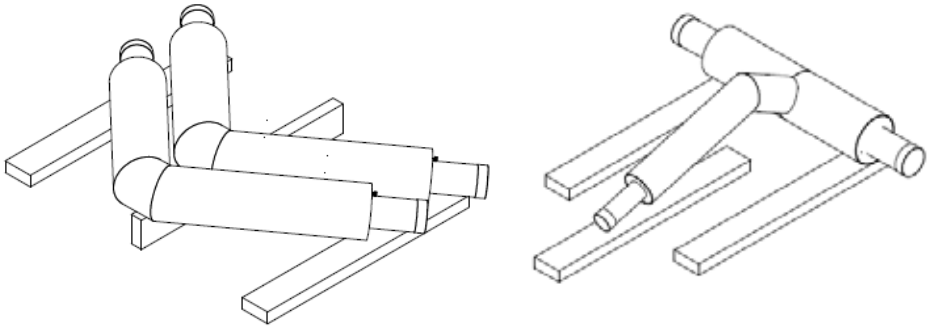
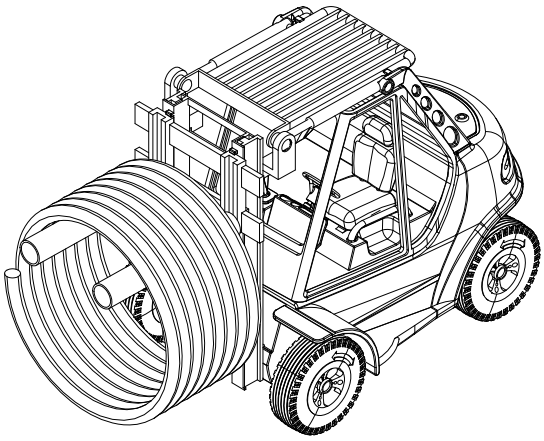


FIG 4.2.2
Fork-lift with protection pipes



ATTENTION. Caution should be shown when releasing the binding holding the coils together due to risk of injury with tension release. It is safest to stand inside the coil when releasing binding. Do not lay the pipes if the outside temperature is below +5°C. If storing pipes for long periods of time it is necessary to protect them from corrosion.

PUR INSULATION AND JOINT MATERIAL

Store PEH shrinkable casing, 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 4.3
FIELD WORK

PIPE-LAYING

The casing pipe and insulation foam move axially with the expansion of the service pipe as happens with the pre-insulated rigid pipes. The expansion is not taken into account during the pipe-laying due to the self-compensation of the flexible pipes from Set Pipes. The service pipe can only transport a small pressure force and easily overcomes outer forces. However, these requirements have to be considered before laying of bigger pipes (da = 75 – 110) into houses, as the pipe bends slightly and therefore no movement occurs inside the building.

If ploughing the pipes down it is necessary to ensure suitable soil. Do not plough pipes where there is a risk of stones that can damage the casing. Only plough in silt and sandy soil.

CHAPTER 4.3.1
WEATHER CONDITIONS

WEATHER CONDITIONS

If the temperature drops below freezing the casing pipe is sensitive to heavy impact. Set Pipes recommends if the temperature goes below 5°C to store the pipes in a heated room. The heating needs to reach through the whole coil.

Transport and handling the coils in low temperatures must be done with care to avoid breakage in the pipe.

CHAPTER 4.3.2
TRENCH

TRENCH

Figures 4.3.2.1 - 4.3.2.3 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 4.3.2.1
Trench cross section

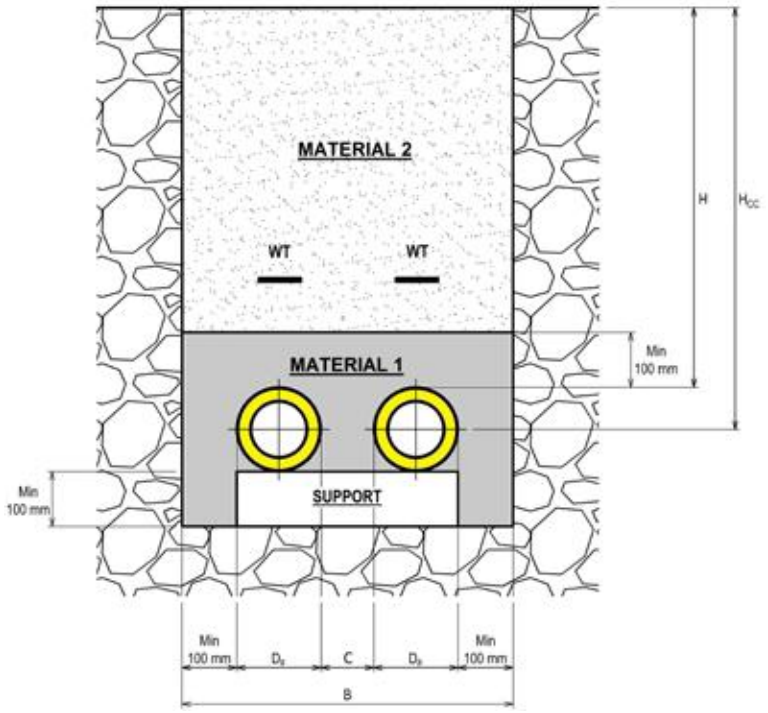


TABLE 4.3.2.1
Minimum trench width with vertical parallel pipes [mm]

Da	75	90	110	125	140	160	180
C	150	150	150	150	150	150	150
B	500	530	570	600	630	670	710

FIG 4.3.2.2
Trench cross section

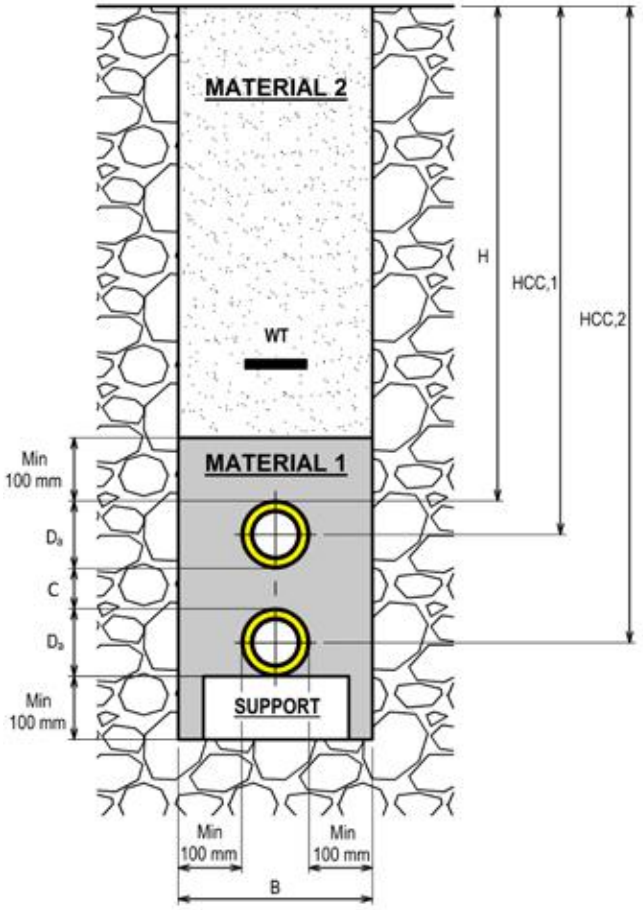


TABLE 4.3.2.2
Minimum trench width with horizontal parallel pipes [mm]

Da	75	90	110	125	140	160	180
C	150	150	150	150	150	150	150
B	275	290	310	325	340	360	380

FIG 4.3.2.3
Trench cross section

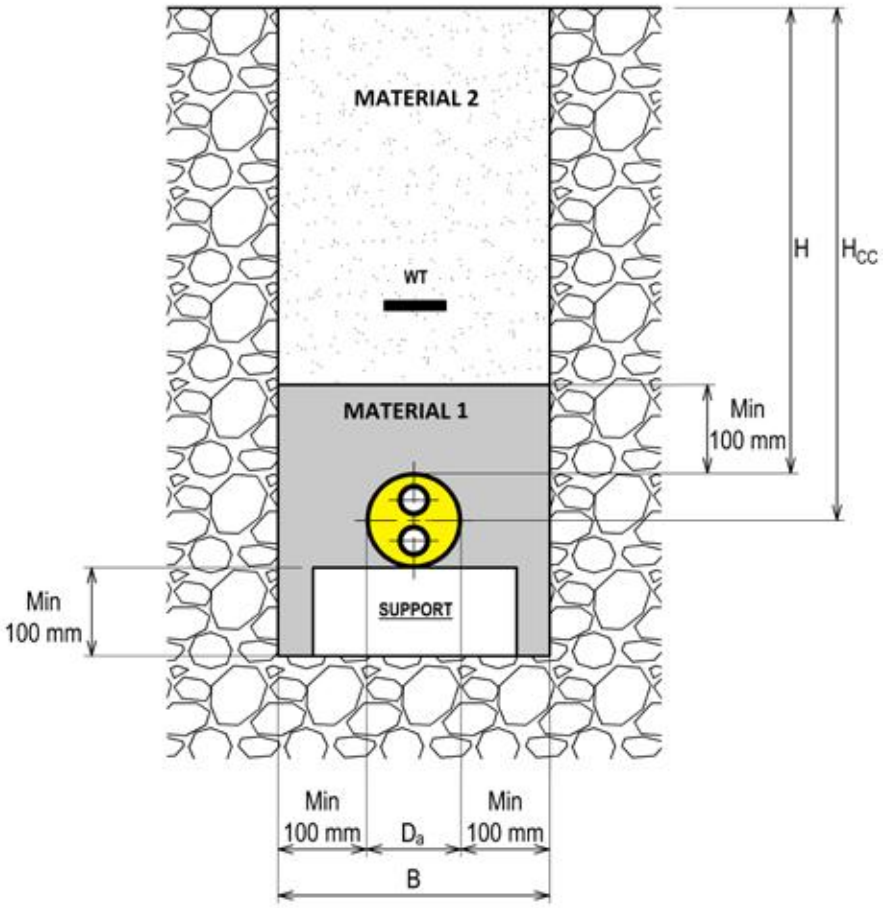


TABLE 4.3.2.3
Minimum trench width with double pipes [mm]

Da	90	110	125	140	160	180
C	290	310	325	340	360	380

If the pipe assembly must be done in the trench it is necessary to ensure enough trench width to meet all requirements.

CHAPTER 4.3.3
BACKFILLING

BACKFILLING 1

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

- Pipe-laying guidelines are followed
- Verification jointing is secure
- Stones and foreign objects which may have fallen from trench bank during assembly are removed

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 4.3.3.1
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	$^{d60}/_{d10} > 1,8$

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

It is necessary to compact the sand well around the pipes, allowing for the predisposed friction between outer casing and backfill. 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. See figures 4.3.2.1, 4.3.2.2 og 4.3.2.3.

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 does not 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/cm^2. 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 4.3.4
BENDING RADIUS – FLEXIBLE PIPES

BENDING RADIUS – FLEXIBLE PIPES

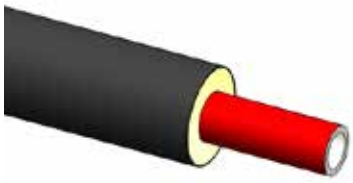
The minimum bending radius for Eli-products is very low and is therefore ideal for example in house connections. Avoid any sharp edges when bending. Material flexibility depends on the temperature. In low temperatures (see „weather conditions “) the pipe must be pre-heated to reach the minimum bending radius.

TABLE 4.3.4.1
Minimum bending radius r_{min} for flexible pipes

CASING PIPE [mm]	ELIPEX [m]	ELICOPP [m]	ELISTEEL [m]	ELIALPEX [m]
75	0,60	0,75	0,75	0,65
90	0,75	0,80	0,80	0,80
110	0,78	0,82	0,82	0,83
125	0,83	0,90	0,90	0,90
140	0,85	-	-	-
160	0,90	-	-	-
180	0,95	-	-	-

CHAPTER 4.9
PRODUCT CATALOGUE – FLEXIBLE DISTRICT HEATING PIPES

CHAPTER 4.9.1
SINGLE PRE-INSULATED SDR 11 PEX-PIPES INSULATION SERIES 1

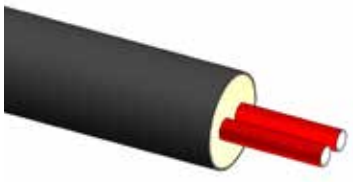


SDR 11 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.101.020	20	16,2	1,9	75	0,80
11.101.025	25	20,4	2,3	75	0,84
11.101.032	32	26,2	2,9	75	0,92
11.101.040	40	32,6	3,7	90	1,3
11.101.050	50	40,8	4,6	110	1,8
11.101.063	63	51,4	5,8	125	2,4
11.101.075	75	61,4	6,8	140	3,2
11.101.090	90	73,6	8,2	160	4,1
11.101.110	110	87,6	11,2	180	5,4

SINGLE PRE-INSULATED SDR 11 PEX-PIPES INSULATION SERIES 2

SDR 11 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.201.020	20	16,2	1,9	90	1,0
11.201.025	25	20,4	2,3	90	1,0
11.201.032	32	26,2	2,9	90	1,1
11.201.040	40	32,6	3,7	110	1,6
11.201.050	50	40,8	4,6	125	2,0
11.201.063	63	51,4	5,8	140	2,9
11.201.075	75	61,4	6,8	160	3,6
11.201.090	90	73,6	8,2	180	4,6

CHAPTER 4.9.2
DOUBLE PRE-INSULATED SDR 11 PEX-PIPES INSULATION SERIES 1



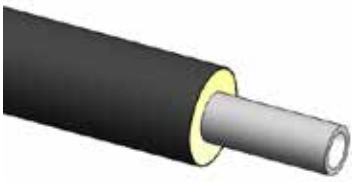
SDR 11 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.106.020	20-20	16,2	1,9	90	1,0
11.106.025	25-25	20,4	2,3	90	1,0
11.106.032	32-32	26,2	2,9	110	1,5
11.106.040	40-40	32,6	3,7	125	1,9
11.106.050	50-50	40,8	4,6	160	3,0
11.106.063	63-63	51,4	5,8	180	3,8

DOUBLE PRE-INSULATED SDR 11 PEX-PIPES INSULATION SERIES 2

SDR 11 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.206.020	20-20	16,2	1,9	90	1,3
11.206.025	25-25	20,4	2,3	110	1,5
11.206.032	32-32	26,2	2,9	125	1,8
11.206.040	40-40	32,6	3,7	140	2,4
11.206.050	50-50	40,8	4,6	180	3,5

CHAPTER 4.9.3

SINGLE PRE-INSULATED SDR 7,4 PEX-PIPE INSULATION SERIES 1



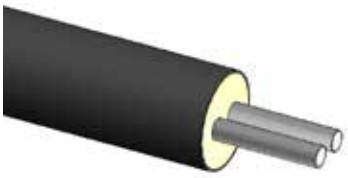
SDR 7,4 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.102.020	20	14,4	2,8	75	0,84
11.102.025	25	18,0	3,5	75	0,91
11.102.032	32	23,2	4,4	75	1,0
11.102.040	40	29,0	5,5	90	1,4
11.102.050	50	36,2	6,9	110	2,1
11.102.063	63	45,8	8,6	125	2,8

SINGLE PRE-INSULATED SDR 7,4 PEX-PIPE INSULATION SERIES 2

SDR 7,4 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.202.020	20	14,4	2,8	90	1,0
11.202.025	25	18,0	3,5	90	1,1
11.202.032	32	23,2	4,4	90	1,2
11.202.040	40	29,0	5,5	110	1,8
11.202.050	50	36,2	6,9	125	2,4
11.202.063	63	45,8	8,6	140	3,3

CHAPTER 4.9.4

DOUBLE PRE-INSULATED SDR 7,4 PEX-PIPES INSULATION SERIES 1



SDR 7,4 Art no.	Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.107.025	25-20	18,0	3,5	90	2.0
11.107.032	32-20	23,2	4,4	110	2,0
11.107.040	40-25	29,0	5,5	125	2,5
11.107.050	50-32	36,2	6,9	140	3,5
11.107.063	63-40	45,8	8,6	160	4,6

CHAPTER 4.9.5

SINGLE PEX BEND 90°
INSULATION SERIES 1

SDR 11 Art no.	Pex pipe d_0 [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.110.020	20	75	1000	2,8
11.110.025	25	75	1000	2,9
11.110.032	32	75	1000	3,3
11.110.040	40	90	1000	4,8
11.110.050	50	110	1000	7,0
11.110.063	63	125	1000	9,5
11.110.075	75	140	1000	12,9
11.110.090	90	160	1000	16,8
11.110.110	110	180	1000	16,8

SINGLE PEX BEND 90°
INSULATION SERIES 2

SDR 11 Art no.	Pex pipe d_0 [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.210.020	20	90	1000	3,6
11.210.025	25	90	1000	3,7
11.210.032	32	90	1000	4,1
11.210.040	40	110	1000	6,2
11.210.050	50	125	1000	8,2
11.210.063	63	140	1000	10,9
11.210.075	75	160	1000	12,7
11.210.090	90	180	1000	13,9

CHAPTER 4.9.6

DOUBLE PEX BEND 90°
INSULATION SERIES 1

SDR 11 Art no.	Pex pipe $d_0 1 - d_0 2$ [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.116.020	20-20	90	1000	5,0
11.116.025	25-25	90	1000	5,2
11.116.032	32-32	110	1000	5,9
11.116.040	40-40	125	1000	8,6
11.116.050	50-50	160	1000	12,6
11.116.063	63-63	180	1000	17,1

DOUBLE PEX BEND 90°
INSULATION SERIES 2

SDR 11 Art no.	Pex pipe $d_0 1 - d_0 2$ [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.216.020	20-20	90	1000	5,0
11.216.025	25-25	110	1000	5,2
11.216.032	32-32	125	1000	5,9
11.216.040	40-40	140	1000	8,6
11.216.050	50-50	180	1000	12,6

CHAPTER 4.9.7

SINGLE PEX BEND 90°
INSULATION SERIES 1

SDR 7,4 Art no.	Pex pipe d_0 [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.112.020	20	75	1000	2,9
11.112.025	25	75	1000	3,1
11.112.032	32	75	1000	3,7
11.112.040	40	90	1000	5,3
11.112.050	50	110	1000	7,8
11.112.063	63	125	1000	10,7

SINGLE PEX BEND 90°
INSULATION SERIES 2

SDR 7,4 Art no.	Pex pipe d_0 [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.212.020	20	90	1000	3,7
11.212.025	25	90	1000	3,9
11.212.032	32	90	1000	4,4
11.212.040	40	110	1000	6,8
11.212.050	50	125	1000	9,0
11.212.063	63	140	1000	12,2

CHAPTER 4.9.8

DOUBLE PEX BEND 90°
INSULATION SERIES 1

SDR 7,4 Art no.	Pex pipe d_01 - d_02 [mm]	Casing pipe D_0 [mm]	Length L_1/L_2 [mm]	Weight [kg/pc]
11.117.025	25-20	90	1000	5,6
11.117.032	32-20	110	1000	6,7
11.117.040	40-25	125	1000	9,5
11.117.050	50-32	140	1000	14,0
11.117.063	63-40	160	1000	19,3

CHAPTER 4.9.9

SINGLE PEX BRANCH STRAIGHT INSULATION SERIES 1

SDR 11 Art.no	Main pipe		Branch		Length [mm]	Weight [kg/spc]
	PEX do [mm]	Casing pipe D1 [mm]	PEX do [mm]	Casing pipe D1 [mm]		
11.120.020.020	20	75	20	75	1000/1000	2,0
11.120.025.025	25	75	25	75	1000/1000	2,2
11.120.032.032	32	75	32	75	1000/1000	2,4
11.120.032.025	32	75	25	75	1000/1000	2,3
11.120.040.020	40	90	20	75	1000/1000	2,5
11.120.040.025	40	90	25	75	1000/1000	2,9
11.120.040.032	40	90	32	75	1000/1000	3,1
11.120.040.040	40	90	40	90	1000/1000	3,5
11.120.050.025	50	110	25	75	1000/1000	3,8
11.120.050.032	50	110	32	75	1000/1000	3,9
11.120.050.040	50	110	40	90	1000/1000	4,4
11.120.050.050	50	110	50	110	1000/1000	5,0
11.120.063.025	63	125	25	75	1000/1000	4,9
11.120.063.032	63	125	32	75	1000/1000	5,0
11.120.063.040	63	125	40	90	1000/1000	5,9
11.120.063.050	63	125	50	110	1000/1000	6,7
11.120.063.063	63	125	63	125	1000/1000	6,7
11.120.075.025	75	140	25	75	1000/1000	6,6
11.120.075.032	75	140	32	75	1000/1000	6,7
11.120.075.040	75	140	40	90	1000/1000	7,3
11.120.075.050	75	140	50	110	1000/1000	8,1
11.120.075.063	75	140	63	125	1000/1000	9,3
11.120.075.075	75	140	75	140	1000/1000	10,5
11.120.090.025	90	160	25	75	1000/1000	8,6
11.120.090.032	90	160	32	75	1000/1000	8,6
11.120.090.040	90	160	40	90	1000/1000	9,0
11.120.090.050	90	160	50	110	1000/1000	10,2
11.120.090.063	90	160	63	125	1000/1000	11,2
11.120.090.075	90	160	75	140	1000/1000	12,1
11.120.090.090	90	160	90	160	1000/1000	12,1

SINGLE PEX BRANCH STRAIGHT INSULATION SERIES 1

SDR 7,4 Art.no	Main pipe		Branch		Length [mm]	Weight [kg/spc]
	PEX do [mm]	Casing pipe D1 [mm]	PEX do [mm]	Casing pipe D1 [mm]		
11.122.020.020	20	75	20	75	1000/1000	2,0
11.122.025.025	25	75	25	75	1000/1000	2,3
11.122.032.025	32	75	25	75	1000/1000	2,5
11.122.032.032	32	75	32	75	1000/1000	2,7
11.122.040.025	40	90	25	75	1000/1000	3,2
11.122.040.032	40	90	32	75	1000/1000	3,4
11.122.040.040	40	90	40	90	1000/1000	4,0
11.122.050.025	50	110	25	75	1000/1000	4,2
11.122.050.032	50	110	32	75	1000/1000	4,3
11.122.050.040	50	110	40	90	1000/1000	4,8
11.122.050.050	50	110	50	110	1000/1000	5,9
11.122.063.025	63	125	25	75	1000/1000	5,5
11.122.063.032	63	125	32	75	1000/1000	5,8
11.122.063.040	63	125	40	90	1000/1000	6,4
11.122.063.050	63	125	50	110	1000/1000	7,4
11.122.063.063	63	125	63	125	1000/1000	8,6

SINGLE PEX BRANCH STRAIGHT INSULATION SERIES 2

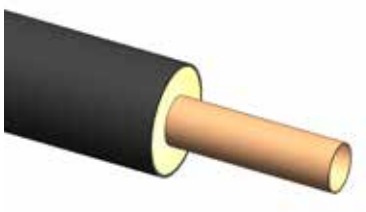
SDR 11 Art.no	Main pipe		Branch		Length [mm]	Weight [kg/spc]
	PEX do [mm]	Casing pipe D1 [mm]	PEX do [mm]	Casing pipe D1 [mm]		
11.220.025.025	25	90	25	90	1000/1000	2,8
11.220.032.025	32	90	25	90	1000/1000	2,8
11.220.032.032	32	90	32	90	1000/1000	3,0
11.220.040.025	40	110	25	90	1000/1000	3,7
11.220.040.032	40	110	32	90	1000/1000	3,8
11.220.040.040	40	110	40	110	1000/1000	4,5
11.220.050.025	50	125	25	90	1000/1000	4,5
11.220.050.032	50	125	32	90	1000/1000	4,6
11.220.050.040	50	125	40	110	1000/1000	5,3
11.220.050.050	50	125	50	125	1000/1000	5,8
11.220.063.025	63	140	25	90	1000/1000	5,7
11.220.063.032	63	140	32	90	1000/1000	5,7
11.220.063.040	63	140	40	110	1000/1000	6,8
11.220.063.050	63	140	50	125	1000/1000	7,6
11.220.063.063	63	140	63	140	1000/1000	7,8
11.220.075.025	75	160	25	90	1000/1000	7,4
11.220.075.032	75	160	32	90	1000/1000	7,5
11.220.075.040	75	160	40	110	1000/1000	8,4
11.220.075.050	75	160	50	125	1000/1000	9,1
11.220.075.063	75	160	63	140	1000/1000	10,4
11.220.075.075	75	160	75	160	1000/1000	11,7
11.220.090.025	90	180	25	90	1000/1000	8,8
11.220.090.032	90	180	32	90	1000/1000	8,9
11.220.090.040	90	180	40	110	1000/1000	9,5
11.220.090.050	90	180	50	125	1000/1000	10,6
11.220.090.063	90	180	63	140	1000/1000	11,7
11.220.090.075	90	180	75	160	1000/1000	12,6
11.220.090.090	90	180	90	180	1000/1000	12,7

SINGLE PEX BRANCH STRAIGHT INSULATION SERIES 2

SDR 7,4 Art.no	Main pipe		Branch		Length [mm]	Weight [kg/spc]
	PEX do [mm]	Casing pipe D1 [mm]	PEX do [mm]	Casing pipe D1 [mm]		
11.222.025.025	25	90	25	90	1000/1000	2,8
11.222.032.025	32	90	25	90	1000/1000	3,0
11.222.032.032	32	90	32	90	1000/1000	3,2
11.222.040.025	40	110	25	90	1000/1000	4,0
11.222.040.032	40	110	32	90	1000/1000	4,1
11.222.040.040	40	110	40	110	1000/1000	4,9
11.222.050.025	50	125	25	90	1000/1000	4,8
11.222.050.032	50	125	32	90	1000/1000	5,0
11.222.050.040	50	125	40	110	1000/1000	5,7
11.222.050.050	50	125	50	125	1000/1000	6,7
11.222.063.025	63	140	25	90	1000/1000	6,2
11.222.063.032	63	140	32	90	1000/1000	6,5
11.222.063.040	63	140	40	110	1000/1000	7,4
11.222.063.050	63	140	50	125	1000/1000	8,3
11.222.063.063	63	140	63	140	1000/1000	9,6

CHAPTER 4.9.10

PRE-INSULATED COPPER PIPES INSULATION SERIES 1



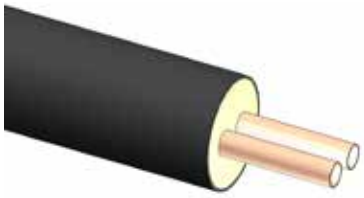
Art no.	Copper pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t mm]		
11.108.015	15	13,0	1,0	75	1,1
11.108.018	18	16,0	1,0	75	1,2
11.108.022	22	20,0	1,0	75	1,3
11.108.028	28	25,6	1,2	75	1,6

PRE-INSULATED COPPER PIPES INSULATION SERIES 2

Art no.	Copper pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t mm]		
11.208.015	15	13,0	1,0	90	1,3
11.208.018	18	16,0	1,0	90	1,4
11.208.022	22	20,0	1,0	90	1,5
11.208.028	28	25,6	1,2	90	1,8

CHAPTER 4.9.11

DOUBLE PRE-INSULATED COPPER PIPES INSULATION SERIES 1



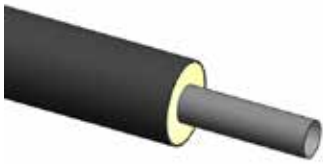
Art no.	Copper pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t mm]		
11.109.015	15-15	13,0	1,0	90	1,7
11.109.018	18-18	16,0	1,0	90	1,8
11.109.022	22-22	20,0	1,0	90	2,1
11.109.028	28-28	25,6	1,2	110	3,1

DOUBLE PRE-INSULATED COPPER PIPES INSULATION SERIES 2

Art no.	Copper pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t mm]		
11.209.015	15-15	13,0	1,0	110	2,1
11.209.018	18-18	16,0	1,0	110	2,2
11.209.022	22-22	20,0	1,0	110	2,5
11.209.028	28-28	25,6	1,2	125	3,3

CHAPTER 4.9.12

SINGLE PRE-INSULATED FLEXIBLE STEEL PIPES INSULATION SERIES 1



ELISTEEL Art no.	Steel pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.1001.020	20	16,0	2,0	75	1,6
11.1001.025	25	21,0	2,0	75	1,8
11.1001.028	28	24,0	2,0	75	2,0

SINGLE PRE-INSULATED FLEXIBLE STEEL PIPES INSULATION SERIES 2

ELISTEEL Art no.	Steel pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.2001.020	20	16,0	2,0	90	1,8
11.2001.025	25	21,0	2,0	90	2,0
11.2001.028	28	24,0	2,0	90	2,2

CHAPTER 4.9.13

DOUBLE PRE-INSULATED FLEXIBLE STEEL PIPES INSULATION SERIES 1

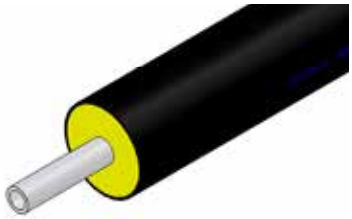
ELISTEEL Art no.	Steel pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.1002.020	20-20	16,0	2,0	90	2,7
11.1002.025	25-25	21,0	2,0	90	3,1
11.1002.028	28-28	24,0	2,0	110	3,8

DOUBLE PRE-INSULATED FLEXIBLE STEEL PIPES INSULATION SERIES 2

ELISTEEL Art no.	Steel pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.2002.020	20-20	16,0	2,0	110	3,1
11.2002.025	25-25	21,0	2,0	110	3,5
11.2002.028	28-28	24,0	2,0	125	4,1

CHAPTER 4.9.14

SINGLE PRE-INSULATED ALUMINUM/PEX- PIPES INSULATION SERIES 1



ELIALIPEX Art no.	Aluminum/Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.103.020	20	14,2	2,9	75	0,84
11.103.025	25	17,6	3,7	75	0,92
11.103.032	32	22,6	4,7	75	1,0
11.103.040	40	29,2	5,4	90	1,4

SINGLE PRE-INSULATED ALUMINUM/PEX- PIPES INSULATION SERIES 2

ELIALIPEX Art no.	Aluminum/Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o [mm]	d_i [mm]	t [mm]		
11.203.020	20	14,2	2,9	90	1,1
11.203.025	25	17,6	3,7	90	1,1
11.203.032	32	22,6	4,7	90	1,3
11.203.040	40	29,2	5,4	110	1,8

CHAPTER 4.9.15

DOUBLE PRE-INSULATED ALUMINUM/PEX- PIPES INSULATION SERIES 1

ELIALIPEX Art no.	Aluminum/Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.103.020.020	20-20	14,2	2,9	90	1,1
11.103.025.025	25-25	17,6	3,7	90	1,1
11.103.032.032	32-32	22,6	4,7	110	1,7
11.103.040.040	40-40	29,2	5,4	125	2,1

DOUBLE PRE-INSULATED ALUMINUM/PEX- PIPES INSULATION SERIES 2

ELIALIPEX Art no.	Aluminum/Pex pipe			Casing pipe D_o [mm]	Weight [kg/m]
	d_o1 - d_o2 [mm]	d_i [mm]	t [mm]		
11.203.020.020	20-20	14,2	2,9	110	1,5
11.203.025.025	25-25	17,6	3,7	110	1,4
11.203.032.032	32-32	22,6	4,7	125	1,9
11.203.040.040	40-40	29,2	5,4	140	2,6

TABLE OF CONTENT

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CHAPTER 5.0
JOINT 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 in accordance with EN 489 and EN 253.

Set pipes can provide conventional closed PE shrinkable casings with shrink sleeves, closed PE electric welding casings and open sleeves which can be used onsite after the pipes have been connected.

CHAPTER 5.0.1
PE SHRINK CASING – SPECIFICATION

APPLICATION RANGE

These specifications are made for PE shrink casings for pre-insulated single and double district heating systems. A conventional heat-shrink casing with a sealing strip between the casing pipe and shrink casing to ensure strong connections. (Chapter 5.0.1.1) and are delivered in a white protection plastic.

MATERIAL

PE shrink casings are produced in accordance with the European standard EN 489.

The PE shrink casings are resilient, with a high chemical resistance and are therefore an optimal protection over PUR foam. The PE shrink casings are produced containing carbon black for sunlight protection, seamless, and are coated with corona treated polyethylene for maximum adhesion to the PUR foam.

The main characteristics of the PE shrink casings are as follows:

TABLE 5.0.1.1
PE shrink casings properties

MATERIAL	Polyethelyne - PE100
COLOUR	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 6
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 5.0.1.2
PE shrink casings

D_o = Outer diameter of casing pipe
t = Casing pipe wall thickness
D_i = Inner diameter of the shrink casing
L = Length of the shrink casing

D_0	t [mm]	L [mm]	D_0 [mm]	t_2 [mm]	L [mm]
90	3,0	600	400	5,6	600
110	3,0	600	450	6,3	600
125	3,0	600	500	7,0	700
140	3,0	600	560	7,8	700
160	3,0	600	630	8,8	700
180	3,0	600	710	9,8	700
200	3,2	600	800	11,1	700
225	3,5	600	900	12,5	700
250	3,9	600			
280	4,4	600			
315	4,5	600			
355	4,5	600			

CHAPTER 5.0.2
PE ELECTRIC WELDING CASING – SPECIFICATION

APPLICATION RANGE

These specifications are made for PE electric welding casing for pre-insulated single and double district heating systems. Electrofusion ensures complete PE jointing in difficult conditions. The electric welding casing is usually used for larger pipe dimensions.

MATERIAL

PE electric welding casings are produced in accordance with the European standard EN 489.

The PE electric welding casings are resilient, with a high chemical resistance and are therefore an optimal protection over PUR foam. The PE shrink casings are produced containing carbon black for sunlight protection, seamless, and are coated with corona treated polyethylene for maximum adhesion to the PUR foam.

The main characteristics of the PE electric welding casings are as follows:

TABLE 5.0.2.1
PE electric welding casing properties

MATERIAL	Polyethelyne - PE100
COLOUR	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 6
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
STANDARD LENGTH	700 mm.

TABLE 5.0.2.2
PE electric welding casing

D_o = Outer diameter of casing pipe
t = Casing pipe wall thickness
D_i = Inner diameter of electric welding casing
L = Length of electric welding casing

D_0 [mm]	t [mm]	L [mm]	D_0 [mm]	t [mm]	L [mm]
90	4,0	600	400	5,6	700
110	4,0	600	450	6,3	700
125	4,1	600	500	7,0	700
140	4,5	600	560	7,8	700
160	5,0	600	630	8,8	700
180	5,0	600	710	9,8	800
200	5,0	600	800	11,1	800
225	5,5	600	900	12,5	800
250	6,1	600			
280	4,4	600			
315	4,5	600			
355	4,5	700			

CHAPTER 5.0.3
PE END CLOSURE – SPECIFICATION

APPLICATION RANGE

These specifications are made for PE end closures for pre-insulated single and double district heating systems. PE end closures are suitable for insulated pipe ends that may later be connected to additional pipelines.

SPECIFICATION

PE end closures are produced in accordance with the European standard EN 489.

The PE end closures are resilient, with a high chemical resistance and are therefore an optimal protection over PUR foam. The PE end closures are produced containing carbon black for sunlight protection, seamless, and are coated with corona treated polyethylene for maximum adhesion to the PUR foam.

The main characteristics of the PE end closures are as follows:

TABLE 5.0.3.1
PE end closure properties

MATERIAL	Polyethelyne - PE100
COLOUR	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 6
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
STANDARD LENGTH	700 mm.

TABLE 5.0.3.2
PE end closure properties

D_o = Outer diameter of casing pipe
t = Casing pipe wall thickness
D_i = Inner diameter of electric welding casing
L = Length of electric welding

D_0	t [mm]	L [mm]	D_0 [mm]	t_2 [mm]	L [mm]
90	3,0	600	400	5,6	600
110	3,0	600	450	6,3	600
125	3,0	600	500	7,0	700
140	3,0	600	560	7,8	700
160	3,0	600	630	8,8	700
180	3,0	600	710	9,8	700
200	3,2	600	800	11,1	700
225	3,5	600	900	12,5	700
250	3,9	600			
280	4,4	600			
315	4,5	600			
355	4,5	600			

CHAPTER 5.0.4
PE SHRINK REDUCTION CASING – SPECIFICATION

APPLICATION RANGE

These specifications are made for PE shrink reduction casing for pre-insulated single and double district heating systems. Shrink reduction casing are for variable dimensions in pre-insulated pipe lines and are used together with steel reducers to reduce between dimensions. A conventional PE shrink reduction casing with a sealing strip in the end and are delivered in white protection plastic.

SPECIFICATION

PE shrink reduction casings are produced in accordance with the European standard EN 489.

The PE shrink reduction casing are resilient, with a high chemical resistance and are therefore an optimal protection over PUR foam. The PE shrink reduction casing are produced containing carbon black for sunlight protection, seamless, and are coated with corona treated polyethylene for maximum adhesion to the PUR foam.

The main characteristics of the PE shrink reduction casings are as follows:

TABLE 5.0.4.1
PE shrink reduction casing properties

MATERIAL	Polyethelyne - PE100
COLOUR	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 6
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

Further details and sizes offered for PE shrink reductions can be found on page 20.

CHAPTER 5.1
SHRINK MATERIAL

CHAPTER 5.1.1
APPLICATION RANGE

Shrink material is made from extruded cross-linked polyethylene (PEX) which has been stretched in the production to get optimal contraction characteristics at a certain heat temperature. These materials are used together with the shrink casing joints to ensure a double seal. To ensure adhesion a sealing strip or glue which becomes liquid when heated, is on the interior of shrink material. The heat resistance of the shrink material is maximum 130°C and only a soft flame, should be used and shortly, when shrinking. Shrink material from Set Pipes meets European standards EN 489 and can be delivered in diverse variations as seen below.

SHRINK SLEEVES

Available for district heating pipe with casing diameters 75 - 500 mm. Each shrink sleeve is inseparable and both sleeves must be placed on the shrink casing before the pipes are welded.

REPAIR STRIPS

Mainly for larger pipes and repairing of casing pipes. The strips can be placed on joints after the welding process. Repair strips are delivered in rolls, widths of 150 – 900 mm.

LOCK STRIPS

Used over joints on repair strips to seal. Repair strips overlap and the lock strips are then heated over the joint.

OPEN SHRINK SLEEVES

Used during assembly of joints, for example over PUR insulation shells. This is a thin material and possible to cut to fit size of joint being worked with. The material shrinks when heated.

SHRINK END CAP

Used to protect foam on ends of insulated pipes for example at house connections. Single shrink end caps are available for DN 20 – 150. Double shrink end caps are available for DN 20 - 90.

SHRINK HOSE FOR STEEL PIPES

Used to protect uninsulated steel pipes from corrosion for example at house connections. Shrink hoses are supplied in different widths and lengths.

TABLE 5.1.1.1
Shrink end caps for single pipes

Description	Casing pipe dimension	Flow pipes dimension
DHEC-2000	63-96	12-22
DHEC-2100	75-93	27-34
DHEC-2200	110-125	27-48
DHEC-2300	110-140	27-54
DHEC-2400	125-140	60-76
DHEC-2500	160-180	60-89
DHEC-2600	160-225	76-133
DHEC-2630	200-225	108-139
DHEC-2700	225-280	133-168
DHEC-2800	280-334	168-245
DHEC-2900	355-400	219-273
DHEC-3000	400-500	324-355

TABLE 5.1.1.2
Shrink end caps for double pipes

Description	Casing pipe dimension	Flow pipe dimension 1	Flow pipe dimension 2
DHEC-3200	90-125	10-28	10-28
DHEC-3250	90-140	19-34	10-21
DHEC-3280	110-160	24-60	20-50
DHEC-3300	140-180	24-48	14-28
DHEC-3350	160-180	24-62	24-62
DHEC-3351	160-180	24-32	24-32
DHEC-3352	160-200	24-49	24-49
DHEC-3360	160-200	24-34	50-62

CHAPTER 5.2
PUR FOAM

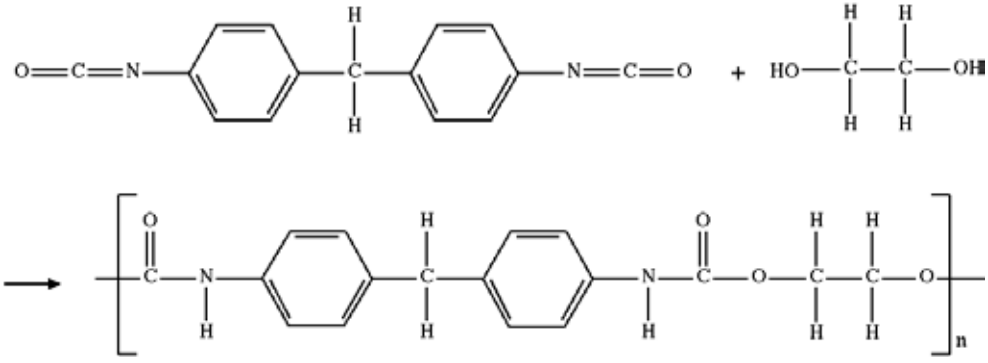
The insulation foam (PUR or PU) consists of two components used as an insulation on pipeline joints. Mixing these two components Polyol (component A) and Isocyanate (component B) together results in a chemical reaction, where the material heats up and expands, forming a polyurethane or urethane foam and gas CO^2.

The PUR foam is delivered in two bottles. The size according to required quantity in regards to the joint and pipe dimensions used.

In addition, welding plugs, vent plugs and PE patches are needed for complete joint closure.

Set Pipes can also deliver insulation foam in bags if necessary.

PRECAUTION: The polyurethane components, isocyanate and polyol, must be stored and handled with caution. Store in a secure area away from unauthorized access, at room temperature (18-20°C). Set Pipes will supply necessary safety data sheets.



GENERAL PROTECTIVE AND HYGIENIC MEASURES

Avoid inhalation of vapours and spray. Wear both chemical resistant protective clothing and gloves when handling isocyanate. Wear only suitable work clothes and protective clothing. Do not eat, drink or smoke while in protective clothing. Remove immediately all contaminated clothing. Hands and face should be washed before breaks and after using.

USAGE

Ensure everything is prepared for joint installation and drilling of pouring holes before mixing foam.The content from the small bottle (polyol) is poured into the larger bottle (isocyanate) and shaken vigorously for a short time (approx. 10-20 sec.). Pour the mixture through the opening on the shrink casing and put the vent plug halfway into the holes. Make sure the plugs point out to the side in regards to the pipeline.

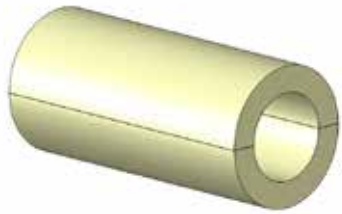
PRECAUTION: Do not leave an empty or partially empty bottle with the cap tightly on after mixing. Due to gas formation there is a risk of explosion and personal injury. Do not seal the vent plug fully into the hole, if air/gas cannot release there is a possibility of the casing joint being damaged or possibly exploding under the pressure.

The foam should be used under well-ventilated conditions due to CO^2 formation. Set Pipes provides safety data sheets and they should always be placed where PU components are stored and used.

CONDITIONS

In rain, a tent must be placed over the joint area. Avoid water entering the casing joint. Foaming is not permitted at temperatures below 5°C, unless the casing joint is preheated up to 60°C.

CHAPTER 5.3
PUR INSULATION SHELL



Insulation shells can be used instead of an insulation foam, both for pipes with a normal foam (PUR) as well as for high heat resistance foam (PIR). Insulation shells are also available with a soft inner layer for PEX-, PE- and PP plastic carrier pipes. The assembling of the insulation shells must be done with care to ensure they fit exactly in the joint area. No space between the shells and the insulation end of the pipe is allowed.

CHAPTER 5.4
INSTRUCTIONS FOR JOINTS

To ensure all requirements regarding the system design and production of the district heating pipes are fulfilled it is important that all work during the assembly process of a pipeline is done precisely.

Studies show that careless work is one of the largest causes of pipeline failures. The system lifetime and operational security is dependent on the work quality carried out at the installation site.

Set Pipes requires that only trained and certified personnel work on the assembly of district heating pipelines. Upon request, Set Pipes can offer training courses.

Instructions for the joint process can be found in chapter 7.

ATTENTION: After the joint assembly is finished it is necessary to foam the casing joint on the same day to protect it against moisture. If water comes in contact with the insulation foam it can affect the foam quality.

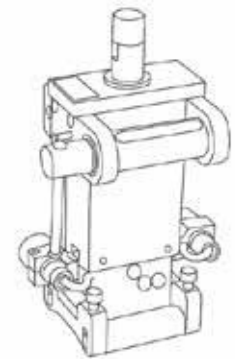
CHAPTER 5.5
WELDING MACHINE AND ACCESSORIES FOR ELECTRIC WELDING SLEEVE

Mittel TSC® welding unit monitors the situation to ensure correct heating and welding. Temperature, time and power are controlled automatically to achieve a perfect result, regardless of fault sources and varying external temperature or moisture. If the welding process deviates from the pre-set parameters, welding is interrupted and a fault alarm goes on. In addition, the processor-controlled welding unit automatically recognizes the pipe diameter and adjusts welding parameter – this minimizes the system´s exposure to human errors. For better record keeping Mittel TSC® welding unit is equipped with GPS, an in-built hard drive and Bluetooth communication module. Thanks to these features you will always be able to trace back every detail of a performed joint, its precise positioning, details of the welding process, date, name of the technician who performed the work, etc.

There are two types of the TSC® welding machine as seen in more details in the table below.

TABLE 5.5.1
Two types of TSC® welding machines

WELDING MACHINE TSC® PRO	WELDING MACHINE TSC® MINI
TSC® PRO is equipped with two welding modules to shorten welding times and provide better productivity on large diameter pipes. **CHASING PIPE DIAMETER:** 90 – 2000 mm **POWER CONSUMPTION:** 230 V 2 x 3,1 kW 2 x 13 A **DIMENSIONS (H X L X W):** 380 x 360 x 240 mm **WEIGHT:** 14 kg **PROTECTION:** IP65 **TEMPERATURE MONITORING:** Digital **LOGGING FUNCTION:** Yes **GPS:** Yes **COMMUNICATION:** Bluetooth®	TSC® MINI is a small and light welding machine that can handle all jobs up to 1000 mm. **CASING PIPE DIAMETER:** 90 – 1000 mm **POWER CONSUMPTION:** 230 V 3,1 kW 13 A **DIMENSIONS (H X L X W):** 260 x 360 x 240 mm **WEIGHT:** 9 kg **PROTECTION:** IP65 **TEMPERATURE MONITORING:** Digital **LOGGING FUNCTION:** Yes **GPS:** Yes **COMMUNICATION:** Bluetooth®



WELDING TOOLS

Mittel´s welding tool are lightweight and easy to work with. In order to switch between different pipe dimensions, you only need to change the Kevlar belt. The tool has an in-built temperature sensor that indicates when the welded PE cools down to a safe level.

SIZE RANGE: 90 - 2000 mm
WEIGHT: 2,8 kg

GENERATOR

A powerful generator is required to maintain steady voltage and frequency during the welding process to prevent a damage to a sensitive electrical equipment.

CHAPTER 5.6
PEX JOINTING SYSTEM

PRESS FITTINGS

Press fittings for PEX-a district heating pipes are quick, safe, leak proof and a permanent connection for PEX-a pipes, consisting of a simple fitting and a compression sleeve. Additional sealing elements are not required, as the pipe itself acts as a seal. Four sealing ribs guarantee a completely secure connection, which also withstands the tough application conditions on construction sites. Specially designed ribs on the compression sleeves prevent the connection coming loose during operation. The fittings are made from brass, red brass or steel. The compression sleeves are made from brass or red brass in dimensions from 20 – 125 mm.

For the press fittings connection to a PEX pipe special tools for the process are needed. These tools are available from Set Pipes.

PLUG-IN FITTINGS

Plug-in fittings are available in dimensions from 20 – 110 mm for PE, PEX-a and PEX-c pipes. The fittings can withstand operating temperatures up to 95°C and the maximum permissible operating pressure 10 bar. The assembly does not need any special tools, simply screwed together and tightened with conventional tools. Screw fittings are not a permanent seal but a detachable jointing technology. Note when starting the heating system for the first time it is necessary to allow the fittings to reach a temperature of 60 - 80 °C before finally tightening all connections. Screw fittings come in a large variety including connectors, bends and reducers.

FUSAPEX ELECTROFUSION FITTINGS

Fusapex electrofusion fittings are made of cross-linked polyethylene (PEX-a) and are resistant for operating temperatures up to 95°C and a maximum permissible pressure of 6 bar. The connection between Fusapex and the district heating pipe has to be assembled with a monomatic welding unit. The unit is available from Set Pipes. This process is a simple, fast and secure connection with corrosion resistance. The Fusapex electrofusion fittings are available in dimensions from 50 – 125 mm.

Chapter 5.9 shows some but not all of the PEX material. For support or special requests please contact the sales or technical department at Set Pipes.

ASSEMBLY TEE

Assembly tees are for PEX-a, PE and PP plastic pipes.
Insulated foam shells with sponge are placed around the tee and the PE tee casing pipe aound the shells. Shrink sheets, shrink sleeves and lock strips, all cut to fit are then used to complete the seal of the tee.

CHAPTER 5.7
ACCESSORIES

SEALING RINGS

Sealing rings are used to seal pipe inlets in the walls of connecting wells and inlets through concrete walls. Sealing rings are available for Ø75 - 400 mm casing.

WATERPROOF SEALING RINGS

Waterproof sealing rings are used to seal pipe inlets in the walls of connecting wells and inlets through concrete walls under water surface and tolerate up to 5 bar pressure and are available for Ø75 - 400 mm casing.

It is also possible to get a special waterproof sealing rings to be used on two different dimensions of heating pipes and electrical cables.

For further information on types and dimensions of sealing rings please contact the technical department in Set Pipes.

CHAPTER 5.8
STORAGE

Shrink casing and shrink sleeve material shall be stored indoors at a constant room temperature and dry air (5-20°C). High heat and direct sunlight may cause premature shrinkage of the material. Store in an upright position avoiding any external pressure.

Foam components shall be stored in a dry and well-ventilated area in temperatures between 10 – 20°C, Avoid low temperatures and direct sunlight. Ensure the storage area is secure to prevent access by children or unauthorized persons.

CHAPTER 5.9
PRODUCT CATALOGUE

CHAPTER 5.9.1
COMPRESSION SLEEVES SDR 11

SDR 11 Art no.	d_o [mm]	t [mm]	Length [mm]	Width [mm]	Weight [kg/pc]
10.80020	20	1,9	20	25	0,022
10.80025	25	2,3	27	30	0,040
10.80032	32	2,9	35	40	0,080
10.80040	40	3,7	37	49	0,13
10.80050	50	4,6	44	61	0,26
10.80063	63	5,8	53	74	0,39
10.80075	75	6,8	53	90	0,50
10.80090	90	8,2	53	108	0,52
10.80110	110	10,0	53	130	1,1
10.80125	125	11,4	53	145	1,6

COUPLERS SDR 11

SDR 11 Art no.	d_o [mm]	t [mm]	Length [mm]	Width [mm]	Weight [kg/pc]
10.140020	20	1,9	53	23	0,08
10.140025	25	2,3	67	24	0,11
10.140032	32	2,9	80	26	0,19
10.140040	40	3,7	90	28	0,41
10.140050	50	4,6	104	28	0,58
10.140063	63	5,8	122	35	0,93
10.140075	75	6,8	132	32	1,5
10.140090	90	8,2	132	32	2,4
10.140110	110	10,0	132	32	3,1
10.140125	125	11,4	133	33	4,5

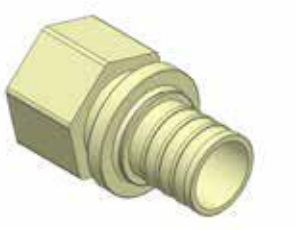
REDUCING COUPLERS SDR 11

SDR 11 Art no.	d_o1 - d_o2 [mm]	t1 - t2 [mm]	Length [mm]	Weight [kg/pc]
10.153025	25-20	2,3 - 1,9	61	0,080
10.153032	32-25	2,9 - 2,3	74	0,15
10.153040	40-20	3,7 - 1,9	83	0,13
10.153043	40-32	3,7 - 2,9	87	0,28
10.153054	50-40	4,6 - 3,7	99	0,48
10.153065	63-50	5,8 - 4,6	117	0,81
10.153075	75-63	6,8 - 5,8	132	1,4
10.153090	90-75	8,2 - 6,8	137	1,7
10.153110	110-90	10,0 - 8,2	137	3,1

COUPLER BSP MALE SDR 11

SDR 11 Art no.	d_o [mm]	t [mm]	a [mm]	z [mm]	Weight [kg/pc]
10.148020	20 - R ½"	1,9	54	39	0,075
10.148021	20 - R ¾"	1,9	53	38	0,095
10.148022	25 - R ¾"	2,3	63	42	0,12
10.148023	25 - R 1"	2,3	63	41	0,16
10.148033	32 - R 1"	2,9	69	42	0,23
10.148044	40 - R 1 ¼"	3,7	82	50	0,30
10.148054	50 - R 1 ¼"	4,6	89	50	0,40
10.148055	50 - R 1 ½"	4,6	89	50	0,40
10.148066	63 - R 2"	5,8	105	59	0,66
10.148077	75 - R 2 ½"	6,8	110	60	1,7
10.148099	90 - R 3"	8,2	111	60	2,1

COUPLER BSP FEMALE SDR 11



SDR 11 Art no.	Pexpipe/ female BSP	t [mm]	Length [mm]	Weight [kg/pc]
10.149020	20 - Rp ½"	1,9	53	0,10
10.149021	20 - Rp ¾"	1,9	55	0,15
10.149022	25 - Rp ¾"	2,3	61	0,16
10.149023	25 - Rp 1"	2,3	66	0,20
10.149033	32 - Rp 1"	2,9	69	0,21

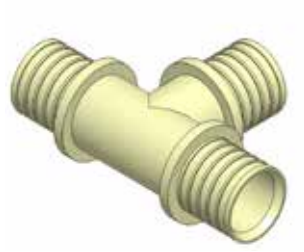
WELDED CONNECTIONS SDR 11

SDR 11 Art no.	d_o x t_1 [mm]	Length [mm]	Length Welded connections [mm]	Width Welded connections [mm]	Weight [kg/pc]
10.150020	20 x 2,3	50	20	26,9 x 2,3	0,70
10.150025	25 x 2,3	50	20	26,9 x 2,3	0,70
10.150032	32 x 2,9	60	24	33,7 x 2,6	0,13
10.150040	40 x 3,7	70	29	42,4 x 2,6	0,27
10.150050	50 x 4,6	85	37	48,3 x 2,6	0,41
10.150063	63 x 5,8	90	32	60,3 x 2,9	0,55
10.150075	75 x 6,8	95	35	76,1 x 2,9	0,84
10.150090	90 x 8,2	95	35	88,9 x 3,2	1,2
10.150110	110 x 10,0	90	40	114,3 x 3,6	1,6
10.150125	125 x 11,4	108	48	139,7 x 3,6	3,5

BEND 90° SDR 11

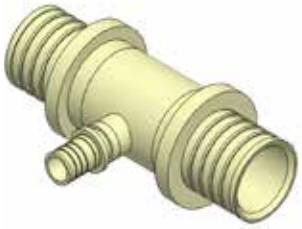
SDR 11 Art no.	d_o [mm]	t [mm]	Length [mm]	Weight [kg/pc]
10.151020	20	1,9	44	0,15
10.151025	25	2,3	54	0,17
10.151032	30	2,9	64	0,30
10.151040	40	3,7	74	0,68
10.151050	50	4,6	87	0,92
10.151063	63	5,8	106	1,3
10.151075	75	6,8	117	2,4
10.151090	90	8,2	127	3,2
10.151110	110	10,0	137	5,0

STRAIGHT T-PIECE SDR 11



SDR 11 Art no.	d_o [mm]	t [mm]	Main pipe - Length [mm]	Branch - Length [mm]	Weight [kg/pc]
10.152020	20	1,9	40	43	0,21
10.152025	25	2,3	50	54	0,30
10.152032	30	2,9	59	64	0,39
10.152040	40	3,7	67	77	0,70
10.152050	50	4,6	88	87	0,87
10.152063	63	5,8	105	108	1,3
10.152075	75	6,8	117	117	2,7
10.152090	90	8,2	126	126	4,0
10.152110	110	10,0	137	137	6,0

REDUCING T-PIECE SDR 11



SDR 11 Art no.	d_o [mm]	Main pipe - Length [mm]	Branch - Length [mm]	Weight [kg/pc]
10.1523220	25-20-25	96	47	0,19
10.1523232	32-20-32	108	51	1,3
10.1523225	32-25-32	114	58	0,33
10.1524020	40-20-40	124	57	0,58
10.1524025	40-25-40	134	66	0,59
10.1524032	40-32-40	134	72	0,63
10.1525020	50-20-50	138	62	0,81
10.1525025	50-25-50	146	69	0,83
10.1526030	63-20-63	160	79	1,0
10.1525032	50-32-50	144	75	0,82
10.1526340	50-40-50	162	80	0,90
10.1526325	63-25-63	166	79	1,2
10.1526332	63-32-63	174	85	1,2
10.1526340	63-40-63	184	90	1,7
10.1526350	63-50-63	196	97	1,9
10.1527525	75-25-75	174	83	2,1
10.1527532	75-32-75	174	89	2,1
10.1527540	75-40-75	192	104	2,3
10.1527550	75-50-75	204	101	2,5
10.1527563	75-63-75	218	113	2,5
10.1529032	90-32-90	184	98	3,0
10.1529040	90-40-90	192	104	3,2
10.1529063	90-63-90	218	121	3,8
10.1529532	110-32-110	184	109	4,3
10.1529550	110-50-110	204	122	5,3
10.1529563	110-63-110	218	132	5,4

CHAPTER 5.9.2

COMPRESSION SLEEVES SDR 7,4

SDR 7,4 Art no.	d_o [mm]	t [mm]	a [mm]	b [mm]	Weight [kg/pc]
10.82020	20	2,8	25	25	0,029
10.82025	25	3,5	29	30	0,044
10.82032	32[1)]	4,4	34	39	0,10
10.82040	40[1)]	5,5	37	49	0,14
10.82050	50	6,9	44	61	0,30
10.82063	63	8,6	53	74	0,43

COUPLERS SDR 7,4

SDR 7,4 Art no.	d_o [mm]	t [mm]	a [mm]	z [mm]	Weight [kg/pc]
10.240020	20	2,8	52	19	0,058
10.240025	25	3,5	68	22	0,11
10.240032	32	4,4	80	26	0,18
10.240040	40	5,5	91	27	0,38
10.240050	50	6,9	105	27	0,56
10.240063	63	8,6	123	35	0,98

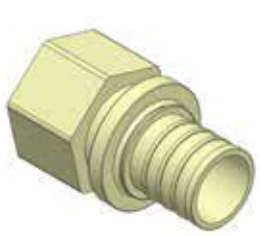
REDUCING COUPLERS SDR 7,4

SDR 7,4 Art no.	d_o1 - d_o2 [mm]	t1 - t2 [mm]	a [mm]	z [mm]	Weight [kg/pc]
10.253025	25-20	3,5 - 2,8	67	27	0,10
10.253032	32-25	4,4 - 3,5	80	30	0,16
10.253043	40-32	5,5 - 4,4	81	31	0,27
10.253054	50-40	6,9 - 5,5	98	27	0,46
10.253063	63-50	8,6 - 6,9	117	32	0,79

COUPLER BSP MALE SDR 7,4

SDR 7,4 Art no.	d_o [mm]	t [mm]	a [mm]	z [mm]	Weight [kg/pc]
10.248020	20 - R ½“	2,8	53	37	0,069
10.248021	20 - R ¾“	2,8	53	37	0,073
10.248022	25 - R ¾“	3,5	62	39	0,11
10.248032	32 - R ¾“	4,4	68	41	0,16
10.248033	32- R 1 ¼“	4,4	72	45	0,19
10.248044	40 - R 1 ¼“	5,5	82	50	0,34
10.248054	50 - R 1 ¼“	6,9	89	50	0,49
10.248055	50 - R 1 ½“	6,9	89	50	0,47
10.248066	63 - R 2"	8,6	105	59	0,79

COUPLER BSP FEMALE SDR 7,4



SDR 7,4 Art no.	Pexpipe/ female BSP	t [mm]	a [mm]	z [mm]	Weight [kg/pc]
10.249010	20 - Rp ½“	2,8	48	17	0,087
10.249011	20 - Rp ¾“	2,8	51	18	0,12
10.249022	25 - Rp ¾“	3,5	61	22	0,16
10.249032	32 - Rp ¾“	4,4	66	23	0,24
10.249033	32- Rp 1"	4,4	71	25	0,22

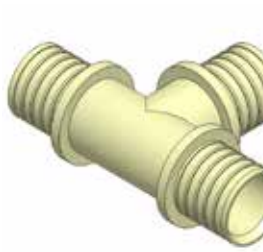
WELDED CONNECTIONS SDR 7,4

SDR 7,4 Art no.	d_o [mm]	t [mm]	a [mm]	Weight [kg/pc]
10.250020	20 - 26,9	2,8	45	0,12
10.250025	25 - 26,9	3,5	50	0,15
10.250032	32 - 33,7	4,4	60	0,32
10.250040	40 - 42,4	5,5	70	0,55
10.250050	50 - 48,3	6,9	85	0,94
10.250063	63 - 60,3	8,7	90	1,4

BEND 90° SDR 7,4

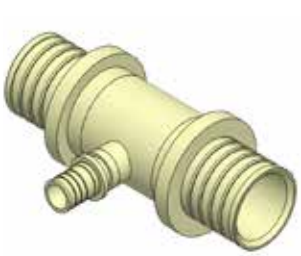
SDR 7,4 Art no.	d_o [mm]	t [mm]	a [mm]	z [mm]	Weight [kg/pc]
10.251020	20	2,8	38	25	0,065
10.251025	25	3,5	55	32	0,16
10.251032	32	4,4	66	39	0,31
10.251040	40	5,5	74	42	0,59
10.251050	50	6,9	87	48	0,96
10.251063	63	8,6	106	60	1,4

STRAIGHT T-PIECE SDR 7,4



SDR 7,4 Art no.	d_o [mm]	t [mm]	a/c [mm]	b [mm]	Weight [kg/pc]
10.252011	20	2,8	78	43	0,13
10.252022	25	3,5	100	55	0,22
10.252033	32	4,4	118	65	0,39
10.252044	40	5,5	134	75	0,80
10.252055	50	6,9	158	87	1,2
10.252066	63	8,7	196	108	2,2

REDUCING T-PIECE SDR 7,4



SDR 7,4 Art no.	d_o [mm]	a/c [mm]	b [mm]	Weight [kg/pc]
10.252121	25-20-25	98	47	0,19
10.252131	32-20-32	110	51	0,29
10.252132	32-25-32	110	59	0,34
10.252141	40-20-40	128	56	0,64
10.252142	40-25-40	132	67	0,64
10.252143	40-32-40	132	73	0,67
10.252151	50-20-50	132	63	0,76
10.252152	50-25-50	136	71	0,81
10.252153	50-32-50	138	76	0,88
10.252154	50-40-50	142	76	0,84
10.252162	63-25-63	160	76	1,3
10.252163	63-32-63	166	86	1,5
10.252164	63-40-63	180	90	1,6
10.252165	63-50-63	180	97	1,9

CHAPTER 5.9.3
PE SHRINK CASING

Art no.	Casing pipe D_o [mm]	Wall thickness t [mm]	Inner diameter D_i [mm]	Length	Weight [kg/pc]
1.520.075	75	3,0	87	600	0,55
1.520.090	90	4,0	105	600	0,62
1.520.110	110	4,0	125	600	0,78
1.520.125	125	4,1	140	600	0,84
1.520.140	140	4,5	155	600	0,98
1.520.160	160	5,0	175	600	1,2
1.520.180	180	5,0	195	600	1,3
1.520.200	200	5,5	220	600	1,4
1.520.225	225	5,5	245	600	1,9
1.520.250	250	6,1	270	600	2,3
1.520.280	280	4,4	300	600	2,7
1.520.315	315	4,5	335	600	3,1
1.520.355	355	4,5	380	600	4,1
1.520.400	400	5,6	425	600	5,2
1.520.450	450	6,3	475	600	6,3
1.520.500	500	7,0	530	700	8,2
1.520.560	560	7,8	590	700	9,0
1.520.630	630	8,8	665	700	10,3
1.520.710	710	9,8	745	700	12,7
1.520.800	800	11,1	840	700	16,2
1.520.900	900	12,5	945	700	20,5

PE END CLOSURE

Art no.	Casing pipe D_o [mm]	Wall thickness t [mm]	Inner diameter D_i [mm]	Weight [kg/pc]
1.540.075	75	3,0	87	0,66
1.540.090	90	4,0	105	0,90
1.540.110	110	4,0	125	0,94
1.540.125	125	4,1	140	1,01
1.540.140	140	4,5	155	1,18
1.540.160	160	5,0	175	1,39
1.540.180	180	5,0	195	1,52
1.540.200	200	5,5	220	1,66
1.540.225	225	5,5	245	2,22
1.540.250	250	6,1	270	2,78
1.540.280	280	4,4	300	3,28
1.540.315	315	4,5	335	3,77
1.540.355	355	4,5	380	4,87
1.540.400	400	5,6	425	6,26
1.540.450	450	6,3	475	7,56
1.540.500	500	7,0	530	9,78
1.540.560	560	7,8	590	10,7
1.540.630	630	8,8	665	15,2
1.540.710	710	9,8	745	18,8
1.540.800	800	11,1	840	19,4
1.540.900	900	12,5	945	20,5

PE SHRINK REDUCTION CASING

Art no.	Casing pipe D_o [mm]	Inner diameter D_i [mm]	Weight [kg/pc]
1.530.090.075	090 / 075	103 / 89	0,87
1.530.110.075	110 / 075	125 / 89	1,0
1.530.110.090	110 / 090	125 / 103	0,75
1.530.125.090	125 / 090	140 / 103	0,89
1.530.125.110	125 / 110	140 / 125	1,1
1.530.140.090	140 / 090	156 / 103	1,1
1.530.140.110	140 / 110	156 / 125	1,2
1.530.140.125	140 / 125	156 / 140	1,3
1.530.160.110	160 / 110	177 / 125	1,3
1.530.160.125	160 / 125	177 / 140	1,5
1.530.160.140	160 / 140	177 / 156	1,7
1.530.180.125	180 / 125	197 / 140	1,7
1.530.180.140	180 / 140	197 / 156	1,9
1.530.180.160	180 / 160	197 / 177	2,0
1.530.200.125	200 / 125	218 / 140	1,6
1.530.200.140	200 / 140	218 / 156	2,1
1.530.200.160	200 / 160	218 / 177	2,3
1.530.200.180	200 / 180	218 / 197	2,5
1.530.225.140	225 / 140	244 / 156	2,6
1.530.225.160	225 / 160	244 / 177	2,7
1.530.225.180	225 / 180	244 / 197	2,9
1.530.225.200	225 / 200	244 / 218	3,2
1.530.250.160	250 / 160	269 / 177	3,2
1.530.250.180	250 / 180	269 / 197	3,4
1.530.250.200	250 / 200	269 / 218	3,6
1.530.250.225	250 / 225	269 / 244	4,1
1.530.280.200	280 / 200	300 / 218	4,2
1.530.280.225	280 / 225	300 / 244	4,6
1.530.280.250	280 / 250	300 / 269	5,0
1.530.315.200	315 / 200	336 / 218	4,8
1.530.315.225	315 / 225	336 / 244	5,2
1.530.315.250	315 / 250	336 / 269	5,6
1.530.315.280	315 / 280	336 / 300	6,1
1.530.355.280	355 / 280	377 / 300	6,3
1.530.355.315	355 / 315	377 / 336	7,5
1.530.400.315	400 / 315	425 / 336	7,9
1.530.400.355	400 / 355	425 / 377	9,2
1.530.450.315	450 / 315	476 / 336	9,7
1.530.450.355	450 / 355	476 / 377	10,4
1.530.450.400	450 / 400	476 / 425	11,4
1.530.500.400	500 / 400	528 / 425	13,0
1.530.500.450	500 / 450	528 / 476	14,3

PE SHRINK REDUCTION CASING

Art no.	Casing pipe D_o [mm]	Inner diameter D_i [mm]	Weight [kg/pc]
1.530.560.400	560 / 400	-	9,47
1.530.560.450	560 / 450	-	10,2
1.530.560.500	560 / 500	-	11,1
1.530.630.450	630 / 450	-	11,7
1.530.630.500	630 / 500	-	12,6
1.530.630.560	630 / 560	-	13,8
1.530.710.500	710 / 500	-	14,6
1.530.710.560	710 / 560	-	15,8
1.530.710.630	710 / 630	-	17,3
1.530.800.560	800 / 560	-	18,2
1.530.800.630	800 / 630	-	19,7
1.530.800.710	800 / 710	-	21,7
1.530.900.630	900 / 630	-	22,0
1.530.900.710	900 / 710	-	24,1
1.530.900.800	900 / 800	-	26,4

PE ELECTRIC WELDING CASING

Art no.	Casing pipe d_o	Wall thickness	Inner diameter D_i	Weight
1.512.090	90	4,0	105	0,62
1.512.110	110	4,0	125	0,78
1.512.125	125	4,1	140	0,84
1.512.140	140	4,5	155	0,98
1.512.160	160	5,0	175	1,2
1.512.180	180	5,0	195	1,3
1.512.200	200	5,0	220	1,4
1.512.225	225	5,5	245	1,9
1.512.250	250	6,1	270	2,3
1.512.280	280	4,4	300	2,7
1.512.315	315	4,5	335	3,1
1.512.355	355	4,5	380	4,1
1.512.400	400	5,6	425	5,2
1.512.450	450	6,3	475	6,3
1.512.500	500	7,0	530	8,2
1.512.560	560	7,8	590	9,0
1.512.630	630	8,8	665	10,3
1.512.710	710	9,8	745	12,7
1.512.800	800	11,1	840	16,2
1.512.900	900	12,5	945	20,5

CHAPTER 5.9.4

SHRINK END CAPS FOR SINGLE INSULATED PIPE

Art no.	Flow pipe d_o [mm]	Casing pipe D_o [mm]	Weight [kg/pc]
1.618.2000	10-15-20	63-75-90	0,080
1.618.2100	20-25	90	0,10
1.618.2200	25-40	110-125	0,10
1.618.2300	40-50	110-140	0,13
1.618.2400	50-65	125-140	0,17
1.618.2500	50-80	160-180	0,20
1.618.2600	80-100	160-225	0,25
1.618.2630	100-125	200-225	0,34
1.618.2700	125-150	250-280	0,56
1.618.2800	150-200	280-315	0,55
1.618.2900	200-250	355-400	1,1
1.618.3000	300-350	400-450	1,2

SHRINK END CAPS FOR DOUBLE INSULATED PIPE

Art no.	Flow pipe 1 d_o1 [mm]	Flow pipe 2 d_o2 [mm]	Casing pipe D_o [mm]	Weight [kg/pc]
1.618.3200	10-28	10-28	90-125	0,15
1.618.3250	19-34	10-21	90-140	0,16
1.618.3280	24-60	20-50	110-160	0,17
1.618.3300	24-48	14-28	140-180	0,20
1.618.3350	24-62	24-62	160-180	0,25
1.618.3351	24-32	24-32	160-180	0,25
1.618.3352	24-49	24-49	160-200	0,30
1.618.3360	24-34	50-62	160-200	0,35

ASSEMBLY TEE

Art no.	PEX Flow pipe		Casing pipe	
	Main pipe [mm]	Branch [mm]	Main pipe [mm]	Branch [mm]
1.568.075	20 - 25 - 32	20 - 25 - 32	75	75
1.568.090	40	40	90	90
1.568.091	40	20 - 25 - 32	90	75
1.568.111	50	20 - 25 - 32	110	75
1.568.112	50	40	110	90
1.568.110	50	50	110	110
1.568.126	63	20 - 25 - 32	125	75
1.568.127	63	40	125	90
1.568.128	63	50	125	110
1.568.125	63	63	125	125
1.568.141	75	25 - 32	140	75
1.568.142	75	40	140	90
1.568.143	75	50	140	110
1.568.144	75	63	140	125
1.568.140	75	75	140	140
1.568.161	90	32	160	75
1.568.162	90	40	160	90
1.568.163	90	63	160	125
1.568.164	90	75	160	140
1.568.160	90	90	160	160

SEALING RINGS

Art no.	Casing pipe D_o [mm]	Weight [kg/pc]
1.800.075	75	0,23
1.800.090	90	0,24
1.800.110	110	0,33
1.800.125	125	0,37
1.800.140	140	0,36
1.800.160	160	0,40
1.800.180	180	0,51
1.800.200	200	0,46
1.800.225	225	0,55
1.800.250	250	0,63
1.800.280	280	0,74
1.800.315	315	0,90
1.800.355	355	1,0
1.800.400	400	1,2
1.800.450	450	1,3
1.800.500	500	1,4

SHRINKING SLEEVES

Art no.	Casing pipe D_o [mm]	Weight [kg/pc]
1.610.075	75	0,13
1.610.090	90	0,14
1.610.110	110	0,16
1.610.125	125	0,18
1.610.140	140	0,20
1.610.160	160	0,22
1.610.180	180	0,23
1.610.200	200	0,26
1.610.225	225	0,38
1.610.250	250	0,48
1.610.280	280	0,53
1.610.315	315	0,60
1.610.355	355	0,63
1.610.400	400	0,69
1.610.450	450	0,75
1.610.500	500	0,85

SHRINK SLEEVES FOR STEEL PIPE CANUSA-PLA

Art no.	Casing pipe D_0 [mm]	CANUSA Number	Weight [kg/pc]
1.634.090	90	PLA-090-450-YE	0,28
1.634.115	115	PLA-115-450-YE	0,35
1.634.125	125	PLA-125-450-YE	0,41
1.634.160	160	PLA-160-450-YE	0,45
1.634.170	170	PLA-170-450-YE	0,52
1.634.200	200	PLA-200-450-YE	0,60
1.634.230	230	PLA-230-450-YE	0,61
1.634.280	280	PLA-280-450-YE	0,78
1.634.315	315	PLA-315-450-YE	0,88

REPAIR STRIPS CANUSA WLD-B

Art no.	Width b [mm]	CANUSA Number	Length L [m]	Weight [kg/pc]
1.635.150	150	WLD-B-150-30	30	0,83
1.635.225	225	WLD-B-225-30	30	1,2
1.635.450	450	WLD-B-450-30	30	2,5
1.635.650	650	WLD-B-650-30	30	3,5
1.635.900	900	WLD-B-900-15	15	5,3

LOCK STRIPS CANUSA CLW

Art no.	Width b [mm]	CANUSA Number	Length L [m]	Weight [kg/pc]
1.637.100	100	CLW-B-100-15	15	0,33

SHRINKING SHEETS FOR STEEL PIPE CANUSA-HCA

Art no.	Width b [mm]	CANUSA Number	Length L [m]	Weight [kg/pc]
1.639.075	75	HCA-B-75-15 BK	15	0,10
1.639.110	110	HCA-B-100-15	15	0,20

SHRINK HOSE FOR STEEL PIPE CANUSA-PMA

Art no.	Width b [mm]	CANUSA Number	Length L [m]	Weight [kg/pc]
1.634.040	40/15	PMA-40/15-1500-BK	1500	1,1
1.634.050	50/16	PMA-50/16-1500-BK	1500	1,1
1.634.060	60/35	PMA-60/35-915-BK	915	0,67
1.634.065	60/35	PMA-60/35-1500-BK	1500	1,1
1.634.070	70/25	PMA-70/25-1500-BK	1500	1,3
1.634.084	84/58	PMA-84/58-915-BK	915	1,1

CHAPTER 5.9.5

FUSAPEX ELECTROFUSION SOCKET SDR 11 PEX

Art no.	D_o [mm]	D [mm]	Z [mm]	L [mm]	Weight [kg/pc]
10.130050	50	68	3	100	0,16
10.130063	63	82	3	118	0,25
10.130075	75	98	3	125	0,35
10.130090	90	117	3	135	0,65
10.130110	110	140	3	163	0,85
10.130125	125	157	3	173	1,1

FUSAPEX ELECTROFUSION BEND 90° SDR 11 PEX

Art no.	D_o [mm]	L [mm]	L1 [mm]	L2 [mm]	Weight [kg/pc]
10.131075	75	150	61	96	0,51
10.131090	90	202	70	111	0,86
10.131110	110	234	73	140	1,5
10.131125	125	271	81	163	2,3

FUSAPEX ELECTROFUSION REDUCER SDR 11 PEX

Art no.	D_o [mm]	L [mm]	L1 [mm]	L2 [mm]	Weight [kg/pc]
10.133090.075	90-75	132	71	61	0,29
10.133110.075	110-75	140	79	61	0,46
10.133110.090	110-90	150	79	71	0,49
10.133125.075	125-75	144	83	61	0,66
10.133125.090	125-90	154	83	71	0,66
10.133125.110	125-110	162	83	79	0,66
10.133160.075	160-75	156	95	61	1,3
10.133160.090	160-90	166	95	71	1,2
10.133160.110	160-110	174	95	79	1,2
10.133160.125	160-1125	178	95	83	1,2

FUSAPEX ELECTROFUSION TRANSITION FLANGE SDR 11 PEX

FLANGE ACCORDING TO EN 1092

Art no.	D_o / DN	Z [mm]	L [mm]	HF [mm]	LK [mm]	Weight [kg/pc]
10.135075	75/65	101	61	29	145	1,9
10.135090	90/80	110	71	29	160	2,1
10.135110	110/100	117	79	31	180	2,5
10.135125	125/100	130	83	38	180	2,8

FUSAPEX FLANGE SEAL SDR 11 PEX

Art no.	D_o/DN [mm]	D1 [mm]	D2 [mm]	s1 [mm]	s2 [mm]
10.136075	75/65	77	127	4	5
10.136090	98/80	89	142	4	5
10.136112	110/100 til 125/110	115	162	5	6
10.135125	125/100	130	83	38	180

FUSAPEX ELECTROFUSION T-PIECE SDR 11 PEX

Art no.	Diameter D1-d1-D2 [mm]	L [mm]	L1 [mm]	D1 [mm]	L2 [mm]	D2 [mm]	H [mm]	Weight [kg/pc]
10.132050	50-50-50	155	49	68	49	68	155	0,38
10.132063	63-63-63	166	58	82	57	82	188	0,60
10.132075	75-75-75	187	61	97	62	96	187	1,1
10.132090	90-90-90	293	71	112	73	117	220	1,8
10.132110	110-110-110	328	72	143	79	139	296	3,4
10.132125	125-125-125	380	85	163	83	155	326	3,7

FUSAPEX ELECTROFUSION ESM TRANSITION WITH AG SDR 11 PEX

Art no.	Pexpipe/ male BSP	L [mm]	L1 [mm]	L2 [mm]	D2 [mm]	Weight [kg/pc]
10.138050	50 - R 1 ½”	136	26	86	38	0,53
10.138063	63 - R 2”	160	31	101	48	0,90
10.138075	75 - R 2 ½”	171	34	46	51	1,5

CHAPTER 5.9.6

PE WELDING PLUG

Art no.	Weight [kg/pc]
1.591	0,010

PE-AIR VENTING PLUG

Art no.	Weight [kg/pc]
1.592	0,010

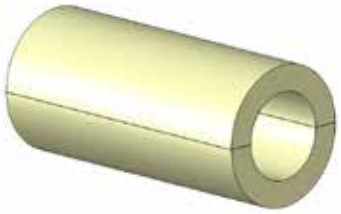
VENTILATION PLUG SEALING

Art no.	Weight [kg/pc]
1.600.000	0,010

PE CLEANER (ETHANOL)

Art no.	Volume [L]	Weight [kg/pc]
1.583.750	0,75	0,67

CHAPTER 5.9.7
PUR INSULATION SHELL



Art no.	DN	Outer diameter D_o[mm]	Inner diameter D_i [mm]	Weight [kg/pc]
1.581.090.020	90/20	90	20	0,22
1.581.090.025	90/25	90	25	0,20
1.581.110.020	110/20	110	20	0,34
1.581.110.025	110/25	110	25	0,32
1.581.110.032	110/32	110	32	0,30
1.581.110.040	110/40	110	40	0,28
1.581.125.020	125/20	125	20	0,45
1.581.125.025	125/25	125	25	0,43
1.581.125.032	125/32	125	32	0,41
1.581.125.040	125/40	125	40	0,39
1.581.125.050	125/50	125	50	0,35
1.581.140.032	140/32	140	32	0,54
1.581.140.040	140/40	140	40	0,52
1.581.140.050	140/50	140	50	0,48
1.581.140.065	140/65	140	65	0,41
1.581.160.050	160/50	160	50	0,67
1.581.160.065	160/65	160	65	0,60
1.581.160.080	160/80	160	80	0,53
1.581.180.065	180/65	180	65	0,82
1.581.180.080	180/80	180	80	0,75
1.581.200.080	200/80	200	80	0,99
1.581.200.100	200/100	200	100	0,82
1.581.225.100	225/100	225	100	1,2
1.581.225.125	225/125	225	125	0,93
1.581.250.100	250/100	250	100	1,5
1.581.250.125	250/125	250	125	1,3
1.581.250.150	250/150	250	150	1,0
1.581.280.125	280/125	280	125	1,8
1.581.280.150	280/150	280	150	1,5
1.581.315.150	315/150	315	150	2,2
1.581.315.200	315/200	315	200	1,5
1.581.355.200	355/200	355	200	2,3
1.581.400.200	400/200	400	200	3,4
1.581.400.250	400/250	400	250	2,5
1.581.450.250	450/250	450	250	3,9
1.581.450.300	450/300	450	300	2,8
1.581.500.350	500/350	500	350	3,6
1.581.560.400	560/400	500	400	3,2
1.581.710.600	710/600	710	600	3,3

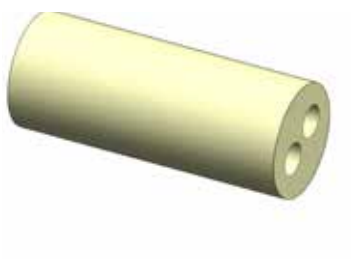
PUR INSULATION SHELL W/SOFT INNER LAYER

Art no.	DN	Outer diameter D_o [mm]	Inner diameter D_i [mm]	Weight [kg/pc]
1.585.075.020	075/020	75	20	0,19
1.585.075.025	075/025	75	25	0,18
1.585.075.032	075/032	75	32	0,24
1.585.075.040	075/040	75	40	0,27
1.585.090.020	090/020	90	20	0,28
1.585.090.025	090/025	90	25	0,27
1.585.090.032	090/032	90	32	0,26
1.585.090.040	090/040	90	40	0,23
1.585.110.025	110/025	110	25	0,42
1.585.110.032	110/032	110	32	0,40
1.585.110.040	110/040	110	40	0,38
1.585.110.050	110/050	110	50	0,34
1.585.125.025	125/025	125	25	0,56
1.585.125.032	125/032	125	32	0,55
1.585.125.040	125/040	125	40	0,52
1.585.125.050	125/050	125	50	0,48
1.585.125.063	125/063	125	63	0,42
1.585.140.032	140/032	140	32	0,70
1.585.140.040	140/040	140	40	0,67
1.585.140.050	140/050	140	50	0,64
1.585.140.063	140/063	140	63	0,58
1.585.140.075	140/075	140	75	0,51
1.585.160.032	160/032	160	32	0,94
1.585.160.040	160/040	160	40	0,91
1.585.160.050	160/050	160	50	0,88
1.585.160.063	160/063	160	63	0,81
1.585.160.075	160/075	160	75	0,75
1.585.160.090	160/090	160	90	0,64
1.585.180.040	180/040	180	40	1,0
1.585.180.050	180/050	180	50	1,2
1.585.180.063	180/063	180	63	1,1
1.585.180.090	180/090	180	90	0,92
1.585.180.110	180/110	180	110	0,75
1.585.200.063	200/063	200	63	1,4
1.585.200.075	200/075	200	75	1,5
1.585.200.090	200/090	200	90	1,2
1.585.200.110	200/110	200	110	1,1
1.585.225.075	225/075	225	75	1,7
1.585.225.090	225/090	225	90	1,6
1.585.225.110	225/110	225	110	1,5
1.585.225.125	225/125	225	125	1,3
1.585.225.140	225/140	225	140	1,2
1.585.250.075	250/075	250	75	2,5
1.585.250.090	250/090	250	90	2,1
1.585.250.110	250/110	250	110	1,5
1.585.250.125	250/125	250	125	1,8

PUR INSULATION SHELL W/SOFT INNER LAYER

1.585.250.140	250/140	250	140	1,6
1.585.250.160	250/160	250	160	1,4
1.585.280.110	280/110	280	110	0,75
1.585.280.125	280/125	280	125	1,2
1.585.280.160	280/160	280	160	2,0
1.585.280.180	280/180	280	180	1,7
1.585.315.125	315/125	315	125	3,2
1.585.315.140	315/140	315	140	3,0
1.585.315.160	315/160	315	160	2,8
1.585.315.200	315/200	315	200	2,2
1.585.315.225	315/225	315	225	1,8
1.585.355.140	355/140	355	140	4,0
1.585.355.160	355/160	355	160	3,8
1.585.355.180	355/180	355	180	3,5
1.585.355.200	355/200	355	200	3,2
1.585.355.250	355/250	355	250	2,3
1.585.400.160	400/160	400	160	5,1
1.585.400.180	400/180	400	180	4,8
1.585.400.200	400/200	400	200	4,6
1.585.400.250	400/250	400	250	3,6
1.585.400.280	400/280	400	280	2,9
1.585.400.315	400/315	400	315	2,5
1.585.450.200	450/200	450	200	6,0
1.585.450.225	450/225	450	225	5,7
1.585.450.250	450/250	450	250	5,3
1.585.450.280	450/280	450	280	4,6
1.585.450.315	450/315	450	315	3,8
1.585.500.225	500/225	500	225	7,5
1.585.500.250	500/250	500	250	7,1
1.585.500.280	500/280	500	280	6,4
1.585.500.315	500/315	500	315	5,6
1.585.500.355	500/355	500	355	4,5
1.585.560.400	560/400	560	400	5,5

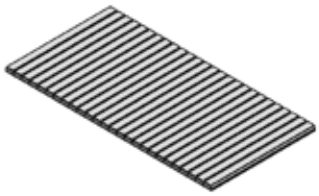
PUR INSULATION SHELL FOR DOUBLE PIPE



Art no.	DN	Outer diameter D_o [mm]	Inner diameter D_i [mm]	Weight [kg/pc]
1.587.125.020	125/20-20	125	20-20	0,42
1.587.140.020	140/20-20	140	20-20	0,44
1.587.140.025	140/25-25	140	25-25	0,52
1.587.160.025	160/25-25	160	25-25	0,72
1.587.160.032	160/32-32	160	32-32	0,67
1.587.180.032	180/32-32	180	32-32	0,89
1.587.160.040	160/40-40	160	40-40	0,67
1.587.180.040	180/40-40	180	40-40	0,89
1.587.200.050	200/50-50	200	50-50	1,0
1.587.225.050	225/50-50	225	50-50	1,3
1.587.225.065	225/65-65	225	65-65	1,2
1.587.250.065	250/65-65	250	65-65	1,6
1.587.250.080	250/80-80	250	80-80	1,4
1.587.280.080	280/80-80	280	80-80	1,9
1.587.315.100	315/100-100	315	100-100	2,2
1.587.355.100	355/100-100	355	100-100	3,1
1.587.400.125	400/125-125	400	125-125	3,7
1.587.450.125	450/125-125	450	125-125	5,0
1.587.450.150	450/150-150	450	150-150	4,5
1.587.500.150	500/150-150	500	150-150	5,9
1.587.560.200	560/200-200	560	200-200	6,6
1.587.630.200	630/200-200	630	200-200	9,2

CHAPTER 5.9.8

FOAM SUPPORT PAD

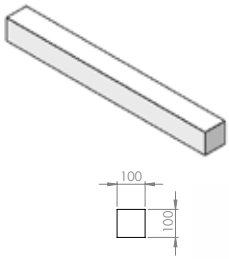


Art no.	Size [mm]	Weight [kg/m]
1.590.1000	2000 x 1000 x 40	4,0

EXPANSION CASING

Art no.	Width [mm]	Weight [kg/m]
1.590.2000	1000	-

UNDER PIPE SUPPORT



Art no.	Size [mm]	Weight [kg/m]
1.590.010	100 x 100 x 1000	0,030 kg

PUR

Art no.	Dose [gr]	Casing pipe [mm]	Weight [kg/pc]
1.580.0250	250	75	0,25
1.580.0300	300	90	0,30
1.580.0400	400	110	0,40
1.580.0450	450	125	0,45
1.580.0550	550	140	0,55
1.580.0650	650	160	0,65
1.580.0850	850	180	0,85
1.580.1000	1000	200	1,0
1.580.1250	1250	225	1,3
1.580.1400	1400	250	1,4
1.580.1600	1600	280	1,6
1.580.1900	1900	315	1,9
1.580.2200	2200	355	2,2
1.580.2400	2400	400	2,4
1.580.3500	3500	-	3,5
1.580.5000	5000	-	5,0

CHAPTER 5.9.9
DRILLING SET FOR BALL VALVE

Art no.
1.935.000

1. Remove the insulation and clean the steel pipe.
2. Weld the ball valve on the steel pipe.
3. Leave the ball valve open and attach the drill at the ball valve.
4. Drill a hole through the steel pipe.
5. Close the ball valve and remove the drill.

Now it is possible to connect a new user to the district heating line

GEAR FOR LONG STEM BALL VALVES

Art no.
1.934.000

Portable gear set for valves larger than DN250 when necessery to open and close valves.

COMPRESSION SLEEVE TOOLS

Art no.	Outer diameter PEX pipe d_o [mm]
9.6031	20-40
9.6030	50-125

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Chapter 6 | Monitoring system

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6.1 – Nordic alarm monitoring system 1
6.2 – Alarm systems design 2

CHAPTER 6.0
MONITORING SYSTEM

A leak in the district heating pipe line is the main cause for premature failures. Most of these failures can be traced to outer causes such as a leak through the casing pipe or joint material. These failures may be avoided by monitoring the district heating system and making the necessary measures as soon as the leak has been detected.

The insulation foam damages and it´s insulation properties reduce considerably when a leak occurs from the steel pipe or casing. Wet foam can last for years at a low temperature but insulation thermal resistant is low. At high temperatures the insulation foam will not last long.

The monitoring system can also find a small leak due to faulty installation of the district heat pipe line and is therefore a certain deterrent for those working with jointing and steel welding.

CHAPTER 6.1
NORDIC ALARM MONITORING SYSTEM

Set Pipes uses Nordic alarm monitoring system for all pre-insulated pipes and fittings according to EN 14419 standard. The system is based on resistance measurement between two steel wires and the steel service pipe. The wires which are used are copper and tin plated copper wire 1,5 mm^2. The purpose of the colour difference is to make it easier to separate the wires during installation.

In production, all pipes and fittings are resistance measured according to EN 14419 and signed off accordingly by a qualified inspector.

Different monitoring equipment is available for the system, from on-site measuring regularly for failures to a system which consistently monitors and results are saved in a database. Set pipes can assist to provide suitable monitoring system for customers.

CHAPTER 6.2
MONITORING SYSTEMS DESIGN

To be able to design and realized the potential of alarm monitoring connections it is necessary to know the alarm system design. The following figure shows the placement of the wires.

Please note. The below illustrations are only examples of fitting solutions. Please contact Set Pipes technical team for further options.

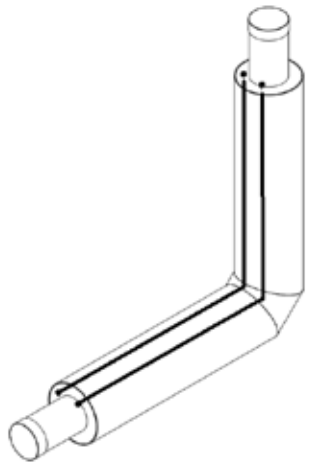

FIGURE 6.2.1
90° Bend

FIGURE 6.2.2
Pre-insulated single steel pipe

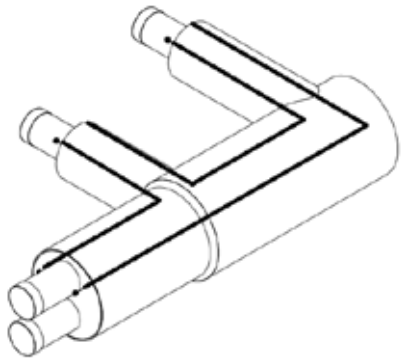

FIGURE 6.2.3
Transition F

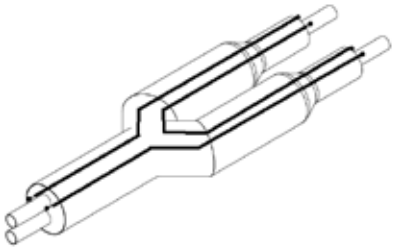

FIGURE 6.2.4
Transition fork

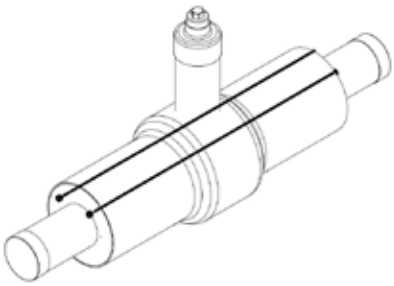

FIGURE 6.2.5
Ball valve

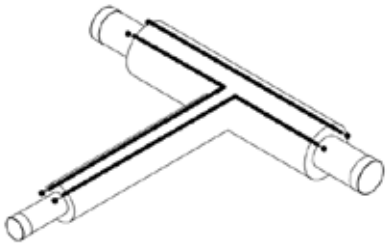

FIGURE 6.2.6
T-piece

FIGURE 6.2.7
Pre-insulated double steel pipe

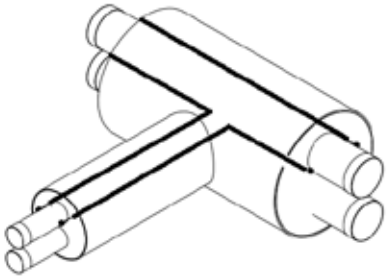

FIGURE 6.2.8
Double T- piece

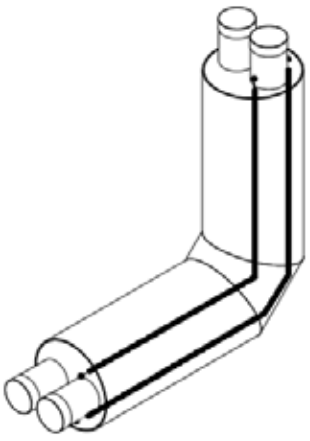

FIGURE 6.2.9
Double bend 90°

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7.2 – Pre-insulated steel pipes - Jointing PE shrink casing and PUR foam set 3
7.3 – Elipex - Joint preparation PE shrink casing and PUR insulation shell 7

CHAPTER 7.0
INSTRUCTIONS

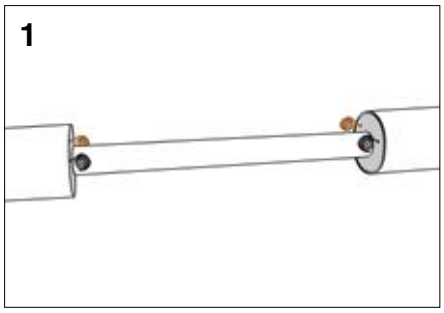
CHAPTER 7.1
PRE-INSULATED STEEL PIPES JOINTING PE SHRINK CASING AND PUR INSULATION SHELL

Joint assembly should be performed by trained and certified personnel. Set Pipes offers training courses regularly. Please contact Set Pipes technical department for registering.

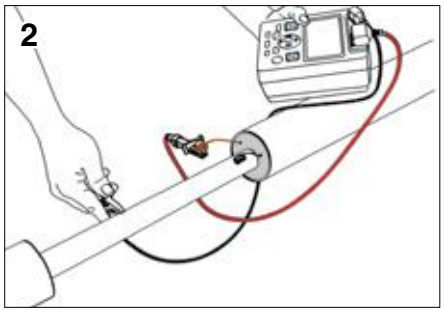
Pay special attention to all weather conditions and avoid water or moisture during the insulation process. It is necessary to tent over the assembling area in rain or wind.

Before starting, ensure all necessary tools and equipment are ready and on-site. If joint preparation is done in a trench be sure it is wide enough to make the work process safe and accessible. Ensure that foaming material is at the right temperature (>18°C) and heat the shrink sleeve in cold conditions.

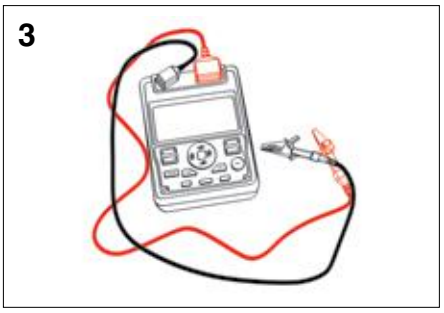
Before the steel is welded together the PE shrink casing and shrink sleeves, including the white protective plastic, are slid on to the pre-insulated pipe.



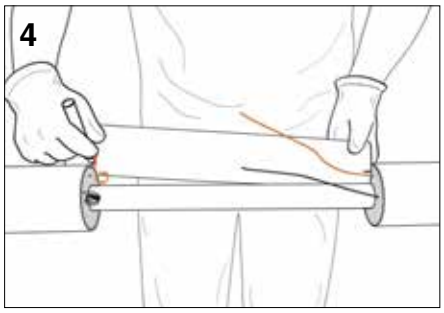
Clean thoroughly all dirt, moisture and grease from the casing pipe and steel pipe ends with a cloth and 99% Ethanol.



Gently straighten the monitoring system wires. Inspect the wire to see if they are damaged and that they are equal in length. Test the wires to see if they work properly.

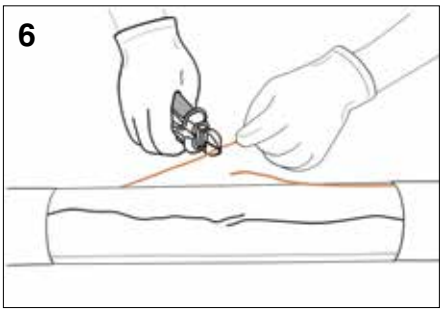


Always measure both the pipes being laid and all connecting components by using an Ohm meter and megger before and after jointing. The insulation resistance should be higher than 500 MΩ. Results shall be documented to ensure the function and quality of the system.

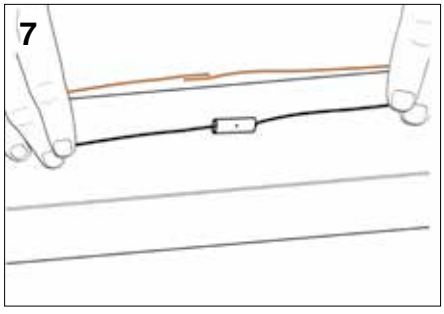


Measure for the PUR insulation shell and cut to the correct length. Make sure there are no gaps between the insulation shell and insulation of the pipe.

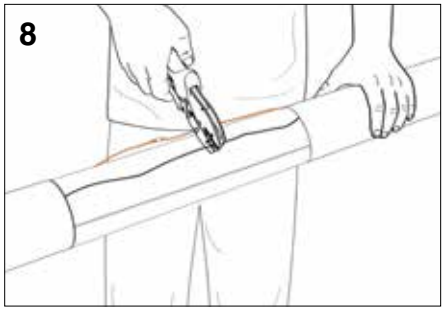
Carve channels in the PUR insulation shell for the monitoring system wire.



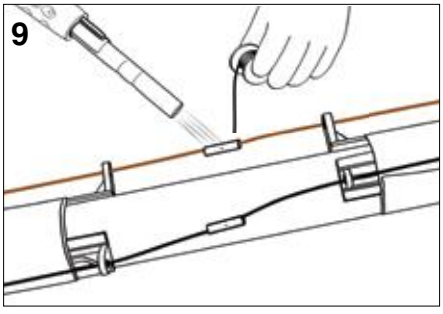
Insert shell in the joint. Cut the wires to correct length.



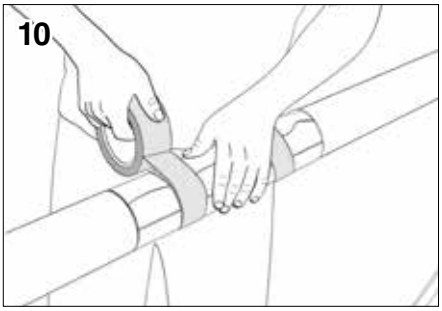
Clean the wire ends with sandpaper and insert the wire connections.



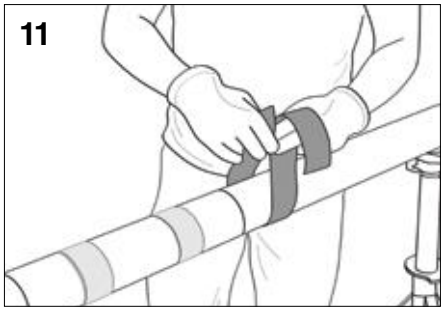
Press wire connections with suitable pliers.



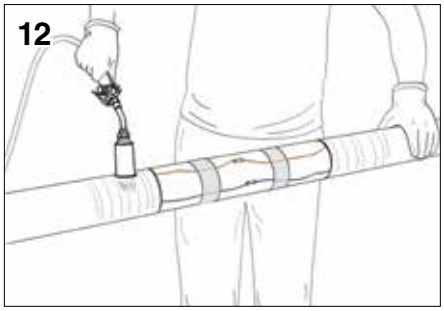
To ensure connection, solder the wire connections.



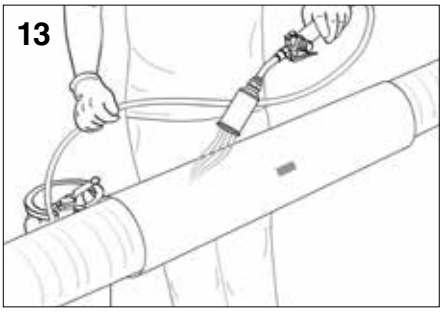
Use duct tape to fix the monitoring system wires down.



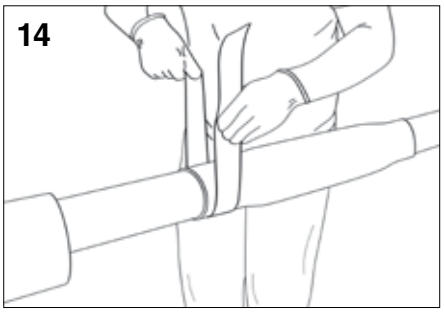
Measure and mark with a marker the position of the PE shrink casing on casing pipe. Sand well the surface area sideways on the casing pipe with sand paper in coarseness of 40-60 where the PE shrink casing will be placed.



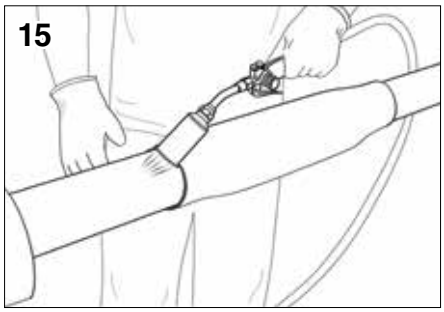
Slowly heat the surface of the casing pipe evenly with a soft flame of up to 60°C where the PE shrink casing will be situated. Slide the PE shrink casing over the joint and place it on the markings.



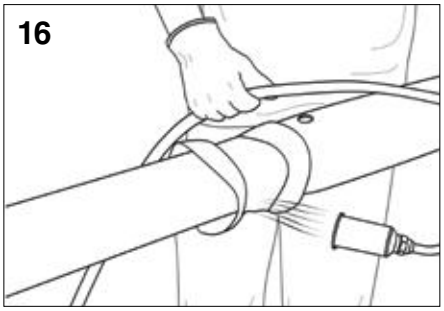
Slowly heat up the PE shrink casing evenly from the center and all around with a soft flame. Be sure the flame is moving constantly to prevent overheating and therefore damaging the PE shrink casing.



Clean the area where the shrink sleeve will be with ethanol and sand with sandpaper in coarseness of 40-60 across the pipeline direction.



Remove the white plastic protection from the PE shrink sleeve. Slowly heat the surface where the PE shrink sleeve will be situated with a flame of up to 60°C.



Slide the PE shrink sleeve over the joint and heat it slowly from the middle all around with a soft flame. While working towards sleeve ends tilt the flame 30° so air will not be trapped under the sleeve.

CHAPTER 7.2

PRE-INSULATED STEEL PIPES JOINT PREPARATION PE SHRINK CASING AND PUR FOAM SET

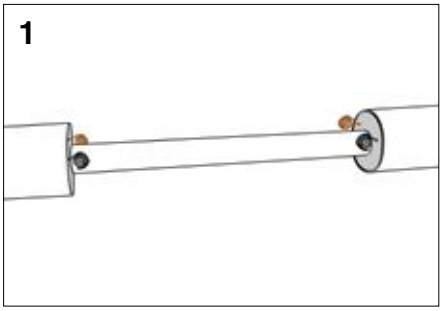
Joint assembly should be performed by trained and certified personnel. Set Pipes offers training courses regularly. Please contact Set Pipes technical department for registering.

Pay special attention to all weather conditions and avoid water or moisture during the insulation process. It is necessary to tent over the assembling area in rain or wind.

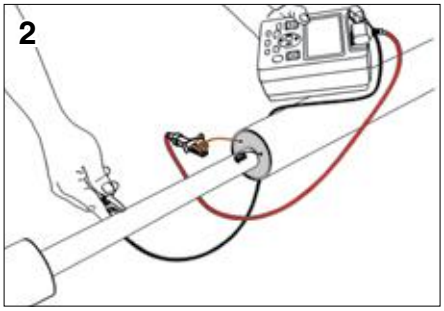
Before starting ensure all necessary tools and equipment are ready and onsite. If joint preparation is done in a trench then be sure it is wide enough to make the work process safe and accessible. Ensure that foaming material is at the right temperature (>18°C) and heat the shrink sleeve in cold conditions.

Before the steel is welded together the PE shrink casing and shrink sleeves, including the white protective plastic are slid on to the pre-insulated pipe.

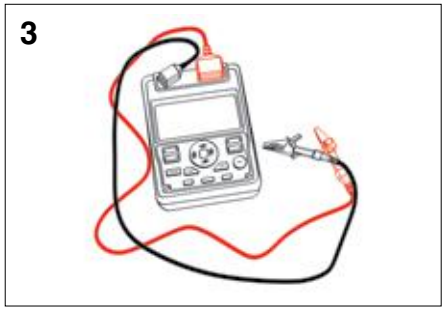
See chapter 5, page 6 regard handling of foam.



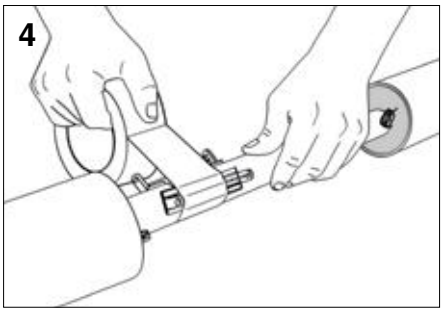
Clean thoroughly all dirt, moisture and grease from the casing pipe and steel pipe ends with a cloth and 99% Ethanol.



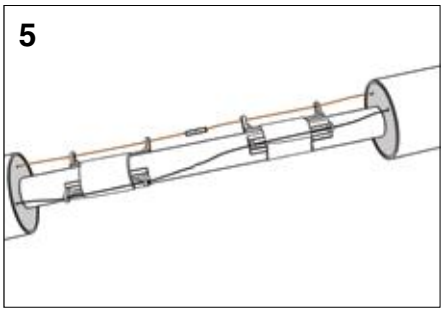
Gently straighten the monitoring system wires. Inspect the wire to see if they are damaged and that they are equal in length. Test the wires to see if they work properly.



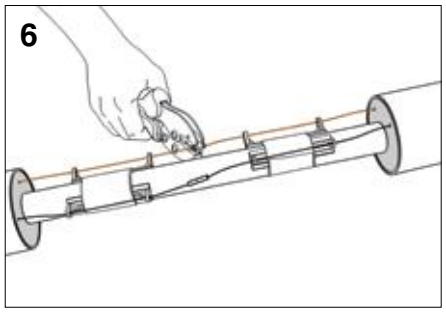
Always measure both the pipes being laid and all connecting components by using an Ohm meter and megger before and after jointing. The insulation resistance should be higher than 500 MΩ. Results shall be documented to ensure the function and quality of the system.



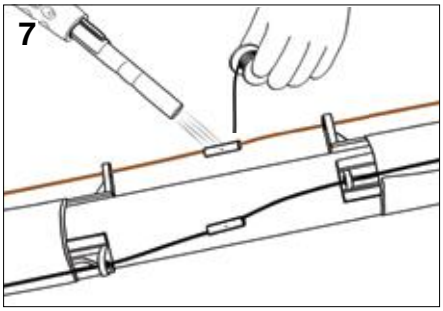
Attach the wire holder on the steel pipe with tape.



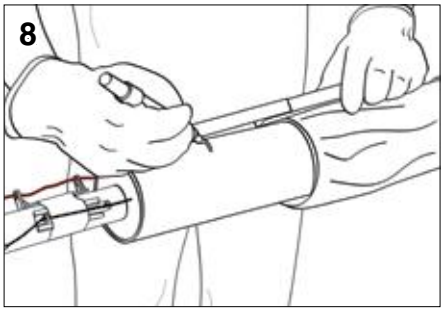
Cut the wires to the correct length.



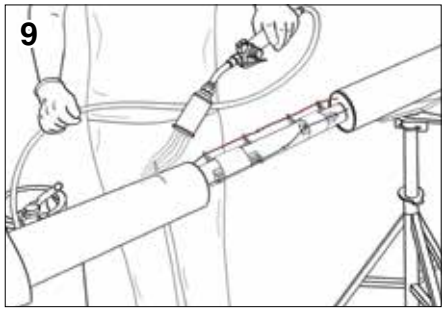
Clean the wire ends with sandpaper and insert the wire connections. Press wire connections with suitable pliers.



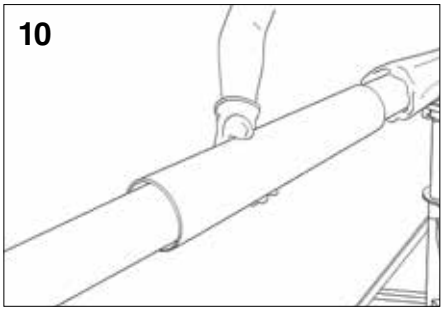
To ensure connection, solder the wire connections.



Measure and mark with a marker the position of the PE shrink casing on casing pipe. Sand well the surface area sideways on the casing pipe with sand paper in coarseness of 40-60 where the PE shrink casing will be placed.

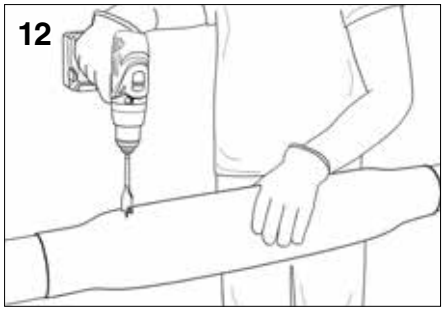


Slowly heat the surface of the casing pipe evenly with a soft flame of up to 60°C where the PE shrink casing will be situated.

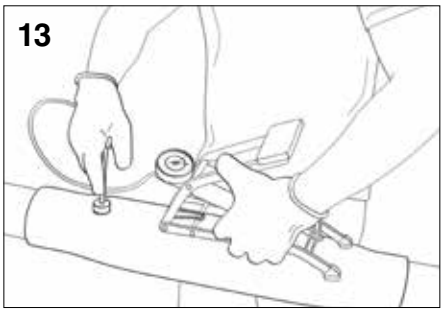


Slide the PE shrink casing over the joint and place it on the markings.

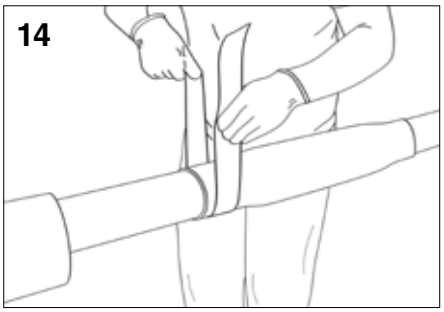
Slowly heat up the end of the PE shrink casing with even and light movements all the way around until the PE shrink casing has reduced to the casing pipe. Be sure the flame is moving constantly to prevent overheating.



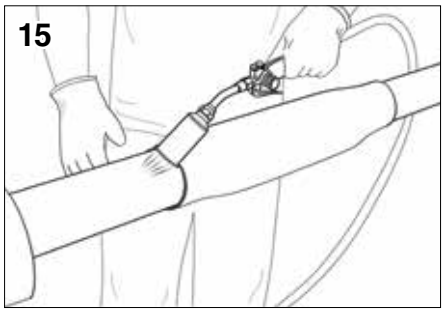
Allow the PE shrink casing time to cool. Drill a hole as close to the edge of the pre-insulated pipe as possible for pouring of the PUR mixture.



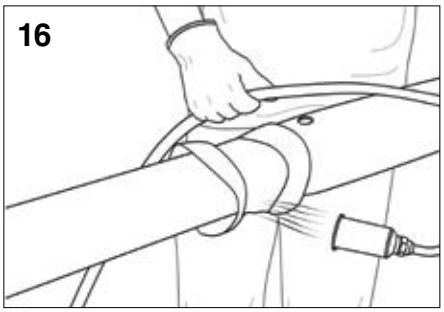
Pressure test the PE shrink casing with 0,2 bar pressure for three minutes. Check for leaks with soapy water.



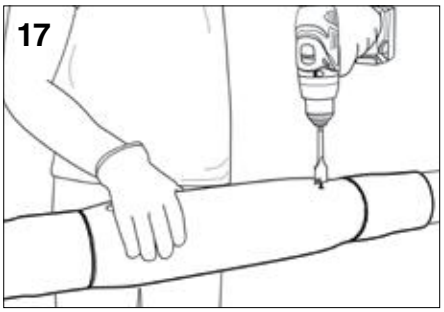
Clean the area where the shrink sleeve will be with ethanol and sand with sandpaper in coarseness of 40-60 across in the pipeline direction.



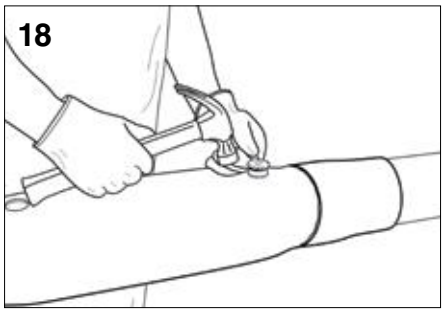
Slowly heat the surface of the casing pipe with a flame of up to 60°C where the PE shrink sleeve will be situated



Slide the PE shrink sleeve over the joint and remove the white plastic protection. Heat it slowly from the middle all around with a soft flame. While working towards sleeve ends tilt the flame 30° so air will not be trapped under the sleeve.

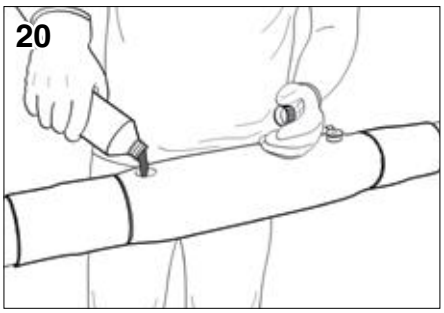


Allow the PE shrink sleeve time to cool down. Drill another hole for the PUR mixture as before. For quicker cleaning after insulating place a wide piece of duct tape before drilling.

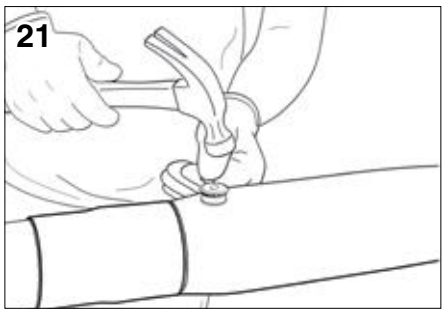


For a pipe line that tilts, an air venting plug can be placed in the higher hole before pouring PUR foam into the lower hole.

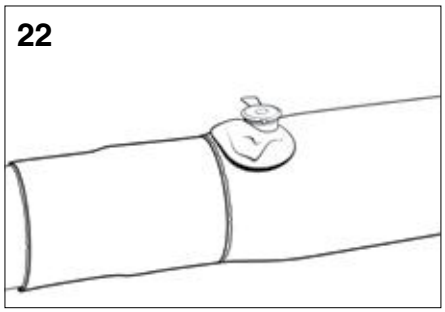
Note: Ensure the polyol and isocyanate is at the correct temperature approx. 20°C before mixing. Pour bottle B (Polyol) into bottle A (Isocyanate) and shake well for about 20 seconds.



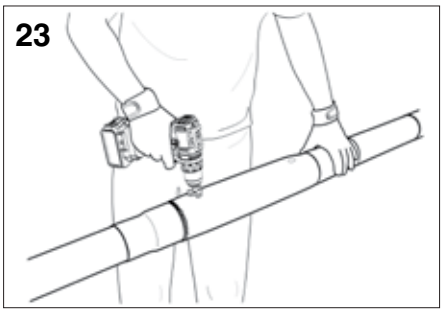
Pour the PUR foam mixture rapidly in the lower drilled hole.



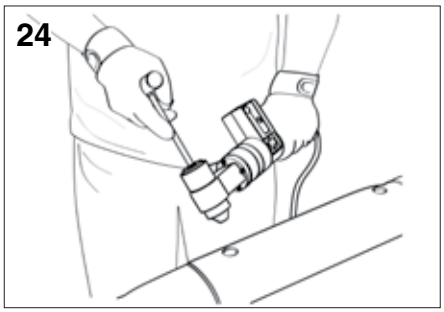
Place air venting plugs into both holes.



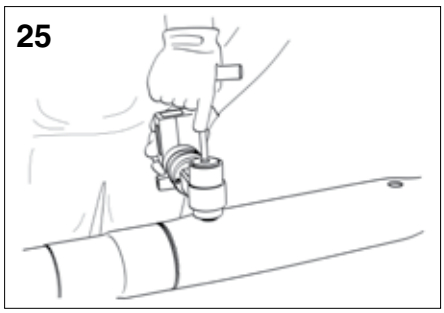
Allow to foam up through the plugs then hit the plugs down.



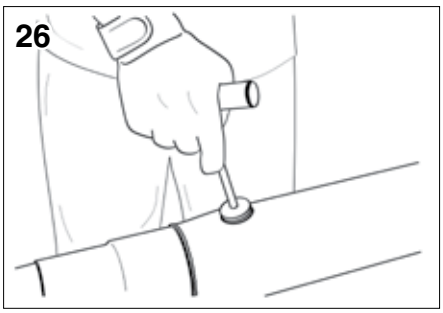
Leave the PUR foam material to dry for about 25 minutes. Remove the air venting plugs and clean all excess foam material from the surface. Make a chamber in the holes for the welding plugs and scrape the surface near the holes with sand paper or a scraper. Clean the area and the welding plugs with Ethanol



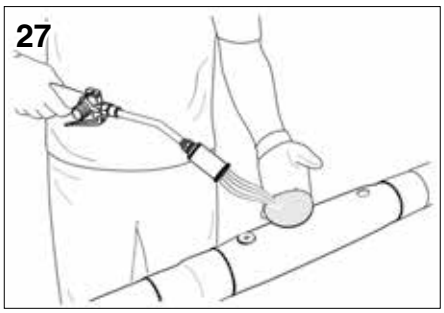
With a plug welding machine heat the welding plug for about 10 seconds before heating the drilled hole.



Press the plug welding machine down into the hole until well submerged, hold for about 10 seconds without pressure.



Remove the plug welding machine and press the plug down into the hole and hold for about 15 seconds.



Heat the surface of PE shrink casing with a light flame up to 60°C for the FOP sealing. Place the FOP sealing in place and heat slightly. Press lightly to release any air beneath

CHAPTER 7.3

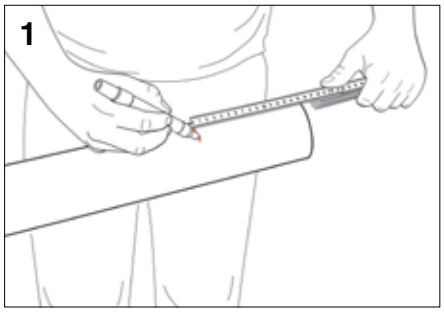
ELIPEX
JOINT PREPARATION
JOINTING PE SHRINK CASING AND PUR INSULATION SHELL

Joint assembly should be performed by trained and certified personnel. Set Pipes offers training courses regularly. Please contact Set Pipes technical department for registering.

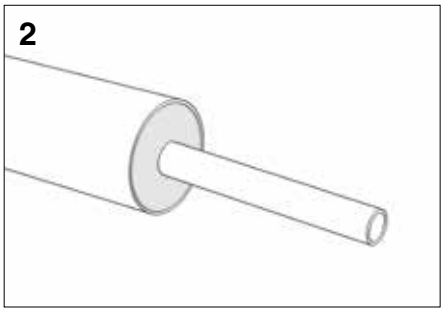
Pay special attention to all weather conditions and avoid water or moisture during the insulation process. It is necessary to tent over the assembling area in rain or wind.

Before starting ensure all necessary tools and equipment are ready and onsite. If joint preparation is done in a trench then be sure it is wide enough to make the work process safe and accessible. Ensure that foaming material is at the right temperature (>18°C) and heat the shrink sleeve in cold conditions.

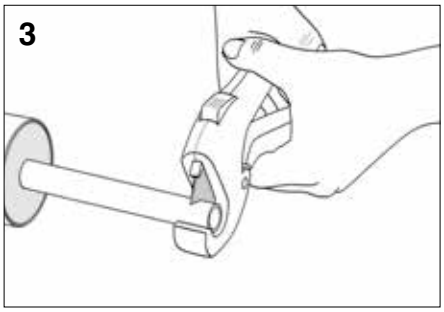
Before the Elipex is connected the PE shrink casing and shrink sleeves, including the white protective plastic are slid on to Elipex pipe.



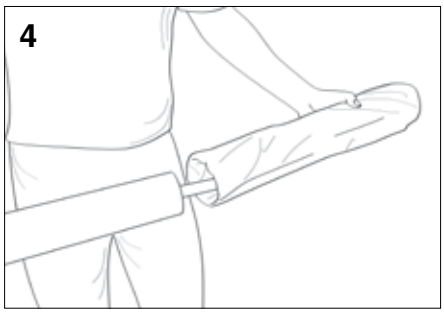
Mark 15-20 cm from the end of the pipe. Use a pipe cutter to remove the casing pipe from the pipe line.



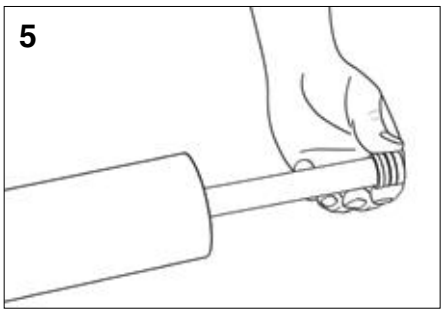
Clean all PUR foam from the Pex pipe.



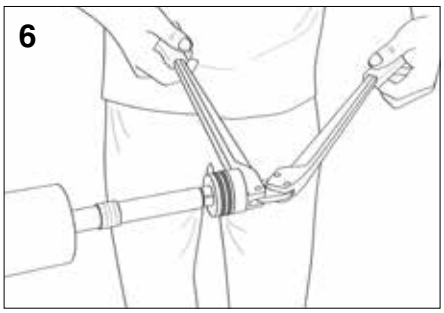
Make a clean cut at the end of the pipe with pipe cutters.



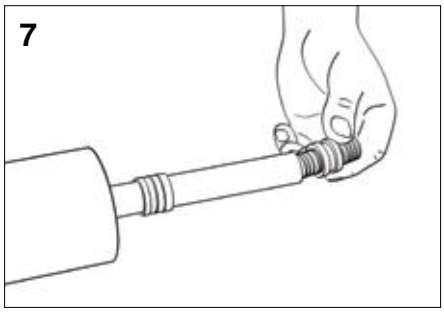
Slide PE shrink casing and PE shrink sleeves onto pipe.



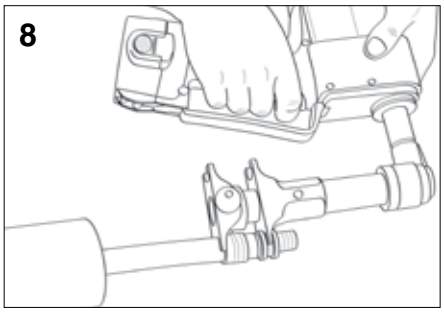
Slide compression sleeve onto the pipe ensuring it is turned correctly.



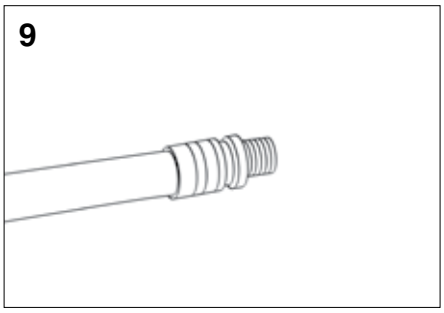
Expand the pipe end, rotate 30° and repeat. The length of the expansion must be at least the length of the compression sleeve.



Place the fitting in the pipe end. After a short while the pipe will tighten around the fitting.

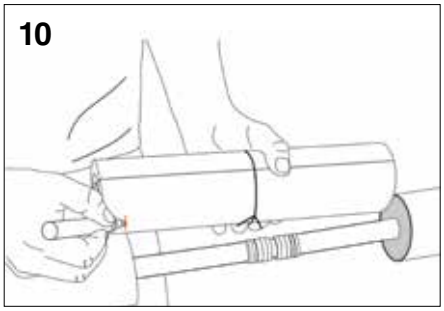


Press the compression sleeve towards the fittings.



Now the assembly is ready, repeat the process for the other pipe end.

10

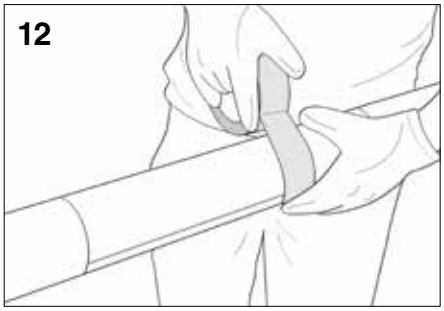


Measure for the PUR insulation shell and cut to the correct length. Make sure there are no gaps between the insulations shell and the insulation of the pipe

11

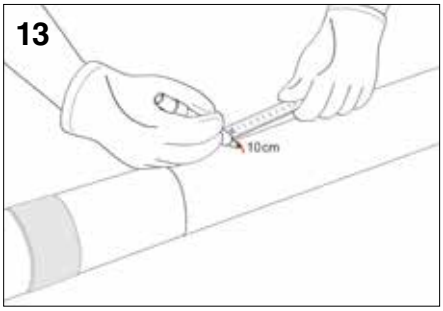
Insert shell in the joint.

12



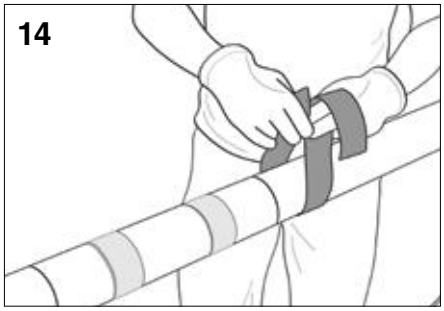
Fasten the PUR insulation shell with duct tape.

13



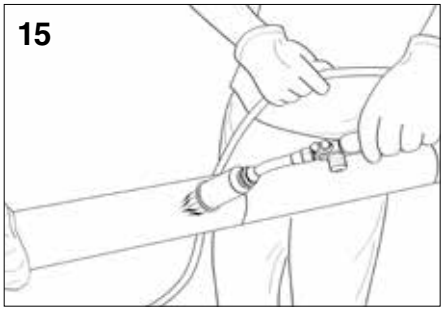
Measure and mark with a marker the position of the PE shrink casing.

14



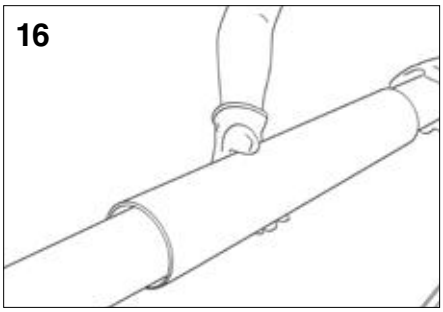
Sand well the surface area sideways on the casing pipe with sand paper in coarseness of 40-60 where the PE shrink casing will be placed.

15



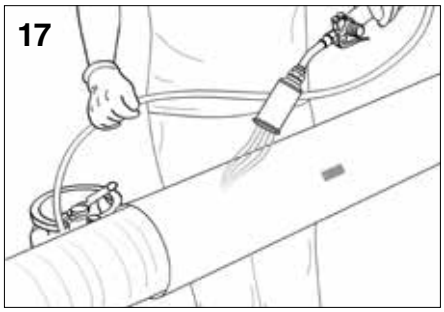
Slowly heat the surface of the casing pipe with a flame of up to 60°C where the PE shrink casing will be situated. Allow time for the surface to slowly heat to 60°C.

16



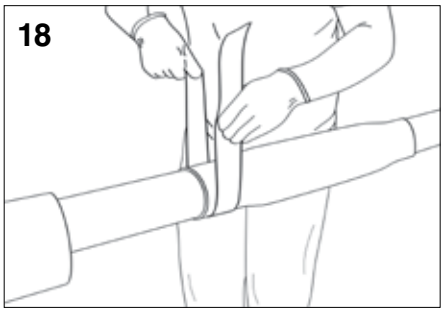
Slide the PE shrink casing over the joint and place it on the markings.

17



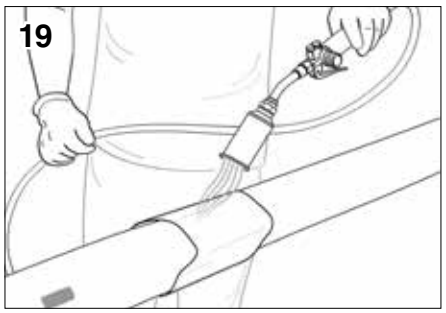
Slowly heat the PE shrink sleeve evenly from the center and all around with a soft flame. Be sure the flame is moving constantly to prevent overheating and therefore damaging the PE shrink casing.

18



Clean the area which the shrink sleeve will be with ethanol and sand with sandpaper in coarseness of 40-60 across the pipeline direction. Remove the white plastic protection from the sleeve. Slowly heat the s face where the sleeve will be situated with a flame of up to 60°C .

19



Slide the PE shrink sleeve over the joint and heat it slowly from the middle all around with a soft flame. While working towards PE shrink sleeve ends tilt the flame 30° so air will not be trapped under the PE shrink sleeve.

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CHAPTER 8.0
DOCUMENTS/TABLES

CHAPTER 8.1
SYMBOL TABLE

TABLE 8.1.1
Symbol table

SYMBOLS	DEFINITION	UNIT
A_i	Cross section for the carrier pipe	mm^2
d_O	Outer diameter of the carrier pipe	mm
d_i	Inner diameter of the carrier pipe	mm
d_a	Outer diameter of flexible carrier pipe	mm
D_O	Outer diameter of the casing pipe	mm
D_i	Inner diameter of the casing pipe	mm
t	Wall thickness	mm
ΔL	Free expansion due to temperature difference	mm
L	Length	m
H	Pipe depth	m
H_{CC}	Distance from the surface to the middle of the pipe plus radius of the outer diameter of the casing	m
H_m	Height difference	m
C	Distance between parallel pipes	m
R_{min}	Minimum bending radius	m
F_a	Free expansion force	N/m
F_g	Pipe weight when filled with water	N/m
F_N	Resistance force of the pipe	kN/m
T	Temperature	°C
T_M	Average temperature	K
T_{VL}	Forward flow media temperature	°C
T_{RL}	Return flow media temperature	°C
ΔT	Temperature difference	K
q	Total heat loss	W/m
U	Heat loss coefficient	W/m·K
R	Thermal resistance	m·K/W
α	Coefficient of thermal conductivity	W/m·K
λ	Expansion coefficient	K^{-1}
E	Modulus of elasticity	N/mm^2
ρ	Density	Kg/m^3
μ	Friction coefficient	-
Δ	Difference (delta)	-
Q	Thermal requirement	W
π	Pi (22/7 = 3,14159...)	-
σP	Pressure	N/m^2
σ_{zul}	Design stress	N/mm^2
σ_y	Yield strength	N/mm^2
$_e$	Specific soil weight	kN/m^2
V	Average water velocity	m/s
$\dot{m}$	Mass flow	m^3/s (l/s)
g	Acceleration due to gravity	m/s^2
c_p	Specific heat	J/kg·K
Δp_{Pipe}	Pressure drop in carrier pipes	Pa/m
k	Resistance Coefficients for carrier pipes	-
ν	Viscosity	m^2/s
Re	Reynolds number	-
f	Friction factor	-
K_0	The quiescent pressure correction factor	-

CHAPTER 8.2
CONVERSIONS TABLES

CONVERSION OF POWER UNITS

TABLE 8.2.1
Conversion of power units

	W [J/s]	kW	kCAL/h	HORSEPOWER (HP)
W [J/s]	1	1×10^{-3}	0,860	$1,36 \times 10^{-3}$
kW	1000	1	860	1,36
kCAL/h	1,16	$1,16 \times 10^{-3}$	1	$1,58 \times 10^{-3}$
HORSEPOWER (HP)	735	0,735	632	1
EXAMPLE: 1 W = 0,860 kcal/h = 1,36 x 10^{-3} hö				

CONVERSION OF ENERGY UNITS

TABLE 8.2.2
Conversion of energy units

	J [W·s]	kW·h	kCAL
J [W·s]	1	278×10^{-6}	239×10^{-6}
kW·h	$3,60 \times 10^{6}$	1	860
kCAL	4187	$1,16 \times 10^{-3}$	1
EXAMPLE: 1 kcal = $3,60 \times 10^{6}$ W·s			

CONVERSION OF PRESSURE UNITS

TABLE 8.2.3
Conversion of pressure units

	Pa [N/m²]	BAR	mmVS	atm [kP/cm²]
Pa [N/m²]	1	10×10^{-6}	0,102	981×10^{-6}
BAR	10×10^{-6}	1	10197	0,981
mmVS	9,81	$98,1 \times 10^{-6}$	1	100×10^{-6}
atm [kP/cm²]	981×10^{3}	0,981	10×10^{3}	1
EXAMPLE: 1 mmVS = 9,81 Pa				

CONVERSION OF LENGTH UNITS

TABLE 8.2.4
Conversion of length units

	1 m	1" (INCH)	1' (FEET)	1 MILE*
1 m	1	39,4	3,28	621×10^{-6}
1" (TOMMA)	$25,4 \times 10^{-3}$	1	$83,3 \times 10^{-3}$	$15,8 \times 10^{-6}$
1' (FET)	0,305	12	1	189×10^{-6}
1 MÍLA*	1609	63360	5280	1
* Imperial mile 1609 m. Nautical mile is 1852.				

CONVERSION OF VOLUME UNITS

TABLE 8.2.5
Conversion of volume units

	1 m³	1 L	1 US GAL.	1 UK GAL.
1 m³	1	1000	264,2	220
1 L	1×10^{-3}	1	0,264	0,220
1 US GAL.	$3,79 \times 10^{-3}$	3,79	1	0,833
1 UK GAL.	$4,55 \times 10^{-3}$	4,55	1,20	1

TABLE 8.2.6

Viscosity and Density of water at 1 atm

T = Temperature

ρ_w = Density

ν = Viscosity

C_p = Specific heat

T [°C]	ρ_w [kg/m^3]	ν [m^2/s]	C_P [J/kg · K]
10	1000	1,307 x 10^{-6}	4192
20	998	1,005 x 10^{-6}	4182
30	996	0,802 x 10^{-6}	4178
40	992	0,662 x 10^{-6}	4179
50	988	0,555 x 10^{-6}	4182
60	983	0,475 x 10^{-6}	4185
70	978	0,414 x 10^{-6}	4191
80	972	0,365 x 10^{-6}	4198
90	965	0,327 x 10^{-6}	4208
100	958	0,295 x 10^{-6}	4219