

THE
POWER
PEOPLE



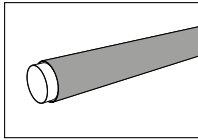
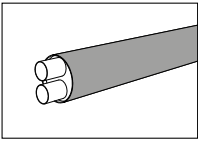
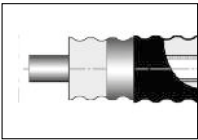
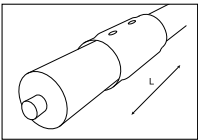
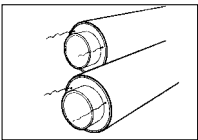
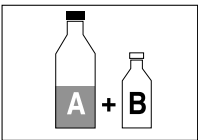
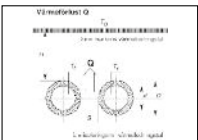
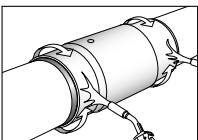



PRODUCT CATALOGUE 2024:2

POWERPIPE

MADE IN SWEDEN

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Introduction

This catalogue provides a description of Powerpipe and the standard products offered by the company. The aim is to provide interested parties with important information about the company and its products, how the products are composed and how they should be managed and installed.

The standards, norms and regulations mentioned in the catalogue have been taken into account in their current version at the time of printing.

Please note

Specifications stated in the catalogue can change without advance notice. Always check the catalogue data available on Powerpipe's website: www.powerpipe.se

Company description

The company has around 70 employees and a turnover of approx. MSEK 300. Every year, we sell around 27,000 pipes, 15,000 pipe fittings and 50,000 sleeves.

A significant share (approx. 30%) of our production is exported, primarily to countries in the Nordic region, France and the UK.

Technical support

With many years in the market, Powerpipe has developed extensive knowledge of pipe products, their production and use. As our customer, should you require it, you have full access to our technical resources, together with our environmental and quality departments. Otherwise, your first technical support contact will normally be our technically experienced sales people and our back office personnel.

Advantages of Powerpipe

Our factory is located in Hisings Kärra, near Gothenburg. Salespeople, technical staff and production planners can also be found here. We are a small company in a big group – an ideal combination that means we're flexible and can offer rapid service and support, but that we're also strong enough to handle major projects. Powerpipe's number 1 goal is always to "Deliver what we Promise".

We offer customised solutions to fulfil our customers' needs for their specific application.

We also strive to operate combined transports and provide notifications by telephone.

We want to be the friendly company where our priorities are extremely high delivery reliability and short delivery times.

Above all for our standard range.

Products in district heating systems

Our products are designed as a sandwich construction with service pipes in steel and polyurethane foam and casing in polyethylene which together create a fixed unit without any relative movement between the service and casings. Pipes and pipe fittings are delivered as standard with two copper alarm wires for connection to an electronic moisture surveillance system. (We offer the electronic surveillance system as supplementary product.) Powerpipe's pipe fittings have been developed to cover a wide range of applications for the customer in terms of deflection, valves, branching, draining, venting etc. All components fulfil the technical functional requirements in the standards below, and we have more than 30 years' experience of manufacturing robust constructions.

Powerpipe's technical philosophy is also to invest in:

- effective insulation
- flexible and reinforced double pipe systems

For example, we can offer extra thick insulation for single pipes as standard in all dimensions (Series 4). You can extend our double pipe systems in stages, ending with a choice of pipe fitting, as these systems are designed from the outset to deal with expansion forces. Nor do straight branches for any double pipes ever need expansion bends, as the T-pieces are designed with built-in reinforcement.

Powerpipe can also offer super insulated pipes. These are available as single pipes but are also particularly appropriate as double pipes. In this case, the supply pipe is equipped with a high insulated vacuum panel. This reduces heat losses from the supply pipe by 40-50% while losses from the entire construction are reduced by 30% despite the external diameter of the pipe package being maintained. *See also chapters 9 and 10.*

Norms and standards

Powerpipe's business is based on the European standards for prefabricated pipes and pipe fittings regarding:

District heating pipe systems – Factory made buried pipes consisting of a service pipe in steel, PUR foam thermal insulation and an outer casing of polyethylene, with a solid bond between the thermal insulation, the service pipe and the casing respectively for direct distribution of hot water.

EN 253:2019	Single pipe systems
EN 448:2019	Single pipe systems
EN 488:2019	Valve assembly
EN 489-1:2019	Joint casing assemblies
EN 13941-1:2019	Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks. Part 1: Design
EN 13941-2:2019	Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks. Part 1: Installation
EN 14419:2019	Surveillance system
EN 15698-1:2019	Twin pipe systems, Part 1: Factory made fittings
EN 15698-2:2019	Twin pipe systems, Part 2: Factory made fittings and valve assembly

In addition, there are national standards and norms that set requirements for our activities and our products.

Specifications

Steel service pipes

Unless otherwise stated in the order, inquiry or tender, the following steel pipe qualities are delivered as standard. As standard, the products are designed for 16 bar, but many are approved for use up to 25 bar. The pressure class not taking into account corrosion is stated at the top left of each product page.

Straight pipes Longitudinally or spirally welded pipe

Material:	P235GH according to EN10217-2 or EN10217-5
Certification:	According to EN 10204/3 3.1. Can be attached to each delivery provided the customer requests this in advance.
Joint preparation:	EN ISO 9692-1
Standard:	EN 253

Seamless steel pipes (can be delivered by specific request)

Material:	Normally P235GH according to EN 10216-2.
Certification:	According to EN 10204/3.1. Can be attached to each delivery provided the customer requests this in advance.
Standard:	EN 253

Insulation (PUR)

Powerpipe's insulation consists of hard polyurethane foam insulation with excellent thermal insulating ability, good mechanical properties and good resistance to ageing.

Material:	Polyurethane made from polyol and isocyanate. C-pentane is used as propellant. Production is a modern high pressure process.
Standard:	EN 253

	Approximate type values	Requirements according to EN 253
Cell size, mm	0.24	< 0.5
Closed cell content, %	90.6	≥ 88
Core density, kg/m ³	61	≥ 55
Compression strength, MPa	0.36	≥ 0.30
Water absorption, %	3.50	≤ 10
Axial shear strength, MPa		
+23°C, new	0.35	≥ 0.12
+23°C, aged	0.14	≥ 0.12
+140°C, new	0.20	≥ 0.08
+140°C, aged	0.14	≥ 0.08
Thermal conductivity, W/mK	0.026	≤ 0.029
Thermal conductivity after ageing	0.028	
Maximum continuous working temperature °C	*)	120
Free steel ends	220±10 mm	min. 150, max. 250, tolerance ±10

*) The lifetime is at least 30 years at 120 °C in accordance with EN253.

Specifications

Casing

Products are delivered with polyethylene casings (bimodal PE80 or PE100) and comply with all requirements set in EN 253.

Manufacturing takes place according to Standard 5100 issued by the Swedish Plastic Pipe Manufacturer's Association. All casings are corona treated during the extrusion process.

The material fulfils the technical functional requirements set in EN 253 and is stabilised for thermal, chemical, oxidative and other degradation, has a high impact strength and abrasion resistance even at low temperatures, and has excellent welding characteristics and high resistance to stress corrosion.

Pipes with a casing diameter of ≥ 560 mm should be handled with particular care at temperatures between 0 and -20°C . Below -20°C , pipes should not be handled without consulting Powerpipe for advice.

Material: High density polyethylene (PEHD)

Density: ≥ 944 kg/m³

Standard: EN 253

Pipe wall thickness according to EN 253

Sleeves

Powerpipe provides joints of different types to suit all installation conditions and customer requirements.

The joints fulfil the technical functional requirements set in EN 489.

- Welding sleeve
- Double expanded shrinkable sleeve PEHD
- Shrinkable sleeve PEX
- Double sealing shrinkable sleeve (PEHD) with tightening tube

The sleeves are manufactured in high density polyethylene (PEHD). The tightening tube is made of cross-linked material. The majority of joint types are installed using a gas torch, while the weld joints are installed with electrical welding equipment.

Pipe fittings

All pipe fittings fulfil the technical functional requirements set in EN 448 and are designed to cope with the loads that normally occur in a district heating system. Depending on the design of the system, a number of different loads will affect the pipe fittings during operation, which in turn governs their dimensions and design. Some components therefore have reinforced service pipes to increase flexibility during system design.

Steel bends are delivered cold or hot formed according to EN 448.

As standard, Powerpipe's T-pieces are designed to fulfil nominal requirements in EN 13941 with an internal overpressure of 16 or 25 bar respectively and in accordance with the instructions in Värmeforskrifter nos. 170 and 258. The corrosion allowance is set to 0 mm as no corrosion is expected from outside or inside.

Valves in Powerpipe's product programme are normally supplied as yield stress valves. This means that they should tolerate a normal force in connecting service pipes corresponding to an axial stress of 300 MPa without jeopardising valve function. Heights for valves in this catalogue refer to reduced version.

In summary, Powerpipe's products fulfil appropriate sections of all relevant standards, and in addition to this the company has more than 30 years' practical experience of robust constructions.

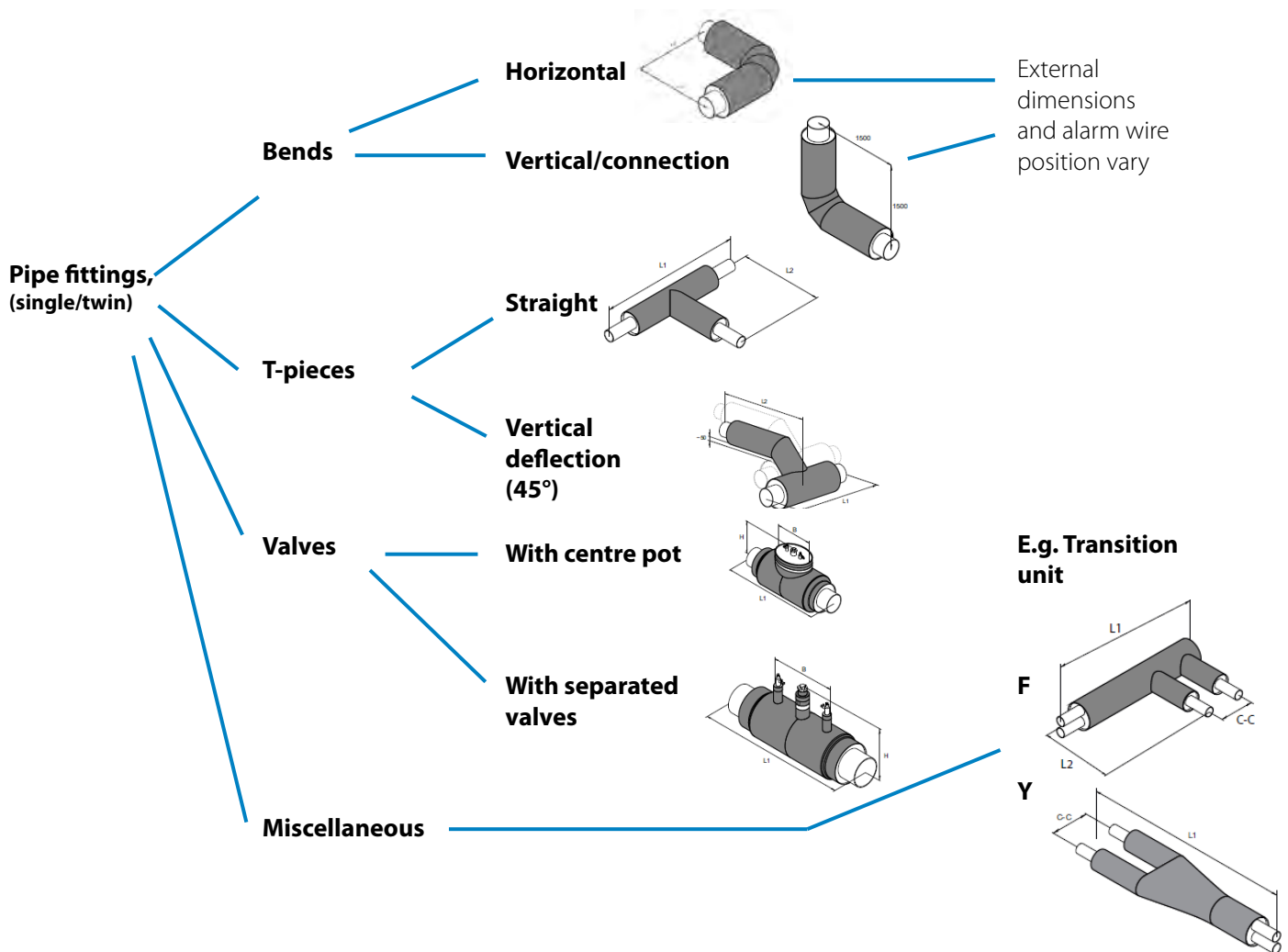
If PN25 is required, it must be stated here: single T-pieces, valve products and reductions

Powerpipe's double pipe systems are designed to be flexible and strong.

This means that:

- All twin pipes have built-in fixing plates to withstand the full shear force between the supply and return line, which means that pipelines can permanently or temporarily end in any twin pipe section without extra reinforcement.
- The straight twin-T is designed so that the branch need not have any bend after a certain length, as a result of forces on the main pipe. This means you can build a practical solution without extra expansion bends.

Pipe fittings overview



Quality – Certified according to ISO 9001:2015

Powerpipe has been certified according to ISO 9001 since 1997. The quality system helps us ensure that customer requirements, standards and regulatory requirements are fulfilled. The quality management system governs how we work with external requirements, organisational structure, division of responsibility, work processes, procedures and resources – everything to ensure that products we supply of the right quality, in accordance with our quality policy and the customer's wishes.

Quality policy

Powerpipe Systems AB develops, produces and delivers environmentally friendly products for district heating, district cooling and industrial applications. By providing society with premium insulated products that provide good energy management, we contribute to long-term sustainable development. We are convinced that an active and thoughtful quality process creates long-term competitiveness and reinforces our image, both internally, for our customers and in our operating context as a whole.

We work as follows:

- We will manufacture products that comply with the customer's wishes and requirements, and with current EN standards
- We will deliver the right products and services, at the right time and to the right place, with the expected quality
- We will comply with legislation and other regulations
- We will continuously strive to improve our processes, with a view to improving the quality of both the products and our work

Testing

Testing of products and equipment takes place continuously to fulfil customer and regulatory requirements etc. As part of our quality process, we carry out continuous visual inspection and testing of alarms on 100% of products. We also carry out ongoing testing of foam density on straight pipes and pipe fittings. All tests are documented and followed up. All manufactured products are labelled according to current standards.

RISE (formerly SP) tests our products once per year on the basis of the functional requirements in EN 253 and the Euroheat & Power certification guidelines. The tests are carried out in the following areas:

- Adhesion
- Tensile test
- Compressive strength
- Voids and bubbles
- Thermal conductivity
- Resistance to stress cracking
- Thermal stability
- Axial shear strength at 23°C and 140°C
- Density
- Centreline deviation

The results are documented in official reports.

Welded joints in steel pipe fittings are X-ray inspected according to the requirements in EN 448 or according to customer requirements in addition to the standard.

Environment – Certified according to ISO 14001:2015.

Powerpipe's organisation has always been characterised by an environmental focus. We have been certified since the outset in 2005. This ensures that we continuously work on improvements to reduce the environmental impact of our activities and products.

The system includes an inspection programme for the external environment. It describes the organisation, emissions and authorisations for emissions, inspections, waste management including recycling, and reporting both internally and to regulatory authorities. Once a year the Environment Department carries out an inspection of the organisation. Every three years a third party inspection is carried out by an independent consultancy agency.

Environmental policy

Powerpipe Systems AB develops, produces and sells low environmental impact products for district heating, district cooling and industrial applications. By providing society with premium insulated products that provide good energy management, we contribute to long-term sustainable development. We are convinced that an active and thoughtful environmental process creates long-term competitiveness and reinforces our image for customers and in our operating context.

We will make continuous improvements in our environmental performance.

We do this by:

- *Preventing pollution of the air, soil and water*
- *Striving to achieve a reduced environmental impact during transport both internally and externally*
- *Implementing continuous improvements in our production facilities that lead to efficiency gains in the form of reduced consumption of energy and materials*
- *Complying with legislation and other requirements*

Recycling

Some waste is generated during the production of district heating pipes, for example during the start and end phases of processes. We have therefore established procedures for how to manage this waste.

- PEHD material is ground down and reused.
- Steel pipes are reused for new straight pipes/pipe fittings as far as possible.
- Excess PUR foam is sent for incineration, generating district heating.
- Waste from alarm wires is resold.

We collect hazardous waste, such as incandescent light bulbs, lubricants and chemical residues in our environmental station for separate collection where necessary.

We offer collection of customer waste, for example from residues of surplus material, for a fee.

Energy – Certified according to ISO 50001:2018

Our products enable good energy management and in use contribute to long-term sustainable development, but the energy used by our activities and production also affects the world around us. Energy consumption affects both the environment and competitiveness.

Powerpipe has embarked upon a systematic energy saving process. As part of this process, we have carried out an energy inventory of our entire organisation to review the most important systems that consume the most energy. We have drawn up action plans in the form of operating procedures and inventory and review of our machinery.

Powerpipe is certified according to environmental management standard ISO 50001:2018.

Energy policy

Powerpipe Systems AB develops, produces and sells products for district heating, district cooling and industrial applications. By providing society with premium insulated products that provide good energy management, we contribute to long-term sustainable development. We are convinced that an active and thoughtful energy saving process creates long-term competitiveness and reinforces our image for customers and in our operating context.

We will make continuous improvements in our energy performance.

We do this by:

- *Planning our activities including purchasing for the greatest possible energy efficiency.*
- *Coordinating maintenance measures with measures to achieve energy efficiency.*
- *Maintaining a good dialogue with our property owners.*
- *Striving to achieve reduced energy use during transport both internally and externally.*
- *Implementing continuous improvements in our production facilities that lead to more efficient use of energy and materials.*
- *Complying with legislation and other requirements.*

Work environment – Certified according to ISO 45001:2018

Powerpipe's operations include handling of large and heavy products and a safe working environment is thus a natural and necessary part of the business. The management system places demands on continuous improvements. We have been certified according to ISO 45001: 2018 since 2021.

Work environment policy

A good, safe working environment is an important strategic issue for Powerpipe. The aim of our work environment management is to create a developing workplace where a physical, psychological, socially sound environment is ensured for all employees and where risks of work-related injuries and work-related ill health are prevented.

We also work to achieve a long-term efficient operation that at the same time provides conditions for good physical and mental health, well-being and job satisfaction for all employees and that prevents accidents from occurring.

We achieve this as follows:

- *In collaboration with the employees, continuously evaluate the company's efforts within the work environment area in order to be able to make continuous improvements in the daily work regarding the work environment.*
- *As far as possible, adapt the demands of the work to human conditions in physical, mental and social terms.*
- *Ensure that measures to improve the work environment also have positive effects both for the company and for the individual.*
- *Ensure that efficiencies and changes in operations never involve ignoring the work environment.*

Certification

EUROHEAT & POWER

CERTIFICATE NUMBER 01/12

PRODUCT "Powerpipe" preinsulated district heating pipes and fittings, single and twin pipe system, with service pipes DN 20 - 1000 mm and casing pipes 75 - 1200 mm

LICENSEE Powerpipe Systems AB
Box 44,
SE-425 05 Hisings-Kärra, Sweden
www.powerpipe.se

PRODUCTION PLANT Powerpipe Systems AB
Box 44
SE-425 05 Hisings-Kärra
Sweden

EUROHEAT & POWER
GUIDELINES: EHP/001
CERTIFICATE: 01/12

VALID UNTIL 30.12.2028

This certificate is granted in accordance with the Euroheat & Power Certification Guidelines for Quality Assessment of District Heating Pipes [001]

Name, Signature	Date, Place
Tomas Holm	01.01.2023, Borås

RISE Research Institutes of Sweden
PO Box 857
SE-401 15 Borås
Sweden
www.rise.se

The production complies with EN 253, EN 448 and EHP Certification Guidelines [001]. The licensee may use the Euroheat & Power Certification Board quality mark. The certificate is valid only for the production plant mentioned in the certificate. The materials used are contained in the confidential Annex to this certificate. The certificate is valid for 6 years subject to periodic surveillance.

Refer to the Euroheat & Power Certification Guidelines [001] for full requirements and conditions.

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Bureau Veritas Certification

Certificate
Awarded to
Powerpipe Systems AB
Ellesbovägen 101, 452 02, Hisings Kärra, Sweden

Bureau Veritas Certification certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standard detailed below

Standard

ISO 9001:2015

Scope of supply

Development and manufacturing of preinsulated tubing systems.

Original Approval Date:

07-04-1997

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until:

23-02-2027

Herman Fahström Technical Manager, Bureau Veritas Certification Sverige AB

Åskred. nr. 1236
Certifiering av ledningssystem
ISO/IEC 17021-1

Date: 05-03-2024

Certificate Number: SE009633 Version: 1

To check this certificate validity please call +46 31 60 65 00
Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.

1/1

Bureau Veritas Certification

Certificate
Awarded to
Powerpipe Systems AB
Ellesbovägen 101, 452 02, Hisings Kärra, Sweden

Bureau Veritas Certification certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standard detailed below

Standard

ISO 14001:2015

Scope of supply

Development and manufacturing of preinsulated tubing systems.

Original Approval Date:

14-03-2005

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until:

23-02-2027

Herman Fahström Technical Manager, Bureau Veritas Certification Sverige AB

Åskred. nr. 1236
Certifiering av ledningssystem
ISO/IEC 17021-1

Date: 05-03-2024

Certificate Number: SE009634 Version: 1

To check this certificate validity please call +46 31 60 65 00
Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.

1/1

Bureau Veritas Certification

Certificate
Awarded to
Powerpipe Systems AB
Ellesbovägen 101, 452 02, Hisings Kärra, Sweden

Bureau Veritas Certification certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standard detailed below

Standard

ISO 50001:2018

Scope of supply

Development and production of pre-insulated pipe systems.

Original Approval Date:

08-03-2018

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until:

07-03-2027

Herman Fahström Technical Manager, Bureau Veritas Certification Sverige AB

Åskred. nr. 1236
Certifiering av ledningssystem
ISO/IEC 17021-1

Date: 29-01-2024

Certificate Number: SE009627 Version: 1

To check this certificate validity please call +46 31 60 65 00
Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.

1/1

Technology, quality, environment and energy 2:110

Bureau Veritas Certification



Certificate
Awarded to
Powerpipe Systems AB
Ellesbovägen 101, 452 02, Hisings Kärra, Sweden

Bureau Veritas Certification certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standard detailed below

Standard

ISO 45001:2018

Scope of supply

Development and manufacturing of preinsulated tubing systems.

Original Approval Date: 24-02-2021
Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until: 23-02-2027



Herman Fahlström Technical Manager, Bureau Veritas Certification Sverige AB

Date: 05-03-2024
Certificate Number: SE009632 Version: 1

To check this certificate validity please call +46 31 40 45 00
Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.



SWEDAC
KREDIT
MINSK



Organisme certificateur
Certification body



Certificat

Systèmes préisolés
Systèmes de canalisations préisolées
Powerpipe

Le CSTB atteste que le produit ci-dessus est conforme à des caractéristiques décrites dans le référentiel de certification QB 19 Systèmes préisolés en vigueur après évaluation selon les modalités de contrôle définies dans ce référentiel.

En vertu de la présente décision, le CSTB accorde à :

La société **POWERPIPE SYSTEMS AB**
Box 40 - Ellesbovägen 101 - SE - 425 02 HISINGS KÄRRA
Usine **SE - 425 02 HISINGS KÄRRA**

le droit d'usage de la marque QB 19 Systèmes préisolés pour le produit objet de cette décision, pour toute sa durée de validité et dans les conditions prévues par les exigences générales de la marque QB et le référentiel mentionné ci-dessus.



06-2244_V1

Décision de reconduction n° 84-06-2244_V1 du 17 janvier 2024. Cette décision se substitue à la décision de reconduction n° 84-06-2244 du 30 mars 2022

Sauf retrait, suspension, ou modification, ce certificat est valable jusqu'au 31/12/2030. Le certificat en vigueur peut être consulté sur le site Internet <http://evaluation.cstb.fr> pour en vérifier sa validité.

CARACTÉRISTIQUES CERTIFIÉES

Conformité à l'avis Technique n°141/16-2244_V1

- Selon les normes NF EN 12516/2019, NF EN 488-2019 et NF EN 488-2012 (1)
 - Spécifications du tube de service, du raccord et du robinet
 - Spécifications de la gaine de protection
 - Spécifications de l'isolant
 - Spécifications du tuyau, raccord et robinet préisolés
- Selon les normes EN 489-2022 (1)
 - Spécifications du système d'assemblage
- Autres caractéristiques :
 - Formation du personnel de pose (soudeur PE et assembléur)
 - Assistance technique

(1) Voir détail page suivante

Oe certificat comporte 2 pages.
Correspondant :
Silia BRAHIMI
Courriel : silia.brahimi@cstb.fr
TEL : 01 64 68 84 52

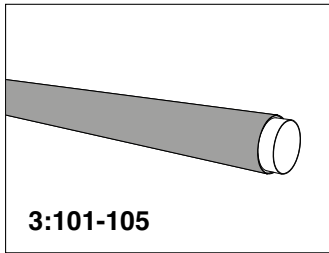
Par délégation
du Président



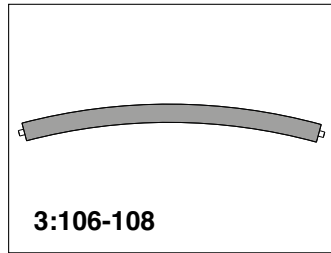
Florian RASSE



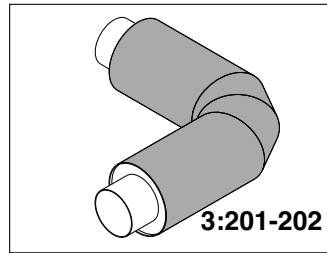
cofrac
CENTRE SCIENTIFIQUE ET TECHNIQUE DU BÂTIMENT
14 avenue Jean Jaurès - Champ-sur-Marne - 77447 Marne-la-Vallée cedex 2
Tel. : +33 (0)1 64 68 82 82 - Fax : +33 (0)1 64 68 89 94 - www.cstb.fr
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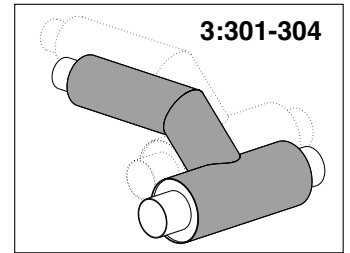
Straight pipes



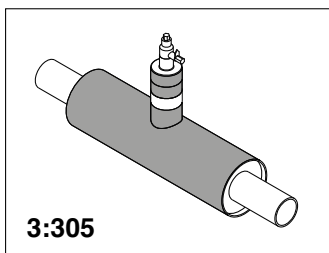
Curved pipes



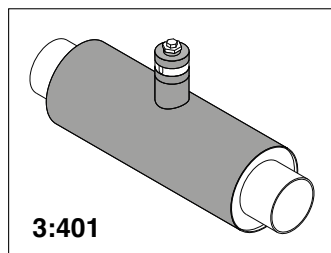
Bends



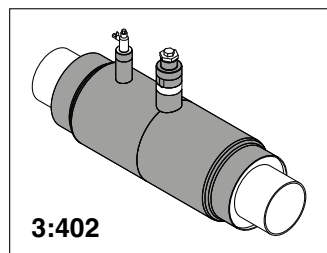
T-pieces



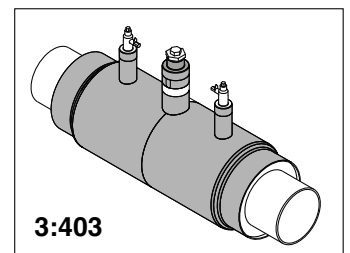
Vent/drain



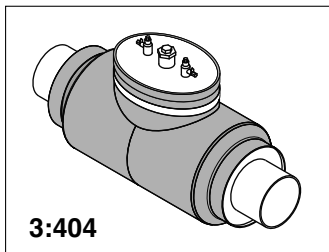
Preinsulated valves



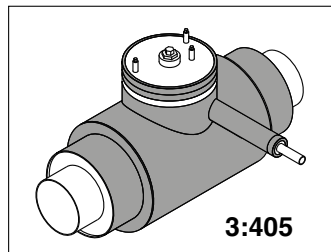
**Preinsulated valves
with 1 vent/drain unit**



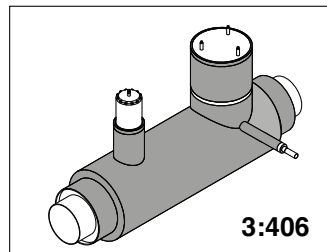
**Preinsulated valves
with 2 vent/drain units
(standard)**



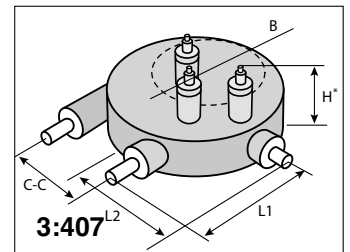
**Preinsulated valves
with 2 vent/drain units
(variants A and B)**



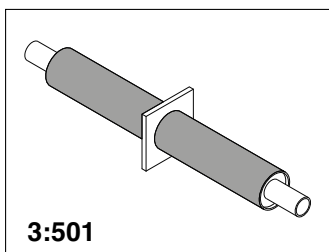
Combination valves



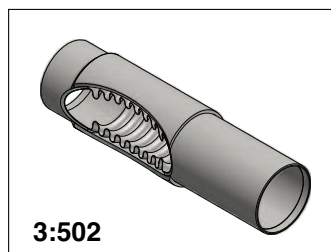
**Combination valves
with gear**



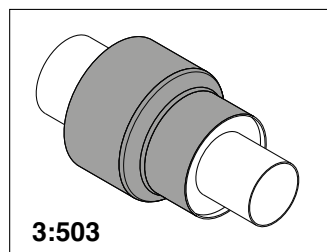
**Valve assembly,
compact**



Anchor units



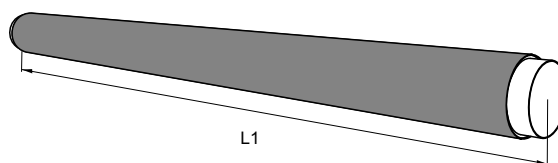
**Single-use
compensator**



Reduction pipes

Straight pipe Series 1

PN25



PART NO. 1102, 1103, 1104, 1105

KMAT 2000PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]
20	26.9 x 2.6	90 x 3.0	2.4	0.4
25	33.7 x 2.6	90 x 3.0	3.1	0.6
32	42.4 x 2.6	110 x 3.0	4.3	1.1
40	48.3 x 2.6	110 x 3.0	4.6	1.5
50	60.3 x 2.9	125 x 3.0	6.1	2.3
65	76.1 x 2.9	140 x 3.0	7.4	3.5
80	88.9 x 3.2	160 x 3.0	9.4	5.3
100	114.3 x 3.6	200 x 3.2	13.6	9.0
125	139.7 x 3.6	225 x 3.4	16.6	13.8
150	168.3 x 4.0	250 x 3.6	21.5	20.2
200	219.1 x 4.5	315 x 4.1	31.9	34.7
250	273.0 x 5.0	400 x 4.8	43.9	54.3
300	323.9 x 5.6	450 x 5.2	60.0	76.8
350	355.6 x 5.6	500 x 5.6	68.3	93.1
400	406.4 x 6.3	560 x 6.0	86.9	121.7
450	457.0 x 6.3	630 x 6.6	101.0	155.0
500	508.0 x 6.3	710 x 7.2	118.0	193.0
600	610.0 x 7.1	800 x 7.9	153.6	277.0
700	711.0 x 8.0	900 x 8.4	210.0	378.0
800	813.0 x 8.8	1 000 x 9.4	246.0	497.0

**For heat losses and
transmission capacity see
p. 9:301-**

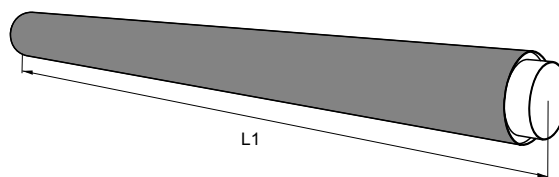
12 m Series 1, 1103 - DN - 000-000 can be ordered from dim DN 20 - DN800
 16 m Series 1, 1104 - DN - 000-000 can be ordered from dim DN100 - DN800
 18 m Series 1, 1105 - DN - 000-000 can be ordered from dim DN150 - DN800
 Can also be ordered in 6 m lengths: 1102-DN-000-000.

Order example

Straight pipe series 1, L1 = 12 m with dim DN200, part number 1103-200-000-000.

Straight pipe Series 2

PN25



PART NO. 1202, 1203, 1204, 1205

KMAT 2000PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]
20	26.9 x 2.6	110 x 3.0	3.3	0.4
25	33.7 x 2.6	110 x 3.0	3.5	0.6
32	42.4 x 2.6	125 x 3.0	4.6	1.1
40	48.3 x 2.6	125 x 3.0	5.0	1.5
50	60.3 x 2.9	140 x 3.0	6.5	2.3
65	76.1 x 2.9	160 x 3.0	8.0	3.5
80	88.9 x 3.2	180 x 3.0	10.1	5.3
100	114.3 x 3.6	225 x 3.4	14.8	9.0
125	139.7 x 3.6	250 x 3.6	17.7	13.8
150	168.3 x 4.0	280 x 3.9	23.6	20.2
200	219.1 x 4.5	355 x 4.5	35.1	34.7
250	273.0 x 5.0	450 x 5.2	47.0	54.3
300	323.9 x 5.6	500 x 5.6	65.5	76.8
350	355.6 x 5.6	560 x 6.0	75.7	93.1
400	406.4 x 6.3	630 x 6.6	96.3	121.7
450	457.0 x 6.3	710 x 7.2	113.5	155.0
500	508.0 x 6.3	800 x 7.9	133.6	193.0
600	610.0 x 7.1	900 x 8.7	173.0	277.0
700	711.0 x 8.0	1 000 x 9.4	231.8	378.0

For heat losses and transmission capacity see p. 9:301-

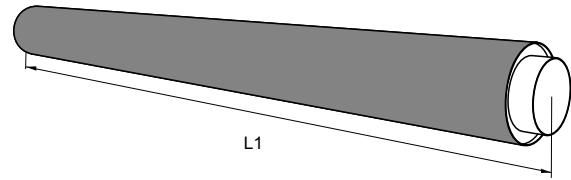
12 m Series 2 1203 - DN - 000-000 can be ordered from dim DN 20 - DN700
 16 m Series 2 1204 - DN - 000-000 can be ordered from dim DN100 - DN700
 18 m Series 2 1205 - DN - 000-000 can be ordered from dim DN150 - DN700
 Can also be ordered in 6 m lengths: 1202-DN-000-000.

Order example

Straight pipe series 2, L1 = 16 m with dim DN200, part number 1204-200-000-000.

Straight pipe Series 3

PN25



PART NO. 1302, 1303, 1304, 1305

KMAT 2000PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]
20	26.9 x 2.6	125 x 3.0	3.7	0.4
25	33.7 x 2.6	125 x 3.0	3.9	0.6
32	42.4 x 2.6	140 x 3.0	5.0	1.1
40	48.3 x 2.6	140 x 3.0	5.4	1.5
50	60.3 x 2.9	160 x 3.0	7.1	2.3
65	76.1 x 2.9	180 x 3.0	8.7	3.5
80	88.9 x 3.2	200 x 3.2	10.9	5.3
100	114.3 x 3.6	250 x 3.6	16.2	9.0
125	139.7 x 3.6	280 x 3.9	19.9	13.8
150	168.3 x 4.0	315 x 4.1	25.7	20.2
200	219.1 x 4.5	400 x 4.8	39.0	34.7
250	273.0 x 5.0	500 x 5.6	51.4	54.3
300	323.9 x 5.6	560 x 6.0	76.9	76.8
350	355.6 x 5.6	630 x 6.6	85.1	93.1
400	406.4 x 6.3	710 x 7.2	108.8	121.7
450	457.0 x 6.3	800 x 7.9	124.0	155.0
500	508.0 x 6.3	900 x 8.7	147.0	193.0
600	610.0 x 7.1	1 000 x 9.4	189.0	277.0

For heat losses and transmission capacity see p. 9:301-

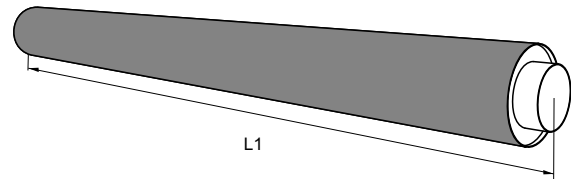
12 m Series 3 1303 - DN - 000-000 can be ordered from dim DN 20 - DN600
 16 m Series 3 1304 - DN - 000-000 can be ordered from dim DN100 - DN600
 18 m Series 3 1305 - DN - 000-000 can be ordered from dim DN150 - DN600
 Can also be ordered in 6 m lengths: 1302-DN-000-000

Order example

Straight pipe series 3, L1 = 18 m with dim DN200, part number 1305-200-000-000.

Straight pipe Series 4

PN25



PART NO. 1402, 1403, 1404, 1405

KMAT 2000PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]
20	26.9 x 2.6	140 x 3.0	4.1	0.4
25	33.7 x 2.6	140 x 3.0	4.4	0.6
32	42.4 x 2.6	160 x 3.0	5.5	1.1
40	48.3 x 2.6	160 x 3.0	6.0	1.5
50	60.3 x 2.9	180 x 3.0	7.8	2.3
65	76.1 x 2.9	200 x 3.2	9.6	3.5
80	88.9 x 3.2	225 x 3.4	11.9	5.3
100	114.3 x 3.6	280 x 3.9	17.4	9.0
125	139.7 x 3.6	315 x 4.1	22.5	13.8
150	168.3 x 4.0	355 x 4.5	28.0	20.2
200	219.1 x 4.5	450 x 5.2	42.0	34.7
250	273.0 x 5.0	560 x 6.0	56.6	54.3
300	323.9 x 5.6	630 x 6.6	82.5	76.8
350	355.6 x 5.6	710 x 7.2	93.5	93.1
400	406.4 x 6.3	800 x 7.9	119.0	121.7
450	457.0 x 6.3	900 x 8.7	140.0	155.0
500	508.0 x 6.3	1 000 x 9.4	167.0	193.0

For heat losses and transmission capacity see p. 9:301-

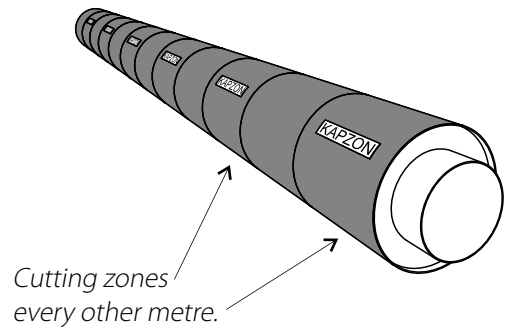
12 m Series 4 1403 - DN - 000-000 can be ordered from dim DN 20 - DN500
 16 m Series 4 1404 - DN - 000-000 can be ordered from dim DN100 - DN500
 18 m Series 4 1405 - DN - 000-000 can be ordered from dim DN150 - DN500
 Can also be ordered in 6 m lengths: 1402-DN-000-000

Order example

Straight pipe series 4, L1 = 12 m with dim DN200, part number 1403-200-000-000.

Cut-to-length pipes Series 1, 2, 3 and 4

PN25



Cut-to-length pipes 1113, 1213, 1313, 1413 and 1114, 1214, 1314, 1414

KMAT 2490PP

General

Cut-to-length pipes are manufactured for all dimensions. In these pipes, the steel pipe is clad with foil every other metre, allowing the insulation material to be removed easily.

The parts covered with foil are clearly marked on the outside of the casing.

The entire cut-to-length pipe or parts of it can be installed at any point in the system

CUT-TO-LENGTH PIPES	Series 1	Series 2	Series 3	Series 4
L = 12m	1113-DN	1213-DN	1313-DN	1413-DN
L = 16m	1114-DN	1214-DN	1314-DN	1414-DN

For dimension information, see details for the relevant straight pipe and series.

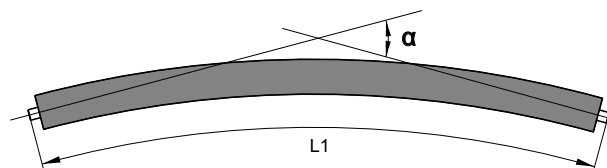
Order example, cut-to-length pipes

DN 200 in Series 2 and 12 m, part number 1213-200-000-000

DN 250 in Series 3 and 16 m, part number 1314-250-000-000

Curved pipes Series 1, 2, 3 and 4

PN25



CURVED PIPES 1123, 1124, 1223, 1224, 1323, 1324, 1423, 1424

KMAT 2005PP

Single pipes DN	Maximum deflection [°]		Note
	L1 = 12 m	L1 = 16 m	
25 - 65	35		Can be bent along the entire length.
80	30		Bent in the factory
100	30	18	Bent in the factory
125	32	21	Bent in the factory
150	32	24	Bent in the factory
200-250	27	30	Bent in the factory
300	22	25	Bent in the factory
350	14	23	Bent in the factory
400	11 - (14 *) - (18 **)	16 - (20 *) - (23 **)	Bent in the factory
450	7 - (8 *) - (10 **) - (11 ***)	11 - (13.5 *) - (16 **) - (18 ***)	Bent in the factory
500	5 - (6 *) - (7 **) - (9 ***)	9 - (10 *) - (12 **)	Bent in the factory
600	-	5 - (8 *) - (9 **)	Bent in the factory
700	-	3 - (4 **)	Bent in the factory

Dimensions without brackets are with standard material thickness
 *) Max angle with one step increased material thickness
 **) Max angle with two steps increased material thickness
 ***) Max angle with three steps increased material thickness

Manufacturing tolerance	DN 100 - 200 DN 250 - 600	+/- 2 +/- 1
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DN	Wall thickness [mm]			
	Std	+ 1step	+ 2step	+ 3step
400	6.3	7.1	8	-
450	6.3	7.1	8	8.8
500	6.3	7.1	8	8.8
600	7.1	8	8.8	-
700	8	-	10	-

The above named maximum deflection can often be increased by increasing the wall thickness of the steel pipe. However, this means a higher price and longer delivery time.
 For larger dimensions (DN800-900), segment-welded curved pipes are available.
 For technical reasons, the alarm wires are evenly distributed on the inside of the bend.

Part no. series 1

1123-DN-xxx-000 for 12 m pipe length
 1124-DN-xxx-000 for 16 m pipe length

Part no. series 2

1223-DN-xxx-000 for 12 m pipe length
 1224-DN-xxx-000 for 16 m pipe length

xxx = Degrees

Part no. series 3

1323-DN-xxx-000 for 12 m pipe length
 1324-DN-xxx-000 for 16 m pipe length

Part no. series 4

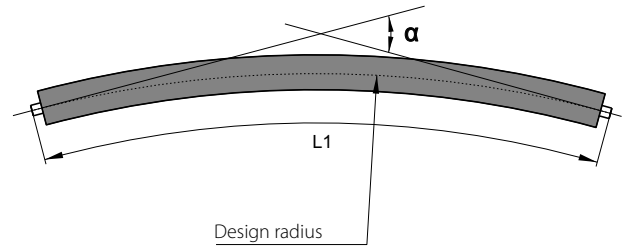
1423-DN-xxx-000 for 12 m pipe length
 1424-DN-xxx-000 for 16 m pipe length

Order example

Curved pipe series 1, L1 = 12 m with dim DN 200, 15° bend,
 part number 1123-200-015-000.

Curved pipe Deflection, design radius Series 1, 2, 3 and 4

PN25



RELATIONSHIP BETWEEN DEFLECTION AND DESIGN RADIUS

Deflection	Design radius		Deflection	Design radius	
	L1 = 12 m	L1 = 16 m		L1 = 12 m	L1 = 16 m
1°	690	910	21°	33.0	44.0
2°	345	460	22°	31.0	42.0
3°	230	305	23°	30.0	40.0
4°	170	230	24°	29.0	38.0
5°	140	185	25°	28.0	37.0
6°	115	155	26°	27.0	36.0
7°	98	130	27°	26.0	34.0
8°	86	115	28°	25.0	33.0
9°	76	100	29°	24.0	32.0
10°	69	92	30°	23.2	30.9
11°	62	83	31°	22.5	30.0
12°	57	76	32°	21.8	29.1
13°	53	71	33°	21.1	28.1
14°	49	65	34°	20.5	27.3
15°	46	61	35°	20.0	26.7
16°	43	57	36°	19.4	25.8
17°	40	54	37°	18.9	25.2
18°	38	51	38°	18.4	24.6
19°	36	48	39°	18.0	23.9
20°	34	46	40°	17.5	23.4

Pipe trench: **For technical reasons, pipes cannot be bent along their entire length. Some straight pipe at each end must be accepted.***

This deviation from the ideal radius can be compensated for by making the pipe trench wider at the centre of the pipe.

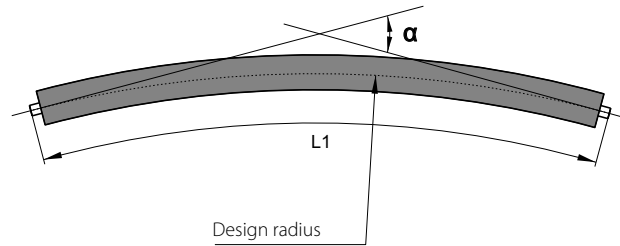
The extra width should be ≈ 200 mm for a deflection of $< 10^\circ$

The extra width should be ≈ 500 mm for a deflection of $> 10^\circ$

* For $DN < 250$ 1-1.5 m and $DN \geq 250$ 2 m or slightly more in each pipe end.

Curved pipes Elastic radius Series 1, 2, 3 and 4

PN25



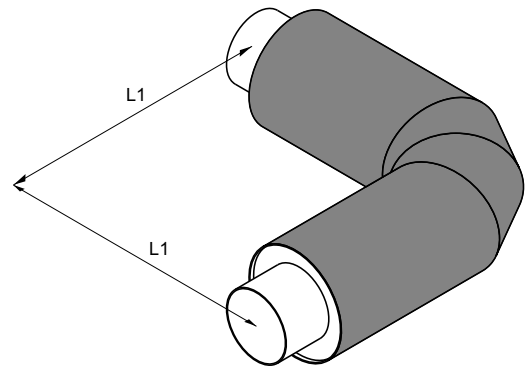
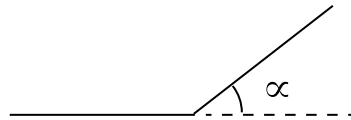
ELASTIC RADIUS

Dim DN	Elastic radius [m]	Deflection/ 12 m
25	15	45.0°
32	19	35.0°
40	22	31.0°
50	27	25.0°
65	34	20.0°
80	40	17.0°
100	52	13.0°
125	63	11.0°
150	76	9.0°
200	99	7.0°
250	124	5.6°
300	147	4.7°
350	161	4.3°
400	184	3.7°
450	207	3.3°
500	230	3.0°
600	276	2.5°
700	322	2.2°
800	368	1.9°
900	414	1.7°

The table above shows the elastic radius, i.e. when the steel pipe is plasticised. In other words, this is the least deflection that can be manufactured while retaining the form.

Bend - Horizontal Series 1, 2, 3 and 4

PN25



PART NO. 2100, 2200, 2300, 2400

KMAT 2500PP

DN	Service pipe	Series 1	Series 2	Casing	Series 4	L1
	Dy x s [mm]	DY [mm]	DY [mm]	Series 3 DY [mm]	DY [mm]	
20	26.9 x 2.3	-	110	125	140	1 000
25	33.7 x 2.6	90	110	125	140	1 000
32	42.4 x 2.6	110	125	140	160	1 000
40	48.3 x 2.6	110	125	140	160	1 000
50	60.3 x 2.9	125	140	160	180	1 000
65	76.1 x 2.9	140	160	180	200	1 000
80	88.9 x 3.2	160	180	200	225	1 000
100	114.3 x 3.6	200	225	250	280	1 000
125	139.7 x 3.6	225	250	280	315	1 000
150	168.3 x 4.0	250	280	315	355	1 000
200	219.1 x 4.5	315	355	400	450	1 000
250	273.0 x 5.0	400	450	500	560	1 300
300	323.9 x 5.6	450	500	560	630	1 500
350	355.6 x 5.6	500	560	630	710	1 600
400	406.4 x 6.3	560	630	710	800	1 600
450	457.0 x 6.3	630	710	800	900	1 200
500	508.0 x 6.3	710	800	900	1 000	1 600
600	610.0 x 7.1	800	900	1 000		1 300
700	711.0 x 8.0	900	1 000			1 500
800	813.0 x 8.8	1 000				1 700

The standard angle is 90°

Other bends, such as 75°, 60°, 45°, 30° and 15° and/or other leg lengths can be supplied on request.

Part no. Series 1

2100-DN-degrees-000

Part no. Series 2

2200-DN-degrees-000

Part no. Series 3

2300-DN-degrees-000

Part no. Series 4

2400-DN-degrees-000

Space for sleeve

To have space for the sleeve when installing DN ≤ 200, an extended leg 1500 x 1500 mm is available.

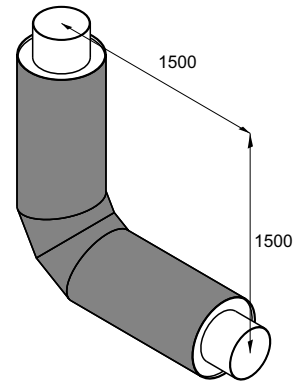
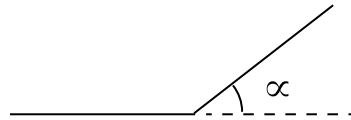
State **suffix -302**.

Order example

Bend, series 3, dim DN100, 90°, part number 2300-100-900-000.

Termination bend – Vertical Series 1, 2, 3 and 4

PN25



PART NO. 2110, 2210, 2310, 2410

KMAT 2500PP

DN	Service pipe Dy x s [mm]	Casing			
		Series 1 DY [mm]	Series 2 DY [mm]	Series 3 DY [mm]	Series 4 DY [mm]
20	26.9 x 2.3	--	110	125	140
25	33.7 x 2.6	90	110	125	140
32	42.4 x 2.6	110	125	140	160
40	48.3 x 2.6	110	125	140	160
50	60.3 x 2.9	125	140	160	180
65	76.1 x 2.9	140	160	180	200
80	88.9 x 3.2	160	180	200	225
100	114.3 x 3.6	200	225	250	280
125	139.0 x 3.6	225	250	280	315
150	168.3 x 4.0	250	280	315	355
200	219.1 x 4.5	315	355	400	450
250	273.0 x 5.0	400	450	500	560
300	323.9 x 5.6	450	500	560	630

The standard angle is 90°

Other angles and/or leg lengths can be supplied on request.

Can be ordered with end cap. (suffix **-811**) with accessible alarm wires, see Chapter 8.

Part no. series 1
2110-DN-000-000

Part no. series 2
2210-DN-000-000

Part no. series 3
2310-DN-000-000

Part no. series 4
2410-DN-000-000

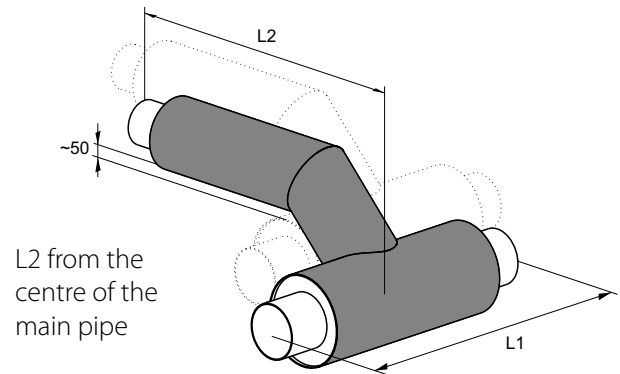
Order example

Termination bend Series 1
dim DN 50, part number 2110-050-000-000.

Backfilling may not reach the alarm wire.
Plastic protection should be retained
until installation takes place.

T-piece Series 1, 2, 3 and 4

PN16 - standard
PN25 - option



KMAT 3500PP

Measurement in mm

PART NO. 3100, 3200				PART NO. 3300, 3400			
Main pipe	Branch	L1	L2	Main pipe	Branch	L1	L2
DN 600-900	DN 25-80	1 200	1 200	DN 600-700	DN 25-80	1 200	1 200
DN 600-900	DN 100-200	1 500	1 200	DN 600-700	DN 100-200	1 500	1 200
DN 600-900	DN 250-450	1 800	1 500	DN 600-700	DN 250-500	1 800	1 500
DN 600-900	DN 500	1 800	1 700	DN 600-700	DN 500	1 800	1 700
DN 600-900	DN 600-900	2 100	2 100	DN 600	DN 600	1 900	1 500
				DN 700	DN 600-700	2 100	2 100

Main pipe	Main pipe x branch	PART NO. 3100, 3200		3300		3400	
		L1	L2	L1	L2	L1	L2
DN20	26.9x26.9	1 000	670	1 000	690	1 200	1 000
DN25	33.7x26.9	1 000	670	1 000	690	1 200	1 000
DN25	33.7x33.7	1 000	670	1 000	690	1 200	1 000
DN32	42.4x26.9	1 000	677	1 000	697	1 200	1 000
DN32	42.4x33.7	1 000	677	1 000	697	1 200	1 000
DN32	42.4x42.4	1 000	685	1 000	705	1 200	1 000
DN40	48.3x26.9	1 000	677	1 000	697	1 200	1 000
DN40	48.3x33.7	1 000	677	1 000	697	1 200	1 000
DN40	48.3x42.4	1 000	685	1 000	705	1 200	1 000
DN40	48.3x48.3	1 000	685	1 000	705	1 200	1 000
DN50	60.3x26.9	1 200	685	1 200	707	1 200	1 000
DN50	60.3x33.7	1 200	685	1 200	707	1 200	1 000
DN50	60.3x42.4	1 200	692	1 200	715	1 200	1 000
DN50	60.3x48.3	1 200	692	1 200	715	1 200	1 000
DN50	60.3x60.3	1 200	700	1 200	725	1 200	1 000
DN65	76.1x26.9	1 200	695	1 200	717	1 200	1 000
DN65	76.1x33.7	1 200	695	1 200	717	1 200	1 000
DN65	76.1x42.4	1 200	702	1 200	725	1 200	1 000
DN65	76.1x48.3	1 200	702	1 200	725	1 200	1 000
DN65	76.1x60.3	1 200	710	1 200	735	1 200	1 000
DN65	76.1x76.1	1 200	720	1 200	745	1 200	1 000
DN80	88.9x26.9	1 200	705	1 200	727	1 200	1 000
DN80	88.9x33.7	1 200	705	1 200	727	1 200	1 000
DN80	88.9x42.4	1 200	712	1 200	735	1 200	1 000
DN80	88.9x48.3	1 200	712	1 200	735	1 200	1 000
DN80	88.9x60.3	1 200	720	1 200	745	1 200	1 000
DN80	88.9x76.1	1 200	730	1 200	755	1 200	1 000

SINGLE PIPES

3:301-2

Main pipe	Main pipe x branch	PART NO. 3100, 3200		3300		3400	
		L1	L2	L1	L2	L1	L2
DN80	88.9x88.9	1 200	740	1 200	765	1 200	1 000
DN100	114.3x26.9	1 200	727	1 200	752	1 200	1 000
DN100	114.3x33.7	1 200	727	1 200	752	1 200	1 000
DN100	114.3x42.4	1 200	735	1 200	760	1 200	1 000
DN100	114.3x48.3	1 200	735	1 200	760	1 200	1 000
DN100	114.3x60.3	1 200	742	1 200	770	1 200	1 000
DN100	114.3x76.1	1 200	752	1 200	780	1 200	1 000
DN100	114.3x88.9	1 200	762	1 200	790	1 200	1 000
DN100	114.3x114.3	1 200	835	1 200	865	1 500	1 000
DN125	139.7x26.9	1 200	740	1 200	767	1 200	1 000
DN125	139.7x33.7	1 200	740	1 200	767	1 200	1 000
DN125	139.7x42.4	1 200	747	1 200	775	1 200	1 000
DN125	139.7x48.3	1 200	747	1 200	775	1 200	1 000
DN125	139.7x60.3	1 200	755	1 200	785	1 200	1 000
DN125	139.7x76.1	1 200	765	1 200	795	1 200	1 000
DN125	139.7x88.9	1 200	775	1 200	805	1 200	1 000
DN125	139.7x114.3	1 200	847	1 200	880	1 500	1 000
DN125	139.7x139.7	1 200	860	1 200	895	1 500	1 000
DN150	168.3x26.9	1 200	755	1 200	785	1 200	1 000
DN150	168.3x33.7	1 200	755	1 200	785	1 200	1 000
DN150	168.3x42.4	1 200	762	1 200	792	1 200	1 000
DN150	168.3x48.3	1 200	762	1 200	792	1 200	1 000
DN150	168.3x60.3	1 200	770	1 200	802	1 200	1 000
DN150	168.3x76.1	1 200	780	1 200	812	1 200	1 000
DN150	168.3x88.9	1 200	790	1 200	822	1 200	1 000
DN150	168.3x114.3	1 200	862	1 200	897	1 500	1 000
DN150	168.3x139.7	1 200	875	1 200	912	1 500	1 000
DN150	168.3x168.3	1 200	890	1 200	930	1 500	1 000
DN200	219.1x26.9	1 500	792	1 500	827	1 200	1 000
DN200	219.1x33.7	1 500	792	1 500	827	1 200	1 000
DN200	219.1x42.4	1 500	800	1 500	835	1 200	1 000
DN200	219.1x48.3	1 500	800	1 500	835	1 200	1 000
DN200	219.1x60.3	1 500	807	1 500	845	1 200	1 000
DN200	219.1x76.1	1 500	817	1 500	855	1 200	1 000
DN200	219.1x88.9	1 500	827	1 500	865	1 200	1 000
DN200	219.1x114.3	1 500	900	1 500	940	1 500	1 000
DN200	219.1x139.7	1 500	912	1 500	955	1 500	1 000
DN200	219.1x168.3	1 500	927	1 500	972	1 500	1 000
DN200	219.1x219.1	1 500	1 015	1 500	1 065	1 500	1 000
DN250	273x26.9	1 500	840	1 500	877	1 200	1 200
DN250	273x33.7	1 500	840	1 500	877	1 200	1 200
DN250	273x42.4	1 500	847	1 500	885	1 200	1 200
DN250	273x48.3	1 500	847	1 500	885	1 200	1 200
DN250	273x60.3	1 500	855	1 500	895	1 200	1 200
DN250	273x76.1	1 500	865	1 500	905	1 200	1 200
DN250	273x88.9	1 500	875	1 500	915	1 200	1 200
DN250	273x114.3	1 500	947	1 500	990	1 500	1 200
DN250	273x139.7	1 500	960	1 500	1 005	1 500	1 200
DN250	273x168.3	1 500	975	1 500	1 023	1 500	1 200

SINGLE PIPES

3:301-3

Main pipe	Main pipe x branch	PART NO. 3100, 3200		3300		3400	
		L1	L2	L1	L2	L1	L2
DN250	273x219.1	1 500	1 063	1 500	1 115	1 500	1 200
DN250	273x273	1 500	1 218	1 500	1 273	1 800	1 500
DN300	323.9x26.9	1 500	865	1 500	908	1 200	1 200
DN300	323.9x33.7	1 500	865	1 500	908	1 200	1 200
DN300	323.9x42.4	1 500	872	1 500	915	1 200	1 200
DN300	323.9x48.3	1 500	872	1 500	915	1 200	1 200
DN300	323.9x60.3	1 500	880	1 500	925	1 200	1 200
DN300	323.9x76.1	1 500	890	1 500	935	1 200	1 200
DN300	323.9x88.9	1 500	900	1 500	945	1 200	1 200
DN300	323.9x114.3	1 500	972	1 500	1 020	1 500	1 200
DN300	323.9x139.7	1 500	985	1 500	1 035	1 500	1 200
DN300	323.9x168.3	1 500	1 000	1 500	1 053	1 500	1 200
DN300	323.9x219.1	1 500	1 088	1 500	1 145	1 500	1 200
DN300	323.9x273	1 500	1 243	1 500	1 303	1 800	1 500
DN300	323.9x323.9	1 500	1 229	1 500	1 294	1 800	1 500
DN350	355.6x26.9	1 500	895	1 500	943	1 200	1 200
DN350	355.6x33.7	1 500	895	1 500	943	1 200	1 200
DN350	355.6x42.4	1 500	903	1 500	950	1 200	1 200
DN350	355.6x48.3	1 500	903	1 500	950	1 200	1 200
DN350	355.6x60.3	1 500	910	1 500	960	1 200	1 200
DN350	355.6x76.1	1 500	920	1 500	970	1 200	1 200
DN350	355.6x88.9	1 500	930	1 500	980	1 200	1 200
DN350	355.6x114.3	1 500	1 003	1 500	1 055	1 500	1 200
DN350	355.6x139.7	1 500	1 015	1 500	1 070	1 500	1 200
DN350	355.6x168.3	1 500	1 030	1 500	1 088	1 500	1 200
DN350	355.6x219.1	1 500	1 118	1 500	1 170	1 500	1 200
DN350	355.6x273	1 500	1 243	1 500	1 308	1 800	1 500
DN350	355.6x323.9	1 500	1 239	1 500	1 309	1 800	1 500
DN350	355.6x355.6	1 500	1 301	1 500	1 376	1 800	1 500
DN400	406.4x26.9	1 600	930	1 600	983	1 200	1 200
DN400	406.4x33.7	1 600	930	1 600	983	1 200	1 200
DN400	406.4x42.4	1 600	938	1 600	990	1 200	1 200
DN400	406.4x48.3	1 600	938	1 600	990	1 200	1 200
DN400	406.4x60.3	1 600	945	1 600	1 000	1 200	1 200
DN400	406.4x76.1	1 600	955	1 600	1 010	1 200	1 200
DN400	406.4x88.9	1 600	965	1 600	1 020	1 200	1 200
DN400	406.4x114.3	1 600	1 038	1 600	1 095	1 500	1 200
DN400	406.4x139.7	1 600	1 050	1 600	1 110	1 500	1 200
DN400	406.4x168.3	1 600	1 065	1 600	1 128	1 500	1 200
DN400	406.4x219.1	1 600	1 153	1 600	1 220	1 500	1 200
DN400	406.4x273	1 600	1 268	1 600	1 338	1 800	1 500
DN400	406.4x323.9	1 600	1 264	1 600	1 339	1 800	1 500
DN400	406.4x355.6	1 600	1 326	1 600	1 406	1 800	1 500
DN400	406.4x406.4	1 600	1 353	1 600	1 438	1 800	1 500
DN450	457x26.9	2 000	970	2 000	1 028	1 200	1 200
DN450	457x33.7	2 000	970	2 000	1 028	1 200	1 200
DN450	457x42.4	2 000	978	2 000	1 035	1 200	1 200
DN450	457x48.3	2 000	978	2 000	1 035	1 200	1 200
DN450	457x60.3	2 000	985	2 000	1 045	1 200	1 200

Main pipe	Main pipe x branch	PART NO. 3100, 3200		3300		3400	
		L1	L2	L1	L2	L1	L2
DN450	457x76.1	2 000	995	2 000	1 055	1 200	1 200
DN450	457x88.9	2 000	1 005	2 000	1 065	1 200	1 200
DN450	457x114.3	2 000	1 078	2 000	1 140	1 500	1 200
DN450	457x139.7	2 000	1 090	2 000	1 155	1 500	1 200
DN450	457x168.3	2 000	1 105	2 000	1 173	1 500	1 200
DN450	457x219.1	2 000	1 193	2 000	1 265	1 500	1 200
DN450	457x273	2 000	1 288	2 000	1 363	1 800	1 500
DN450	457x323.9	2 000	1 294	2 000	1 374	1 800	1 500
DN450	457x355.6	2 000	1 346	2 000	1 431	1 800	1 500
DN450	457x406.4	2 000	1 373	2 000	1 463	1 800	1 500
DN450	457x457	2 000	1 454	2 000	1 549	1 800	1 500
DN500	508x26.9	2 000	1 015	2 000	1 078	1 200	1 200
DN500	508x33.7	2 000	1 015	2 000	1 078	1 200	1 200
DN500	508x42.4	2 000	1 023	2 000	1 085	1 200	1 200
DN500	508x48.3	2 000	1 023	2 000	1 085	1 200	1 200
DN500	508x60.3	2 000	1 030	2 000	1 095	1 200	1 200
DN500	508x76.1	2 000	1 040	2 000	1 105	1 200	1 200
DN500	508x88.9	2 000	1 050	2 000	1 115	1 200	1 200
DN500	508x114.3	2 000	1 123	2 000	1 190	1 500	1 200
DN500	508x139.7	2 000	1 135	2 000	1 205	1 500	1 200
DN500	508x168.3	2 000	1 150	2 000	1 223	1 500	1 200
DN500	508x219.1	2 000	1 238	2 000	1 315	1 500	1 200
DN500	508x273	2 000	1 303	2 000	1 383	1 800	1 500
DN500	508x323.9	2 000	1 299	2 000	1 384	1 800	1 500
DN500	508x355.6	2 000	1 379	2 000	1 469	1 800	1 500
DN500	508x406.4	2 000	1 414	2 000	1 509	1 800	1 500
DN500	508x457	2 000	1 504	2 000	1 604	1 800	1 500
DN500	508x508	2 000	1 549	2 000	1 654	1 800	1 500

Part no. series 1 3100-DN main pipe-DN branch-000

Part no. series 2 3200-DN main pipe-DN branch-000

Part no. series 3 3300-DN main pipe-DN branch-000

Part no. series 4 3400-DN main pipe-DN branch-000

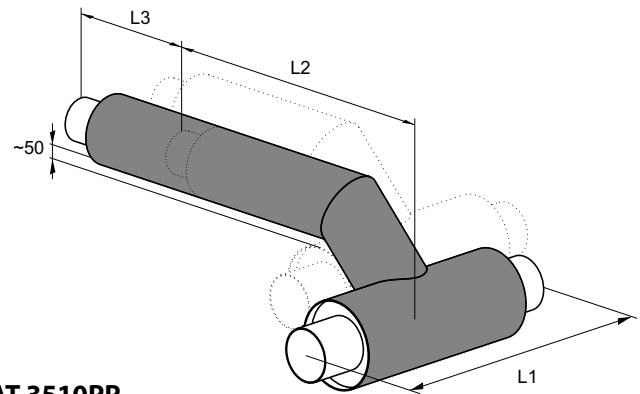
Order example

T-piece series 1 with main pipe DN 200 and branch DN 50, part number 3100-200-050-000.

If PN25, this must be stated when ordering.

Extended T-piece Series 1, 2, 3 and 4

PN16 – standard
PN25 – option



PART NO. 3120, 3220, 3320, 3420

KMAT 3510PP

Main pipe DN	Branch DN	L2 + L3 [mm] Series 1 and 2	L2 + L3 [mm] Series 3 and 4	Main pipe DN	Branch DN	L2 + L3 [mm] Series 1 and 2	L2 + L3 [mm] Series 3 and 4
25-50	25-50	1 330	1 530	500	25-200	2 200	2 300
65-80	25-80	1 370	1 570	500	250	2 500	2 600
100-125	25-125	1 500	1 600	500	300	2 500	2 600
150	25-150	1 530	1 630	500	350	2 500	2 600
200	25-200	1 600	1 700	500	400	2 500	2 600
250	25-200	1 900	2 000	500	450	2 500	2 600
250	250	2 200	2 300	500	500	2 700	2 800
300	25-200	1 950	2 060	600	25-80	2 300	2 400 *)
300	250	2 250	2 360	600	100-200	2 300	2 400 *)
300	300	2 250	2 360	600	250-450	2 600	2 700 *)
350	25-200	2 050	2 130	600	500	2 800	2 900 *)
350	250	2 350	2 430	600	600	3 200	3 300 *)
350	300	2 350	2 430	700	25-80	2 400	
350	350	2 350	2 430	700	100-200	2 400	
400	25-200	2 130	2 200	700	250-450	2 700	
400	250	2 430	2 500	700	500	2 900	
400	300	2 430	2 500	700	600-700	3 300	
400	350	2 430	2 500	800	25-80	2 500	
400	400	2 430	2 500	800	100-200	2 500	
				800	250-450	2 800	
				800	500	3 000	
				800	600-800	3 400	

For L1 and L2 see p. 3:301

*) applies to Series 3

A branch cannot be designed with dimensions larger than the main pipe.

An extended T-piece enables easy connection of a valve unit, transition unit etc. after a branch.

An extended T-piece helps ensure safer welding work.

Part no. series 1

3120-DN main pipe-DN branch-000

Part no. series 2

3220-DN main pipe-DN branch-000

Part no. series 3

3320-DN main pipe-DN branch-000

Part no. series 4

3420-DN main pipe-DN branch-000

Order example

T-piece series 1 with main pipe DN 200 and branch DN 50,
part number 3120-200-050-000.

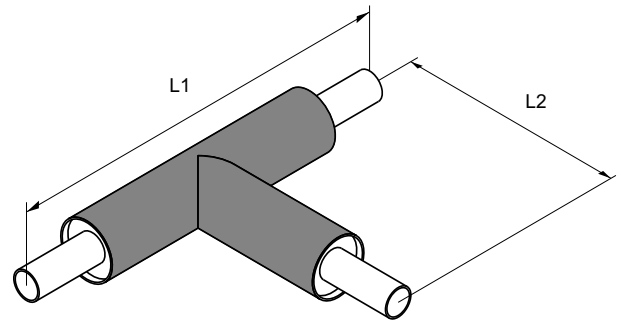
If PN25, this must be stated when ordering.

T-piece, straight Series 1, 2, 3 and 4

PN16 – standard
PN25 – option

KMAT 3400PP

Measurement in mm



PART NO. 3130, 3230, 3330 (DN20-DN500)			PART NO. 3130, 3230 (DN600-DN900)																																															
Main pipe	L1	L2	Main pipe	Branch	L1	L2																																												
DN20	1 000	500	DN600-900	DN25-100	1 200	1 100																																												
DN25	1 000	500	DN600-900	DN125-200	1 500	1 100																																												
DN32	1 000	500	DN600-900	DN250-500	1 800	1 100																																												
DN40	1 000	500	DN600-900	DN600-800	2 100	1 100																																												
DN50	1 200	600	PART NO. 3330 (DN600-DN900) <table border="1"> <thead> <tr> <th>Main pipe</th> <th>Branch</th> <th>L1</th> <th>L2</th> </tr> </thead> <tbody> <tr> <td>DN600-900</td> <td>DN25-100</td> <td>1 200</td> <td>1 100</td> </tr> <tr> <td>DN600-900</td> <td>DN125-200</td> <td>1 500</td> <td>1 100</td> </tr> <tr> <td>DN600-900</td> <td>DN250-500</td> <td>1 800</td> <td>1 100</td> </tr> <tr> <td>DN600</td> <td>DN600</td> <td>1 900</td> <td>1 100</td> </tr> <tr> <td>DN700</td> <td>DN600-700</td> <td>2 100</td> <td>1 100</td> </tr> </tbody> </table>				Main pipe	Branch	L1	L2	DN600-900	DN25-100	1 200	1 100	DN600-900	DN125-200	1 500	1 100	DN600-900	DN250-500	1 800	1 100	DN600	DN600	1 900	1 100	DN700	DN600-700	2 100	1 100																				
Main pipe	Branch	L1					L2																																											
DN600-900	DN25-100	1 200					1 100																																											
DN600-900	DN125-200	1 500					1 100																																											
DN600-900	DN250-500	1 800					1 100																																											
DN600	DN600	1 900					1 100																																											
DN700	DN600-700	2 100					1 100																																											
DN65	1 200	600																																																
DN80	1 200	600																																																
DN100	1 200	600																																																
DN125	1 200	600																																																
DN150	1 200	600																																																
DN200	1 500	700																																																
DN250	1 500	700																																																
DN300	1 500	800																																																
DN350	1 500	800																																																
DN400	1 600	800	PART NO. 3430 (DN20-DN900) <table border="1"> <thead> <tr> <th>Main pipe</th> <th>Branch</th> <th>L1</th> <th>L2</th> </tr> </thead> <tbody> <tr> <td>DN20-200</td> <td>DN20-100</td> <td>1 200</td> <td>700</td> </tr> <tr> <td>DN125-200</td> <td>DN125-200</td> <td>1 500</td> <td>700</td> </tr> <tr> <td>DN250-500</td> <td>DN25-100</td> <td>1 200</td> <td>900</td> </tr> <tr> <td>DN250-500</td> <td>DN125-200</td> <td>1 500</td> <td>900</td> </tr> <tr> <td>DN250-500</td> <td>DN250-500</td> <td>1 800</td> <td>900</td> </tr> <tr> <td>DN600-900</td> <td>DN25-100</td> <td>1 200</td> <td>1 100</td> </tr> <tr> <td>DN600-900</td> <td>DN125-200</td> <td>1 500</td> <td>1 100</td> </tr> <tr> <td>DN600-900</td> <td>DN250-500</td> <td>1 800</td> <td>1 100</td> </tr> <tr> <td>DN600</td> <td>DN600</td> <td>1 900</td> <td>1 100</td> </tr> <tr> <td>DN700</td> <td>DN600-700</td> <td>2 100</td> <td>1 100</td> </tr> </tbody> </table>				Main pipe	Branch	L1	L2	DN20-200	DN20-100	1 200	700	DN125-200	DN125-200	1 500	700	DN250-500	DN25-100	1 200	900	DN250-500	DN125-200	1 500	900	DN250-500	DN250-500	1 800	900	DN600-900	DN25-100	1 200	1 100	DN600-900	DN125-200	1 500	1 100	DN600-900	DN250-500	1 800	1 100	DN600	DN600	1 900	1 100	DN700	DN600-700	2 100	1 100
Main pipe	Branch	L1					L2																																											
DN20-200	DN20-100	1 200					700																																											
DN125-200	DN125-200	1 500					700																																											
DN250-500	DN25-100	1 200					900																																											
DN250-500	DN125-200	1 500					900																																											
DN250-500	DN250-500	1 800					900																																											
DN600-900	DN25-100	1 200					1 100																																											
DN600-900	DN125-200	1 500					1 100																																											
DN600-900	DN250-500	1 800					1 100																																											
DN600	DN600	1 900	1 100																																															
DN700	DN600-700	2 100	1 100																																															
DN450	2 000	900																																																
DN500	2 000	900																																																

The T-piece, straight is delivered in equal strength version as standard, and the branch can be designed at the same level as the main pipe. A branch cannot be designed with dimensions larger than the main pipe.

Part no. series 1

3130-DN main pipe-DN branch-000

Part no. series 2

3230-DN main pipe-DN branch-0000

Part no. series 3

3330-DN main pipe-DN branch-000

Part no. series 4

3430-DN main pipe-DN branch-000

Order example

T-piece series 1 with main pipe DN 200 and branch DN 50, part number 3130-200-050-000.

If PN25, this must be stated when ordering.

T-piece, parallel Series 1, 2, 3 and 4

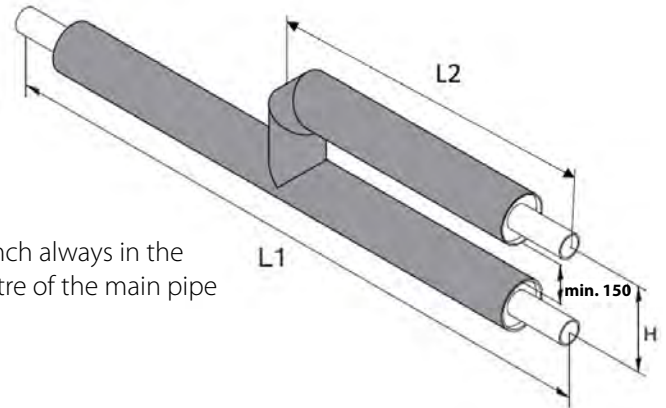
PN16 – standard

PN25 – option

KMAT 3600PP

Measurement in mm

Branch always in the
centre of the main pipe



Main pipe	Main pipe x branch	PART NO. 3110, 3210			3310			3410		
		L1	L2	H	L1	L2	H	L1	L2	H
DN20	26.9x26.9	1 000	550	270	1 000	550	285	1 200	600	290
DN25	33.7x26.9	1 000	550	270	1 000	550	285	1 200	600	290
DN25	33.7x33.7	1 000	550	270	1 000	550	285	1 200	600	290
DN32	42.4x26.9	1 000	550	278	1 000	550	293	1 200	600	300
DN32	42.4x33.7	1 000	550	278	1 000	550	293	1 200	600	300
DN32	42.4x42.4	1 000	550	285	1 000	550	300	1 200	600	310
DN40	48.3x26.9	1 000	550	278	1 000	550	293	1 200	600	300
DN40	48.3x33.7	1 000	550	278	1 000	550	293	1 200	600	300
DN40	48.3x42.4	1 000	550	285	1 000	550	300	1 200	600	310
DN40	48.3x48.3	1 000	550	285	1 000	550	300	1 200	600	310
DN50	60.3x26.9	1 200	550	285	1 200	550	303	1 200	600	310
DN50	60.3x33.7	1 200	550	285	1 200	550	303	1 200	600	310
DN50	60.3x42.4	1 200	550	293	1 200	550	311	1 200	600	320
DN50	60.3x48.3	1 200	550	293	1 200	550	311	1 200	600	320
DN50	60.3x60.3	1 200	600	300	1 200	600	320	1 200	600	330
DN65	76.1x26.9	1 200	550	295	1 200	550	312	1 200	600	320
DN65	76.1x33.7	1 200	550	295	1 200	550	312	1 200	600	320
DN65	76.1x42.4	1 200	550	303	1 200	550	320	1 200	600	330
DN65	76.1x48.3	1 200	550	303	1 200	550	321	1 200	600	330
DN65	76.1x60.3	1 200	600	310	1 200	600	330	1 200	600	340
DN65	76.1x76.1	1 200	600	320	1 200	600	340	1 200	600	350
DN80	88.9x26.9	1 200	550	305	1 200	550	322	1 200	600	333
DN80	88.9x33.7	1 200	550	305	1 200	550	322	1 200	600	333
DN80	88.9x42.4	1 200	550	313	1 200	550	331	1 200	600	343
DN80	88.9x48.3	1 200	550	313	1 200	550	330	1 200	600	343
DN80	88.9x60.3	1 200	600	320	1 200	600	340	1 200	600	353
DN80	88.9x76.1	1 200	600	330	1 200	600	350	1 200	600	363
DN80	88.9x88.9	1 200	650	340	1 200	650	360	1 200	600	375
DN100	114.3x26.9	1 200	550	328	1 200	550	348	1 200	600	360
DN100	114.3x33.7	1 200	550	328	1 200	550	348	1 200	600	360
DN100	114.3x42.4	1 200	550	335	1 200	550	355	1 200	600	370
DN100	114.3x48.3	1 200	550	335	1 200	550	355	1 200	600	370
DN100	114.3x60.3	1 200	600	343	1 200	600	366	1 200	600	380
DN100	114.3x76.1	1 200	600	353	1 200	600	376	1 200	600	390
DN100	114.3x88.9	1 200	650	363	1 200	650	386	1 200	600	403
DN100	114.3x114.3	1 200	700	406	1 200	700	415	1 200	600	430
DN125	139.7x26.9	1 200	550	340	1 200	550	363	1 200	600	378
DN125	139.7x33.7	1 200	550	340	1 200	550	363	1 200	600	378

SINGLE PIPES

3:304-2

Main pipe	Main pipe x branch	PART NO. 3110, 3210			3310			3410		
		L1	L2	H	L1	L2	H	L1	L2	H
DN125	139.7x42.4	1 200	550	348	1 200	550	371	1 200	600	388
DN125	139.7x48.3	1 200	550	347	1 200	550	370	1 200	600	388
DN125	139.7x60.3	1 200	600	355	1 200	600	380	1 200	600	398
DN125	139.7x76.1	1 200	600	365	1 200	600	390	1 200	600	408
DN125	139.7x88.9	1 200	650	375	1 200	650	400	1 200	600	420
DN125	139.7x114.3	1 200	700	403	1 200	700	430	1 200	600	448
DN125	139.7x139.7	1 200	700	413	1 200	700	440	1 500	750	465
DN150	168.3x26.9	1 200	550	355	1 200	550	380	1 200	600	398
DN150	168.3x33.7	1 200	550	355	1 200	550	380	1 200	600	398
DN150	168.3x42.4	1 200	550	363	1 200	550	388	1 200	600	408
DN150	168.3x48.3	1 200	550	363	1 200	550	388	1 200	600	408
DN150	168.3x60.3	1 200	600	370	1 200	600	398	1 200	600	418
DN150	168.3x76.1	1 200	600	380	1 200	600	408	1 200	600	428
DN150	168.3x88.9	1 200	650	390	1 200	650	418	1 200	600	440
DN150	168.3x114.3	1 200	700	415	1 200	700	447	1 500	750	468
DN150	168.3x139.7	1 200	700	426	1 200	700	458	1 500	750	485
DN150	168.3x168.3	1 200	700	489	1 200	700	489	1 500	750	505
DN200	219.1x26.9	1 500	550	393	1 500	550	423	1 200	600	445
DN200	219.1x33.7	1 500	550	393	1 500	550	423	1 200	600	445
DN200	219.1x42.4	1 500	550	400	1 500	550	430	1 200	600	455
DN200	219.1x48.3	1 500	550	400	1 500	550	430	1 200	600	455
DN200	219.1x60.3	1 500	600	408	1 500	600	441	1 200	600	465
DN200	219.1x76.1	1 500	600	418	1 500	600	451	1 200	600	475
DN200	219.1x88.9	1 500	650	428	1 500	650	461	1 200	600	488
DN200	219.1x114.3	1 500	700	450	1 500	700	490	1 200	600	515
DN200	219.1x139.7	1 500	700	463	1 500	700	501	1 500	750	533
DN200	219.1x168.3	1 500	700	499	1 500	700	529	1 500	750	553
DN200	219.1x219.1	1 500	800	626	1 500	800	627	1 500	750	600
DN250	273x26.9	1 500	550	440	1 500	550	473	1 200	600	500
DN250	273x33.7	1 500	550	440	1 500	550	473	1 200	600	500
DN250	273x42.4	1 500	550	448	1 500	550	480	1 200	600	510
DN250	273x48.3	1 500	550	447	1 500	550	480	1 200	600	510
DN250	273x60.3	1 500	600	455	1 500	600	490	1 200	600	520
DN250	273x76.1	1 500	600	465	1 500	600	500	1 200	600	530
DN250	273x88.9	1 500	650	475	1 500	650	510	1 200	600	543
DN250	273x114.3	1 500	700	498	1 500	700	540	1 200	600	570
DN250	273x139.7	1 500	700	510	1 500	700	550	1 500	750	588
DN250	273x168.3	1 500	700	545	1 500	700	579	1 500	750	608
DN250	273x219.1	1 500	800	627	1 500	800	677	1 500	750	655
DN250	273x273	1 500	800	647	1 500	800	660	1 800	900	710
DN300	323.9x26.9	1 500	550	465	1 500	550	503	1 200	600	535
DN300	323.9x33.7	1 500	550	465	1 500	550	503	1 200	600	535
DN300	323.9x42.4	1 500	550	473	1 500	550	511	1 200	600	545
DN300	323.9x48.3	1 500	550	473	1 500	550	510	1 200	600	545
DN300	323.9x60.3	1 500	600	480	1 500	600	520	1 200	600	555
DN300	323.9x76.1	1 500	600	490	1 500	600	530	1 200	600	565
DN300	323.9x88.9	1 500	650	500	1 500	650	540	1 200	600	578
DN300	323.9x114.3	1 500	700	523	1 500	700	570	1 200	600	605
DN300	323.9x139.7	1 500	700	535	1 500	700	580	1 500	750	623
DN300	323.9x168.3	1 500	700	570	1 500	700	609	1 500	750	643
DN300	323.9x219.1	1 500	800	653	1 500	800	707	1 500	750	690

SINGLE PIPES

3:304-3

Main pipe	Main pipe x branch	PART NO. 3110, 3210			3310			3410		
		L1	L2	H	L1	L2	H	L1	L2	H
DN300	323.9x273	1 500	800	635	1 500	800	690	1 800	900	745
DN300	323.9x323.9	1 500	850	711	1 500	850	751	1 800	900	780
DN350	355.6x26.9	1 500	550	495	1 500	550	538	1 200	600	575
DN350	355.6x33.7	1 500	550	495	1 500	550	538	1 200	600	575
DN350	355.6x42.4	1 500	550	503	1 500	550	546	1 200	600	585
DN350	355.6x48.3	1 500	550	503	1 500	550	546	1 200	600	585
DN350	355.6x60.3	1 500	600	510	1 500	600	555	1 200	600	595
DN350	355.6x76.1	1 500	600	520	1 500	600	565	1 200	600	605
DN350	355.6x88.9	1 500	650	530	1 500	650	575	1 200	600	618
DN350	355.6x114.3	1 500	700	560	1 500	700	605	1 200	600	645
DN350	355.6x139.7	1 500	700	565	1 500	700	615	1 500	750	663
DN350	355.6x168.3	1 500	700	601	1 500	700	644	1 500	750	683
DN350	355.6x219.1	1 500	800	697	1 500	800	742	1 500	750	730
DN350	355.6x273	1 500	800	665	1 500	800	725	1 800	900	785
DN350	355.6x323.9	1 500	850	728	1 500	850	792	1 800	900	820
DN350	355.6x355.6	1 500	900	852	1 500	900	882	1 800	900	900
DN400	406.4x26.9	1 600	550	530	1 600	550	578	1 200	600	620
DN400	406.4x33.7	1 600	550	530	1 600	550	578	1 200	600	620
DN400	406.4x42.4	1 600	550	538	1 600	550	586	1 200	600	630
DN400	406.4x48.3	1 600	550	538	1 600	550	586	1 200	600	630
DN400	406.4x60.3	1 600	600	545	1 600	600	595	1 200	600	640
DN400	406.4x76.1	1 600	600	555	1 600	600	605	1 200	600	650
DN400	406.4x88.9	1 600	650	565	1 600	650	615	1 200	600	663
DN400	406.4x114.3	1 600	700	588	1 600	700	645	1 200	600	690
DN400	406.4x139.7	1 600	700	600	1 600	700	655	1 500	750	708
DN400	406.4x168.3	1 600	700	636	1 600	700	686	1 500	750	728
DN400	406.4x219.1	1 600	800	722	1 600	800	782	1 500	750	775
DN400	406.4x273	1 600	800	700	1 600	800	765	1 800	900	830
DN400	406.4x323.9	1 600	850	753	1 600	850	832	1 800	900	865
DN400	406.4x355.6	1 600	900	842	1 600	900	910	1 800	900	918
DN400	406.4x406.4	1 600	1 000	985	1 600	1 000	995	1 800	900	990
DN450	457x26.9	2 000	550	570	2 000	550	623	1 200	600	620
DN450	457x33.7	2 000	550	570	2 000	550	623	1 200	600	620
DN450	457x42.4	2 000	550	578	2 000	550	630	1 200	600	630
DN450	457x48.3	2 000	550	578	2 000	550	630	1 200	600	630
DN450	457x60.3	2 000	600	585	2 000	600	640	1 200	600	640
DN450	457x76.1	2 000	600	595	2 000	600	650	1 200	600	650
DN450	457x88.9	2 000	650	605	2 000	650	660	1 200	600	663
DN450	457x114.3	2 000	700	628	2 000	700	690	1 200	600	690
DN450	457x139.7	2 000	700	640	2 000	700	700	1 500	750	708
DN450	457x168.3	2 000	700	676	2 000	700	729	1 500	750	728
DN450	457x219.1	2 000	800	757	2 000	800	827	1 500	750	775
DN450	457x273	2 000	800	740	2 000	800	810	1 800	900	830
DN450	457x323.9	2 000	850	793	2 000	850	877	1 800	900	886
DN450	457x355.6	2 000	900	872	2 000	900	955	1 800	900	1 005
DN450	457x406.4	2 000	1 000	977	2 000	1 000	1 027	1 800	900	1 050
DN450	457x457	2 000	1 050	1 109	2 000	1 050	1 119	1 800	900	1 079
DN500	508x26.9	2 000	550	605	2 000	550	673	1 200	600	670
DN500	508x33.7	2 000	550	605	2 000	550	673	1 200	600	670
DN500	508x42.4	2 000	550	613	2 000	550	680	1 200	600	680
DN500	508x48.3	2 000	550	613	2 000	550	680	1 200	600	680

SINGLE PIPES

3:304-4

Main pipe	Main pipe x branch	PART NO. 3110, 3210			3310			3410		
		L1	L2	H	L1	L2	H	L1	L2	H
DN500	508x60.3	2 000	600	630	2 000	600	690	1 200	600	690
DN500	508x76.1	2 000	600	640	2 000	600	700	1 200	600	700
DN500	508x88.9	2 000	650	650	2 000	650	710	1 200	600	713
DN500	508x114.3	2 000	700	673	2 000	700	740	1 200	600	740
DN500	508x139.7	2 000	700	685	2 000	700	750	1 500	750	758
DN500	508x168.3	2 000	700	721	2 000	700	779	1 500	750	778
DN500	508x219.1	2 000	800	802	2 000	800	877	1 500	750	825
DN500	508x273	2 000	800	785	2 000	800	860	1 800	900	880
DN500	508x323.9	2 000	850	838	2 000	850	927	1 800	900	915
DN500	508x355.6	2 000	900	912	2 000	900	1 005	1 800	900	1 055
DN500	508x406.4	2 000	1 000	1 022	2 000	1 000	1 077	1 800	900	1 100
DN500	508x457	2 000	1 050	1 094	2 000	1 050	1 149	1 800	900	1 124
DN500	508x508	2 000	1 100	1 233	2 000	1 100	1 263	1 800	900	1 230

L1 and L2, Series 1-4

Main pipe	Branch	L1	L2
DN600-900	DN25-80	1200	600
DN600-900	DN100-200	1500	750
DN600-900	DN250-400	1800	900
DN600-900	DN450-500	2400	1200
DN600-900	DN600	2400	1200
DN700	DN600	2800	1400
DN800-900	DN700	3000	1500

H-DIMENSIONS

Main pipe	Series	Branch										
		DN20	DN25	DN32	DN40	DN50	DN65	DN80	DN100	DN125	DN150	DN200
DN600	1&2	605	605	613	613	620	630	640	663	675	690	728
DN600	3&4	720	720	730	730	740	750	763	790	808	828	875
DN700	1&2	655	655	663	663	670	680	690	713	725	740	778
DN700	3&4	770	770	780	780	790	800	813	840	858	878	925
DN800	1&2	705	705	713	713	720	730	740	763	775	790	828
DN800	3	770	770	780	780	790	800	813	840	858	878	925
DN900	1&2	755	755	763	763	770	780	790	813	825	840	878

H-DIMENSIONS

Main pipe	Series	Branch									
		DN250	DN300	DN350	DN400	DN450	DN500	DN600	DN700	DN800	DN900
DN600	1&2	815	854	928	1 016	1 091	1 194	1 346			
DN600	3&4	930	965	1 063	1 150	1 226	1 280	1 426			
DN700	1&2	825	905	989	1 067	1 142	1 245	1 422	1 588		
DN700	3&4	980	1 015	1 105	1 201	1 277	1 325	1 482	1 588		
DN800	1&2	875	964	1 040	1 118	1 203	1 295	1 473	1 639	1 816	
DN800	3	980	1 015	1 105	1 168	1 278	1 295	1 473	1 639	1 816	
DN900	1&2	925	1 014	1 090	1 169	1 251	1 346	1 524	1 689	1 867	2 045

A branch cannot be designed with dimensions larger than the main pipe. See Chapter 7 for type drawing of alarm system.

Part no. series 1 3110-DN main pipe-DN branch-000

Part no. series 2 3210-DN main pipe-DN branch-000

Part no. series 3 3310-DN main pipe-DN branch-000

Part no. series 4 3410-DN main pipe-DN branch-000

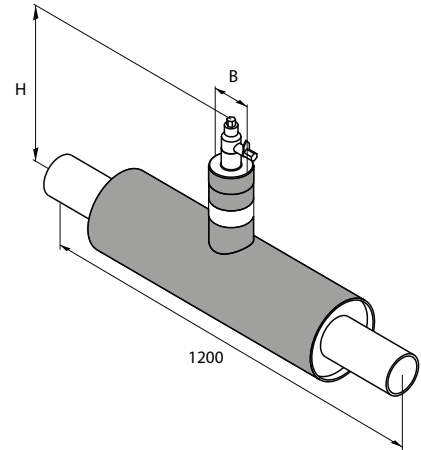
Order example

T-piece series 1 with main pipe DN 200 and branch DN 50,
part number 3110-200-050-000.

If PN25, this must be stated when ordering.

Vent/drain Series 1, 2, 3 and 4

PN 16/PN25



PART NO. 3140, 3240, 3340, 3440

KMAT 3410PP

Main pipe DN	H [mm]	Vent/drain DN	B [mm]
25	409	25	114
32	414	40	114
40	417	50	140
50	423	65	170
65	431		
80	438		
100	450		
125	463		
150	477		
200	502		
250	530		
300	554		
350	570		
400	596		
500	650		
600	700		
700	758		
800	800		
900	850		

NB The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10

The sealing shall not lie continuously under water.

Backfilling may not reach the sealing, alarm wire or marking tape.

The end cap and valve body are in stainless material.

Vent/drain valves are available in dimensions DN 25, DN 40, DN 50 and DN 65. Available in a choice of dimensions, but standard dimensions are DN25 for DN25-DN200 main pipes, DN40 for DN250-DN300 main pipes, DN50 for DN350-600 main pipes and DN65 for DN700-DN900 main pipes.

Alarm wires not accessible.

The valve is delivered with an end cap for the spindle as standard.

Part no. series 1

3140-DN main pipe-DN vent/drain-000

Part no. series 3

3340-DN main pipe-DN vent/drain-000

Part no. series 2

3240-DN main pipe-DN vent/drain-000

Part no. series 4

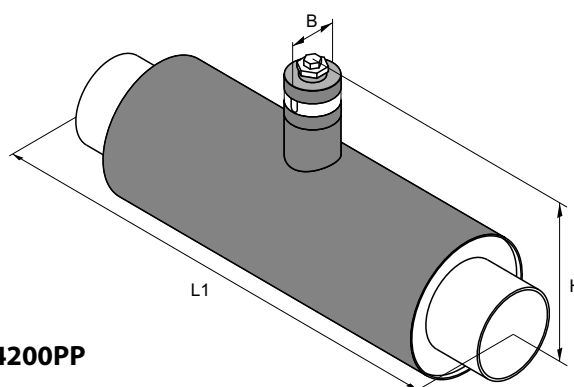
3440-DN main pipe-DN vent/drain-000

Order example

Venting for main pipe in Series 1 dimension DN 200 and venting DN 25, part number 3140-200-025-000.

Preinsulated valves Series 1, 2, 3 and 4

PN 16/PN25



PART NO. 4100, 4200, 4300, 4400

KMAT 4200PP

Main pipe DN	Service pipe Dy x s mm	L1 [mm]	H [mm]	B [mm]	Wrench size [mm]
25	33.7 x 2.3	1 500	382	110	19
32	42.4 x 2.6	1 500	388	110	19
40	48.3 x 2.6	1 500	401	110	19
50	60.3 x 2.9	1 500	406	110	19
65	76.1 x 2.9	1 500	415	110	19
80	88.9 x 3.2	1 500	426	110	19
100	114.3 x 3.6	1 500	450	125	27
125	139.7 x 3.6	1 500	455	125	27
150	168.3 x 4.0	1 500	475	125	27
200	219.1 x 4.5	1 500	517	160	50
250	273.0 x 5.0	1 500	560	160	50
300	323.9 x 5.6	1 800	610	160	50
350	355.6 x 5.6	1 800	830	350	
400	406.4 x 6.3	2 000	909	350	
500	508.3 x 6.3	custom	947	350	
600	610.0 x 7.1	custom	1 020	350	

H-dimension is up to mount for T-key up to and including DN300, including fixed gear.

The alarm wire is accessible from outside the sealing. For fixed gear, order alarm wire placement separately.

The pipe has a ball valve as standard, but is also available with a gate valve or valve with full bore. Valves can come with T-key, portable planetary gear, fixed gear, hydraulic or electronic actuator. See Accessories, Chapter 8. Comes with end cap as standard. Is available with separate measurement sleeve by special order. See Chapter 6.

Also available with stem extension 250, 500, 750, 1000, 1250 or 1500 mm for DN25-DN300 as standard.

As standard, the valve is delivered as follows:

- 1) DN 25-DN150 with mount for T-key.
- 2) DN 200-DN 300 with mount for portable gear.
- 3) DN 350-DN 900 with fixed gear and wire placement are ordered separately.

NB The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

The end cap shall not lie continuously under water.

Backfilling may not reach the end cap, alarm wire or marking tape.

Part no. series 1

4100-DN-000-000

Part no. series 2

4200-DN-000-000

Part no. series 3

4300-DN-000-000

Part no. series 4

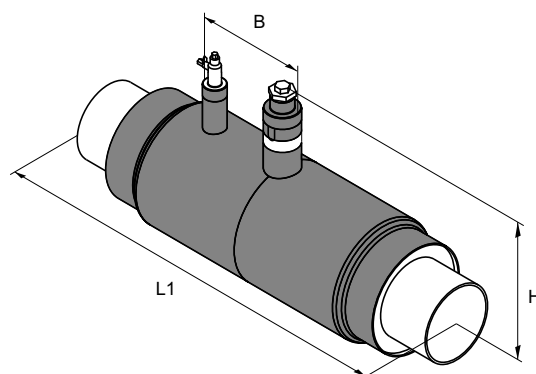
4400-DN-000-000

Order example

Pre-insulated valve Series 1 with main pipe DN 200, part number 4100-200-000-000.

Valve with 1 vent/drain unit. Series 1, 2, 3 and 4

PN 16/PN25



PART NO. 4141, 4241, 4341, 4441

KMAT 4220PP

Main pipe DN	L1 [mm]	H [mm]	B [mm]	Wrench size [mm]	Vent/drain DN [mm]	D [mm]	Change in B dimension for larger dimension of vent/drain
25	1 500	382	370	19	25	110	+0
32	1 500	388	365	19	40	110	+0
40	1 500	401	365	19	50	125	+7.5
50	1 500	406	365	19	65	140	+15.0
65	1 500	415	365	19			
80	1 500	426	365	19			
100	1 500	450	365	27			
125	1 500	455	365	27			
150	1 500	475	365	27			
200	1 500	517	365	50			
250	1 500	560	420	50			
300	1 800	610	470	50			
350	1 800	830	535				
400	2 000	909	660				
500	2 200	947	800				
600	2 400	1 020	875				

NB The valves must be operated at least twice a year in order to ensure a good function. For care instructions for valves, see Chapter 10.

The end cap shall not lie continuously under water.

Backfilling may not reach the end cap, alarm wire or marking tape.

H-dimension is up to mount for T-key up to and including DN300, including fixed gear. The alarm wire is accessible from outside the sealing. For fixed gear, order alarm wire placement separately. The pipe has a ball valve as standard, but is also available with a gate valve or valve with full bore. Valves can come with T-key, portable planetary gear, fixed gear, hydraulic or electronic actuator. See Accessories, Chapter 8. Comes with end cap as standard. Is available with separate measurement sleeve by special order. See Chapter 6.

The valve stem for vent/drain unit is oriented towards the stop valve. Vent/drain valves are available in dimensions DN 25, DN 40, DN 50 and DN 65.

Stop valve available with stem extension 250, 500, 750, 1000, 1250 or 1500 mm for DN25-DN300 as standard.

As standard, the valve is delivered as follows:

- 1) DN 25-DN150 with mount for T-key.
- 2) DN 200-DN 300 with mount for portable gear.
- 3) DN 350-DN 900 with fixed gear and wire placement are ordered separately.

Part no. series 1

4141-DN main pipe-DN venting-000

Part no. series 2

4241-DN main pipe-DN venting-000

Part no. series 3

4341-DN main pipe-DN venting-000

Part no. series 4

4441-DN main pipe-DN venting-000

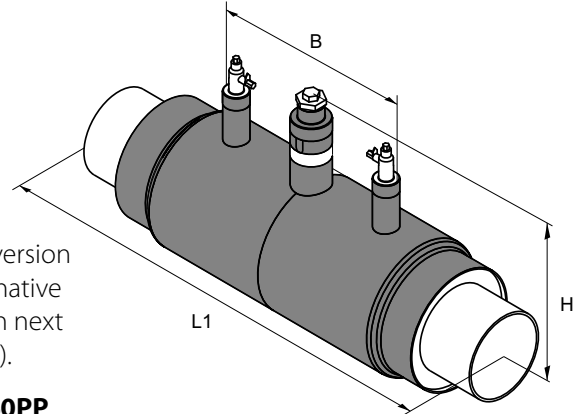
Order example

Pre-insulated valve series 2 with main pipe DN 100 and vent DN 25, part number 4241-100-025-000.

Valve with 2 vent/drain units (standard) Series 1, 2, 3 and 4

PN 16/PN25

Standard version
(see alternative
version on next
page).



PART NO. 4142, 4242, 4342, 4442

KMAT 4240PP

Main pipe DN	L1 Standard [mm]	B [mm]	H [mm]	Wrench size [mm]	Vent/drain DN [mm]	D [mm]	Change in B dimension for larger dim of vent/drain
25	1 500	610	382	19	25	110	+0
32	1 500	610	388	19	40	110	+0
40	1 500	610	401	19	50	125	+15
50	1 500	610	406	19	65	140	+30
65	1 500	610	415	19			
80	1 500	610	426	19			
100	1 500	610	450	27			
125	1 500	610	455	27			
150	1 500	610	475	27			
200	1 500	610	517	50			
250	1 500	810	560	50			
300	1 800	810	610	50			
350	1 800	810	830				
400	2 000	1 010	909				
500	2 200	1 210	947				
600	2 400	1 310	1 020				

NB The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

The end cap shall not lie continuously under water.

Backfilling may not reach the end cap, alarm wire or marking tape.

H-dimension is up to mount for T-key up to and including DN300, including fixed gear. The alarm wire is accessible from outside the sealing. For fixed gear, order alarm wire placement separately. The pipe has a ball valve as standard, but is also available with a gate valve or valve with full bore. Valves can come with T-key, portable planetary gear, fixed gear, hydraulic or electronic actuator. See Accessories, Chapter 8. Comes with end cap as standard. The valve stem for vent/drain unit is oriented towards the stop valve. Vent/drain valves are available in dimensions DN 25, DN 40, DN 50 and DN 65.

Stop valve available with stem extension 250, 500, 750, 1000, 1250 or 1500 mm for DN25-DN300 as standard.

As standard, the valve is delivered as follows:

- 1) DN 25-DN150 with mount for T-key.
- 2) DN 200-DN 300 with mount for portable gear.
- 3) DN 350-DN 900 with fixed gear and wire placement are ordered separately.

Order example

Pre-insulated valve series 2 with main pipe DN 100 and vent DN 25, part number 4242-100-025-000.

Part no. series 1

4142-DN main pipe-DN venting-000

Part no. series 2

4242-DN main pipe-DN venting-000

Part no. series 3

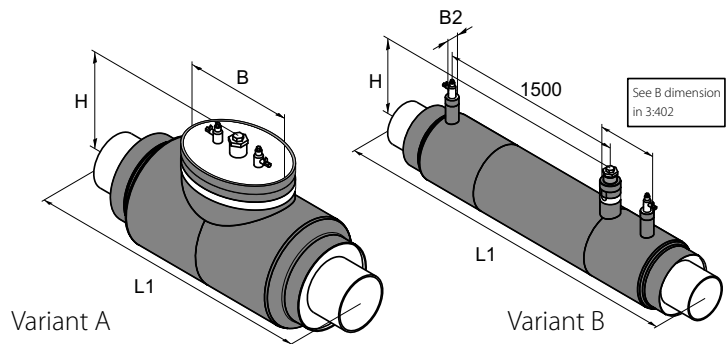
4342-DN main pipe-DN venting-000

Part no. series 4

4442-DN main pipe-DN venting-000

Valve with 2 vent/ drain units (Variant A and B) Series 1, 2, 3 and 4

PN 16/PN25



PART NO. 4142, 4242, 4342, 4442

KMAT 4242PP

Main pipe DN	L1 622 [mm]	L1 637 [mm]	H [mm]	B [mm]	Wrench size [mm]	Vent/drain	
						DN [mm]	B2 [mm]
25	1 500	2 750	382	350	19	25	110
32	1 500	2 750	388	350	19	40	110
40	1 500	2 750	401	350	19	50	125
50	1 500	2 750	406	350	19	65	140
65	1 500	2 750	415	350	19		
80	1 500	2 750	426	394	19		
100	1 500	2 750	450	394	27		
125	1 500	2 750	455	285	27		
150	1 500	2 750	475	285	27		
200	1 500	2 750	517	355	50		
250	1 500	2 850	560	355	50		
300	1 800	2 850	610	355	50		
350	1 800	2 850	830				
400	2 000	2 950	909				
500	2 200	3 050	947				
600	2 400	3 150	1 020				

H-dimension is up to mount for T-key up to and including DN300, in addition including fixed gear. The B dimension for variant A applies to purging/draining DN25. As standard, the alarm wires are connected through the stainless end cap. For fixed gear, order alarm wire placement separately. The pipe has a ball valve as standard, but is also available with a gate valve or valve with full bore. Valves can come with T-key, portable planetary gear, fixed gear, hydraulic or electronic actuator. See Accessories, Chapter 8. Comes with end cap as standard. The valve stem for vent/drain unit is oriented towards the stop valve. Vent/drain valves are available in dimensions DN 25, DN 40, DN 50 and DN 65. Stop valve available with stem extension 250, 500, 750, 1000, 1250 or 1500 mm for DN25-DN300 as standard.

As standard, the valve is delivered as follows:

- 1) DN 25-DN150 with mount for T-key.
- 2) DN 200-DN 300 with mount for portable gear.
- 3) DN 350-DN 900 with fixed gear and wire placement are ordered separately.

Variant A has **suffix -622** Variant B has **suffix -637**

Variant A with alarm box has **suffix -722**.

NB The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

The end cap shall not lie continuously under water.

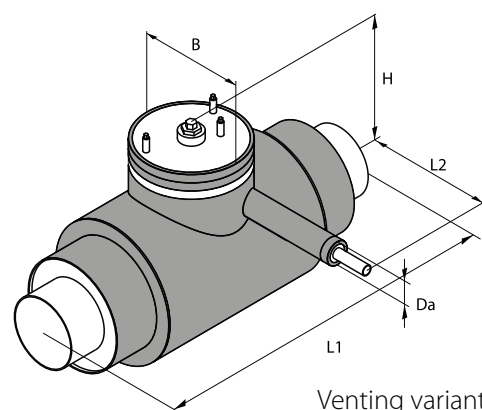
Backfilling may not reach the end cap, alarm wire or marking tape.

Order example

Valve series 2 with main pipe DN 300 and vent DN 40 in variant A, part number 4242-300-040-622.
Variant B, part number 4242-300-040-637

Combination valves Series 1, 2, 3 and 4

PN 16/PN25



Venting variant

PART NO. 4841, 4842, 4843, 4844			KMAT 4250PP				
Main pipe	Dy	Bypass	L1	L2	Da	B	H
DN	Series 2 [mm]	valves DN (3 pcs)	[mm]	[mm]	[mm]	[mm]	[mm]
100	225	25	1 800	650	110	415	450
125	250	25	1 800	650	110	415	455
150	280	32	1 800	700	125	415	475
200	355	40	1 800	700	125	415	518
250	450	40	1 800	700	125	450	559
300	500	50	2 100	750	140	450	610

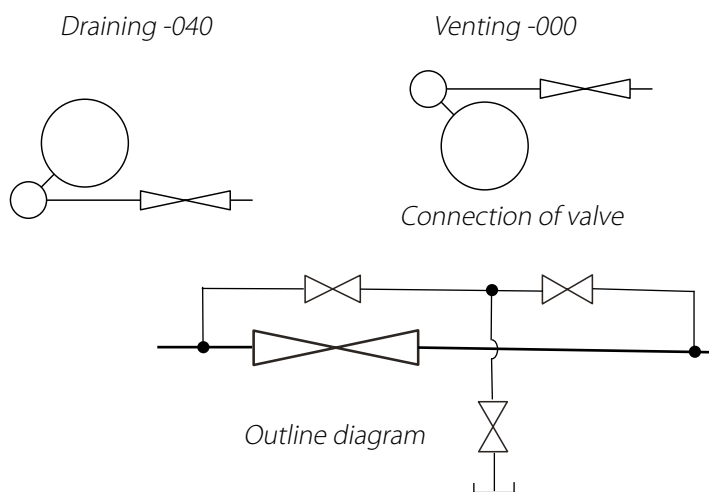
Dimensions in the table apply to the venting variant. H-dimension is up to mount for T-key. As standard, the alarm wires are connected through the stainless end cap. The pipe has a ball valve as standard, but is also available with a gate valve or valve with full bore. T-key and portable planetary gear can be supplied for valves. Comes with end cap as standard. For design with gear, see next page. Can be customised to specific requirements. Stop valve, outlet pipe and sealing are manufactured in stainless material. The valve stem for vent/drain unit is oriented towards the stop valve. Stop valve available with stem extension 250, 500, 750, 1000, 1250 or 1500 mm for DN25-DN300 as standard.

As standard, the valve is delivered as follows:

- 1) DN 100-DN 150 with mount for T-key.
- 2) DN 200-DN 300 with mount for portable gear.

The variant with drain has **suffix -040**

The variant with venting has **suffix -000**



NB

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

The valve must be operated at least twice a year in order to ensure good function.

For care instructions for valves, see Chapter 10.

The sealing shall not lie continuously under water.

Backfilling may not reach the sealing, alarm wire or marking tape.

Part no. 1

4841-DN-000-000.

Part no. 3

4843-DN-000-000.

Part no. 2

4842-DN-000-000.

Part no. 4

4844-DN-000-000.

Order example

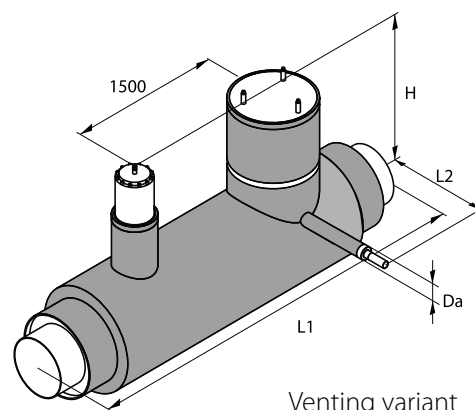
Combination valve for DN 200 Series 3, part number 4843-200-000-000.

Combination valves with gear Series 1, 2, 3 and 4

PN 16/PN25

KMAT 4250PP

PART NO. 4841, 4842, 4843, 4844 in version 637 and 635



Venting variant

Main pipe DN	Dy Series 2 [mm]	Bypass valves DN (3 pcs)	L1 [mm]	L2 [mm]	Da [mm]	H [mm]
350	560	50	3 200	800	140	830
400	680	50	3 400	800	140	909
500	800	50	3 600	900	140	947

Dimensions in the table apply to the venting variant.

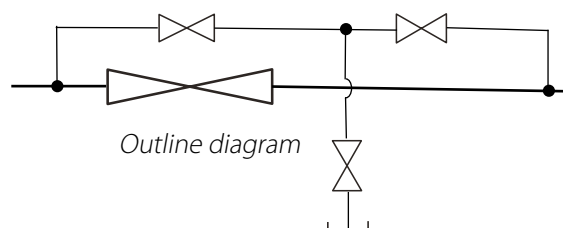
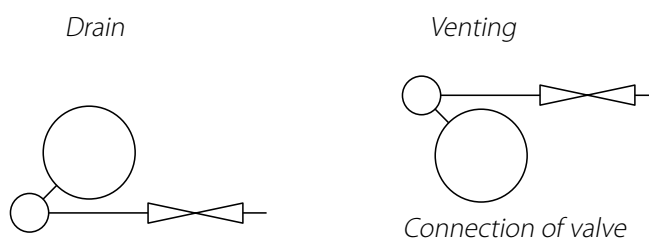
H-dimension is for fixed gear.

As standard, the alarm wires are connected through the stainless end cap.

The pipe has a ball valve as standard, but is also available with a gate valve or valve with full bore. Comes with fixed gear (standard), hydraulic or electronic actuator. Comes with end cap as standard. Can be customised to specific requirements.

Stop valve, outlet pipe and sealing are manufactured in stainless material.

The variant with drain has **suffix -637**
The variant with venting has **suffix -635**



Outline diagram

Part no.

4841-DN-000-XXX
4842-DN-000-XXX
4843-DN-000-XXX
4844-DN-000-XXX

Order example

Combination valve for DN 400 Series 3 in vent variant, part number 4843-400-000-635.

NB

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

The valve must be operated at least twice a year in order to ensure good function.

For care instructions for valves, see Chapter 10.

The sealing shall not lie continuously under water.

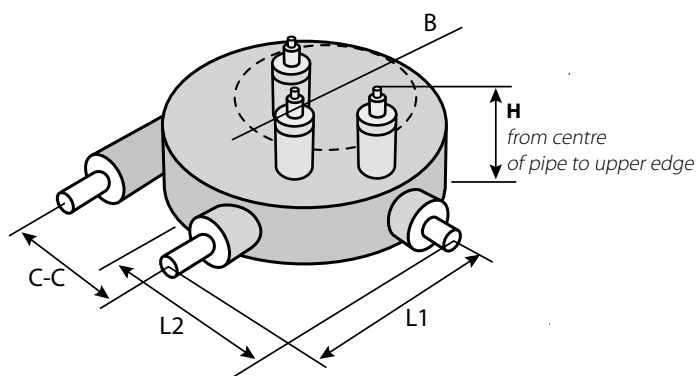
Backfilling may not reach the sealing, alarm wire or marking tape.

Valve assembly, compact Series 1, 2, 3 and 4

PN 16/PN25

KMAT 4251PP

PART NO. 4170, 4270, 4370, 4470



The image shows example of combination valve, variant right

DN	C-C	H Standard [mm]	H Min [mm]	B [mm]	L1 [mm]	L2 [mm]
25	300	382	190	357	600	600
32	380	390	200	407	670	650
40	380	400	200	425	670	670
50	455	410	210	479	780	700
65	500	415	210	517	810	730
80	530	425	225	537	820	758

The valve assembly is used for draining or venting. It is constructed so it will fit in a standard manhole. Spindle height "H" is available with standard height or min. height according to the table above. The valve assembly can be supplemented with loose stem extensions of 250, 500, 750, 1000, 1250 or 1500 mm. See Accessories, Chapter 8. The outlet pipe is manufactured in stainless material. The valve is delivered with an end cap for the spindle as standard.

Alarm wires not accessible as standard, but can be ordered.

As standard, the valve is delivered as follows:

1) DN 25-DN150 with mount for T-key.

Part no. series 1
4170-DN-000-XXX

Part no. series 2
4270-DN-000-XXX

Part no. series 3
4370-DN-000-XXX

Part no. series 4
4470-DN-000-XXX

Outlet 90° right has **suffix -032** (see image)

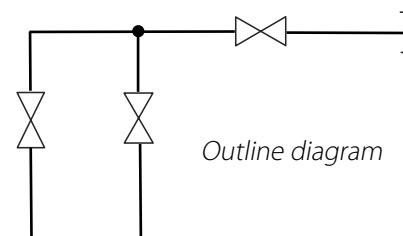
Outlet 90° left has **suffix -031**

For valve assemblies with minimal stem height, -000- is replaced with Hmin.

Order example

Valve assembly, compact, left Series 2 dim DN 50, part number 4270-050-000-031.

When ordering minimal spindle height, state as below: Valve assembly, compact, left, Series 2. DN 50 with minimal spindle height, part number 4270-050-210-031.



NB

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

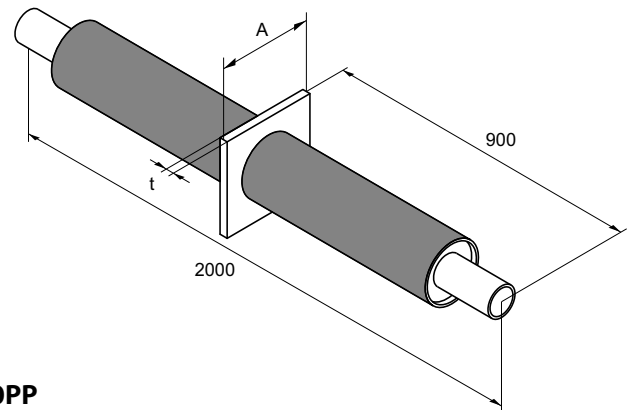
The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

The sealing shall not lie continuously under water.

Backfilling may not reach the end cap, alarm wire or marking tape.

Anchor unit, Series 1, 2, 3 and 4

PN25



PART NO. 5100, 5200, 5300, 5400

KMAT 4000PP

DN	Max load [kN] $\Delta T = 60^\circ\text{C}$	A [mm]	h [mm]	Pressure area (Series 2) [cm ²]
25	38	200	25	191
32	49	220	25	243
40	56	220	25	243
50	78	240	25	289
65	100	280	25	452
80	129	300	30	392
100	187	350	30	565
125	230	400	30	765
150	310	450	30	875
200	455	550	35	1 385
250	630	650	40	1 730
300	840	700	40	1 885
350	920	700	40	1 385
400	1 200	850	40	2 560
500	1 500	1 000	65	4 000
600	2 000	1 200	65	6 200

The anchor unit is manufactured for casting in concrete quality K 250. Design compression strength: Normal value in concrete 5 MN/m² (50 kg/cm²) and normal value in soil 0.15 MN/m² (1.5 kg/cm²).

A and t dimensions are stated above for Series 2.

Part no. series 1

5100-DN-000-000

Part no. series 2

5200-DN-000-000

Part no. series 3

5300-DN-000-000

Part no. series 4

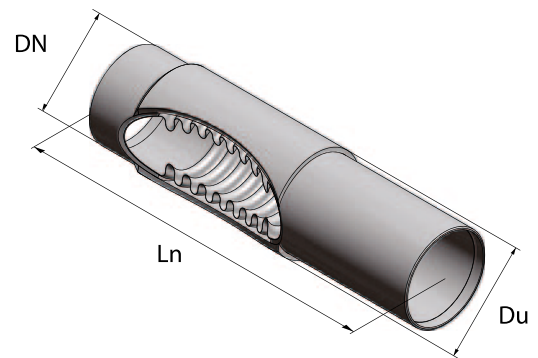
5400-DN-000-000

Order example

Anchor unit Series 1 with dim DN 200, part number 5100-200-000-000

Single-use compensator

PN 16/PN25



PART NO. 7810

DN	Movement absorption [mm]	Ln	Du
40	50	450	60
50	50	450	70
65	70	500	90
80	70	500	102
100	80	550	127
125	80	550	152
150	100	630	178
200	120	700	232
250	120	700	286
300	140	730	338
350	140	730	371
400	140	730	426
450	150	800	477
500	150	800	528
600	150	800	635
700	150	780	735
800	150	850	838

Single-use compensator is used where thermal pre-stressing cannot be carried out for practical reasons

Part no.

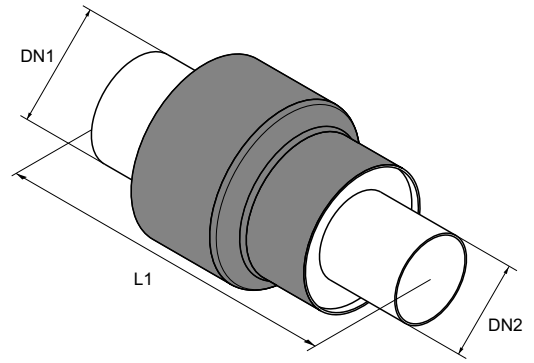
7810-DN-000-000

Order example

Single-use compensator for DN 200, part number 7810-200-000-000,
Associated sleeve is specified in Chapter 6.

Reduction pipes

PN16 – standard
PN25 – option



PART NO. 1571, 1572, 1573, 1574

KMAT 4900PP

DN1	L1 [mm]
25-50	900
65-150	1 000
200	1 100
250-800	1 500

Transition units are used for dimension transitions. An alternative to a transition unit is a steel cone + PEHD reduction.

Part no. series 1
1571-DN1-DN2-000

Part no. series 2
1572-DN1-DN2-000

Part no. series 3
1573-DN1-DN2-000

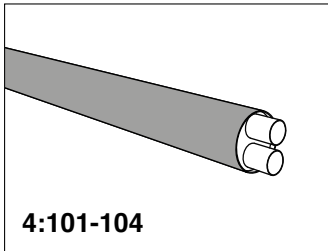
Part no. series 4
1574-DN1-DN2-000

NB

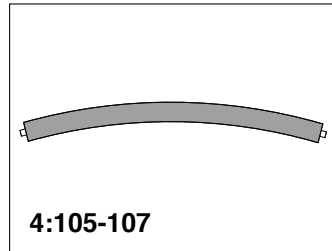
Consult with the designer to determine where the transition unit should be positioned and how large it can be.

Order example

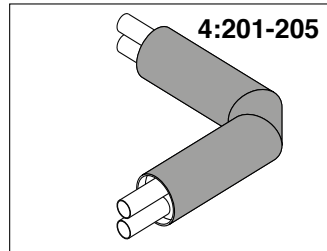
Reduction pipe Series 1 with dim DN 200 to DN 150, part number 1571-200-150-000.
If PN25, this must be stated when ordering.



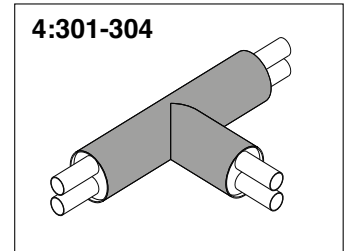
Straight pipes



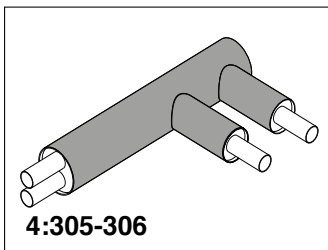
Curved pipes



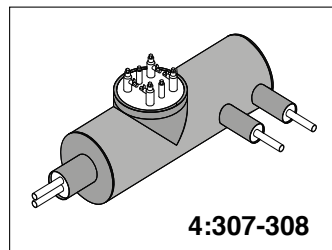
Bends



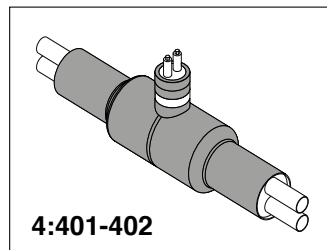
T-pieces



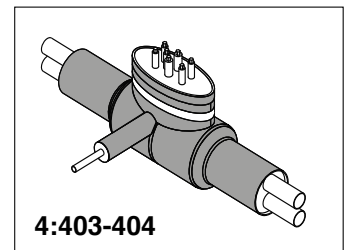
Transition unit



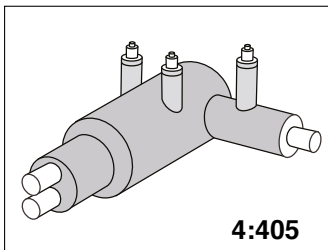
Transition valve



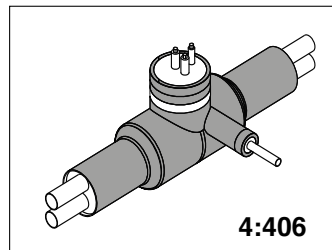
Preinsulated valves



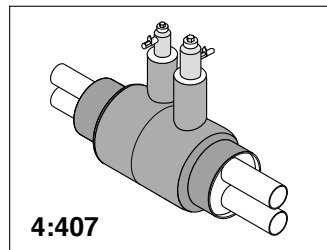
Combination valves



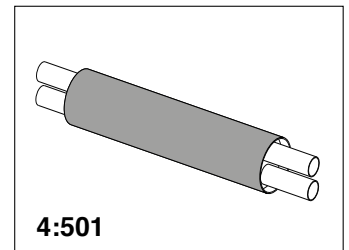
Valve assembly, compact



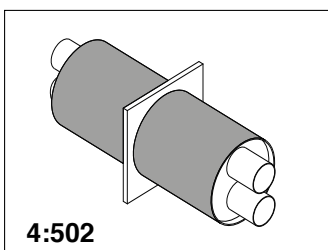
Valve assembly, direct



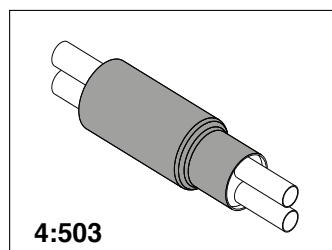
Vent/drain



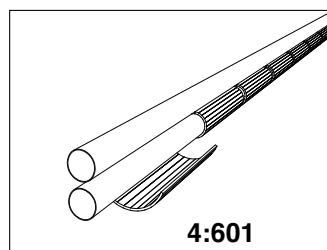
Anchor units



Anchor units



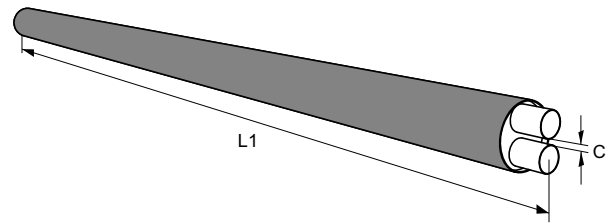
Reduction pipes



Straight pipe, super insulated

Straight pipe, standard (Series 1)

PN25



PART NO. 1503, 1504, 1505

KMAT 2090PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]	C [mm]
20	26.9 x 2.6	125 x 3.0	6.1	0.8	19
25	33.7 x 2.6	140 x 3.0	7.1	1.2	19
32	42.4 x 2.6	160 x 3.0	9.1	2.2	19
40	48.3 x 2.6	160 x 3.0	9.6	3.0	19
50	60.3 x 2.9	200 x 3.2	13.1	4.6	20
65	76.1 x 2.9	225 x 3.4	16.5	7.0	20
80	88.9 x 3.2	250 x 3.6	20.7	10.6	25
100	114.3 x 3.6	315 x 4.1	30.7	18.0	25
125	139.7 x 3.6	400 x 4.8	41.5	27.6	30
150	168.3 x 4.0	450 x 5.2	51.0	40.4	40
200	219.1 x 4.5	560 x 6.0	76.0	69.4	45

**For heat losses and
transmission capacity see
p. 9:301-**

Powerpipe's double pipes are normally laid with the supply pipe at the bottom.

Part no. Standard, 12 m: 1503-DN-000-000 can be ordered from dim DN 20-DN200

Part no. Standard, 16 m: 1504-DN-000-000 can be ordered from dim DN 100-DN200

Part no. Standard, 18 m: 1505-DN-000-000 can be ordered from dim DN 150-DN200

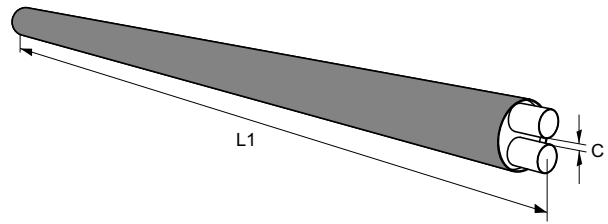
Can also be ordered in 6 m lengths: 1502-DN-000-000

Order example

Straight pipe Double Standard, L1 = 12 m with dim DN 200, part number 1503-200-000-000.

Straight pipe, double+ (Series 2)

PN25



PART NO. 1603, 1604, 1605

KMAT 2090PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]	C [mm]
20	26.9 x 2.6	140 x 3.0	6.7	0.8	19
25	33.7 x 2.6	160 x 3.0	7.8	1.2	19
32	42.4 x 2.6	180 x 3.0	9.9	2.2	19
40	48.3 x 2.6	180 x 3.0	10.3	3.0	19
50	60.3 x 2.9	225 x 3.4	14.0	4.6	20
65	76.1 x 2.9	250 x 3.6	17.6	7.0	20
80	88.9 x 3.2	280 x 3.9	22.8	10.6	25
100	114.3 x 3.6	355 x 4.5	33.9	18.0	25
125	139.7 x 3.6	450 x 5.2	46.3	27.6	30
150	168.3 x 4.0	500 x 5.6	56.5	40.4	40
200	219.1 x 4.5	630 x 6.6	82.9	69.4	45

**For heat losses and
transmission capacity see
p. 9:301-**

Powerpipe's double pipes are normally laid with the supply pipe at the bottom.

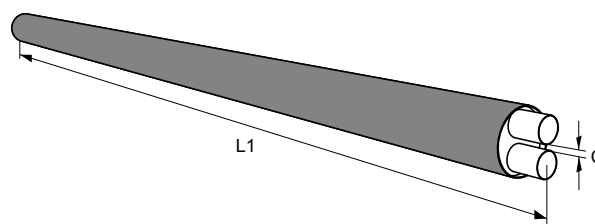
Part no. Double+, 12 m: 1603-DN-000-000 can be ordered from dim DN 20-DN200
 Part no. Double+, 16 m: 1604-DN-000-000 can be ordered from dim DN100-DN200
 Part no. Double+, 18 m: 1605-DN-000-000 can be ordered from dim DN150-DN200
 Can also be ordered in 6 m lengths: 1602-DN-000-000

Order example

Straight pipe Double+ Series 2, L1 = 12 m with dim DN 200, part number 1603-200-000-000.

Straight pipe, double++ (Series 3)

PN25



PART NO. 1703, 1704, 1705

KMAT 2090PP

DN	Service pipe DYxS [mm]	Casing DYxS [mm]	Weight [kg/m]	Water content [l/m]	C [mm]
20	26.9 x 2.6	160 x 3.0	7.4	0.8	19
25	33.7 x 2.6	180 x 3.0	8.5	1.2	19
32	42.4 x 2.6	200 x 3.2	10.6	2.2	19
40	48.3 x 2.6	200 x 3.2	11.1	3.0	19
50	60.3 x 2.9	250 x 3.6	15.1	4.6	20
65	76.1 x 2.9	280 x 3.9	19.7	7.0	20
80	88.9 x 3.2	315 x 4.1	24.9	10.6	25
100	114.3 x 3.6	400 x 4.8	37.8	18.0	25
125	139.7 x 3.6	500 x 5.6	51.8	27.6	30
150	168.3 x 4.0	560 x 6.0	63.7	40.4	40
200	219.1 x 4.5	710 x 7.2	91.2	69.4	45

**For heat losses and
transmission capacity see
p. 9:301-**

*) Is also available with jacket pipe 180 x 3.0

Powerpipe's double pipes are normally laid with the supply pipe at the bottom.

Part no. Double++, 12 m: 1703-DN-000-000 can be ordered from dim DN 20-DN200

Part no. Double++, 16 m: 1704-DN-000-000 can be ordered from dim DN100-DN200

Part no. Double++, 18 m: 1705-DN-000-000 can be ordered from dim DN150-DN200

Can also be ordered in 6 m lengths: 1702-DN-000-000

Order example

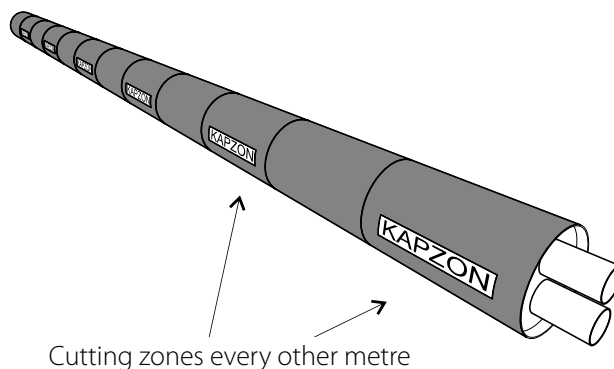
Straight pipe Double++, L1 = 12 m with dim DN 2x200, part number 1703-200-000-000.

Cut-to-length pipes Series 1, 2 and 3

PN25

KMAT 2496PP

PART NO. 1513, 1613, 1713 (12m), 1514, 1614, 1714 (16 m)



Cutting zones every other metre

L = 12 m

Part no.

1513-DN-000-000 (STANDARD)

1613-DN-000-000 (DOUBLE+)

1713-DN-000-000 (DOUBLE++)

L = 16 m

Part no.

1514-DN-000-000 (STANDARD)

1614-DN-000-000 (DOUBLE+)

1714-DN-000-000 (DOUBLE++)

General

Cut-to-length pipes are manufactured for all dimensions. In these pipes, the steel pipe is clad with foil every other metre, allowing the insulation material to be removed easily. The parts covered with foil are clearly marked on the outside of the casing. The entire cut-to-length pipe or parts of it can be installed at any point in the system.

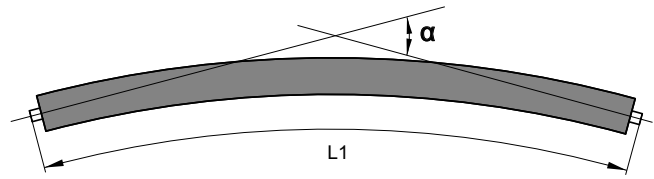
For other information, see Straight pipes.

Order example

Cut-to-length pipe, Double pipe, DN 2x100, STANDARD, part number 1513-100-000-000.

Curved pipes Series 1, 2 and 3

PN25



PART NO. 1523, 1623, 1723 (12 m)

PART NO. 1524, 1624, 1724 (16 m)

KMAT 2095PP

Double pipes DN	Maximum deflection		Note
	L1 = 12 m	L1 = 16 m	
25 - 65	30°		Can be bent along the entire length.
80	35°		Bent in the factory
100	30°	18°	Bent in the factory
125	32°	21°	Bent in the factory
150	32°	24°	Bent in the factory
200	27°	30°	Bent in the factory

Manufacturing tolerance DN 2x80 - 2x200 +/- 2°

Curved pipes are manufactured for horizontal deflection. For vertical deflection, see page "Profile bends".

Part no. (applies to 12 m)

1523-DN-xxx-000 (STANDARD)

1623-DN-xxx-000 (DOUBLE+)

1723-DN-xxx-000 (DOUBLE++)

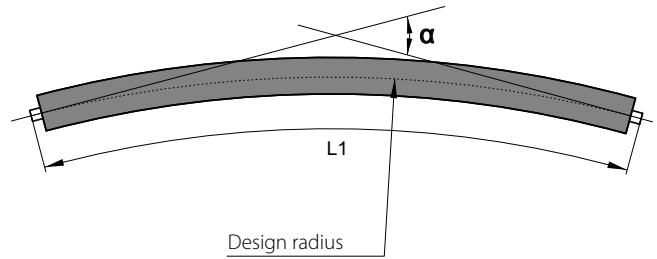
xxx = Degrees

Order example

Curved pipe Double pipe, L1 = 12 m with dim DN 2x100, STANDARD, bend 15°, part number 1523-100-015-000.

Curved pipes Deflection Design radius

PN25



RELATIONSHIP BETWEEN DEFLECTION AND DESIGN RADIUS

Deflection	Design radius L = 12 m	Deflection	Design radius L = 12 m
1°	690	21°	33.0
2°	345	22°	31.0
3°	230	23°	30.0
4°	170	24°	29.0
5°	140	25°	28.0
6°	115	26°	27.0
7°	98	27°	26.0
8°	86	28°	25.0
9°	76	29°	24.0
10°	69	30°	23.2
11°	62	31°	22.5
12°	57	32°	21.8
13°	53	33°	21.1
14°	49	34°	20.5
15°	46	35°	20.0
16°	43	36°	19.4
17°	40	37°	18.9
18°	38	38°	18.4
19°	36	39°	18.0
20°	34	40°	17.5

For technical reasons, pipes cannot be bent along their entire length. Some straight pipe occurs at each pipe end. For DN < 100, 1-1.5 m and for DN ≥ 100 approx. 2 m.

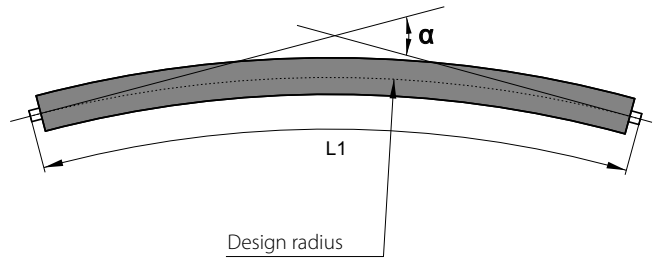
This deviation from the ideal radius can be compensated for by making the pipe trench wider at the centre of the pipe.

The extra width should be ≈ 200 mm for a deflection of < 10°

The extra width should be ≈ 500 mm for a deflection of > 10°

Curved pipes Elastic radius

PN25



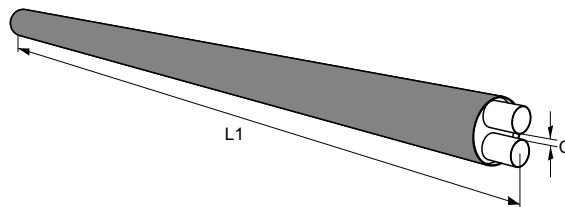
ELASTIC RADIUS

DN	Elastic radius m	Deflection/ 12 m
25	15	45°
32	19	35°
40	21	31°
50	27	25°
65	34	20°
80	40	17°
100	52	13°
125	63	11°
150	76	9°
200	98	7°

The table above shows the elastic radius, i.e. when the steel pipe is plasticised. In other words, this is the least deflection that can be manufactured while retaining the form.

Straight pipe, super insulated hybrid pipe with vacuum panel Series 1, 2 and 3

PN25



PART NO. 1503, 1603, 1703

DN	Service pipe DYxS [mm]	Casing S1 / S2 / S3 DYxS [mm]	C [mm]
20	26.9 x 2.6	125 / 140 / 160 *)	19
25	33.7 x 2.6	140 / 160 / 180	19
32	42.4 x 2.6	160 / 180 / 200	19
40	48.3 x 2.6	160 / 180 / 200	19
50	60.3 x 2.9	200 / 225 / 250	20
65	76.1 x 2.9	225 / 250 / 250	20
80	88.9 x 3.2	250 / 280 / 315	25
100	114.3 x 3.6	315 / 355 / 400	25
125	139.7 x 3.6	400 / 450 / 500	30
150	168.3 x 4.0	450 / 500 / 500	40

For heat losses and transmission capacity see p. 9:301-

*) Is also available with casing 180

In the super insulated and patented pipe, the supply pipe is equipped with a high insulated vacuum panel. This reduces thermal losses from the supply pipe by 50%, while losses from the entire construction are reduced by 30% given temperatures in the supply and return pipes and ground as stated in Chapter 9.

The product fulfils the requirements in EN 15698-1 and EN 253.

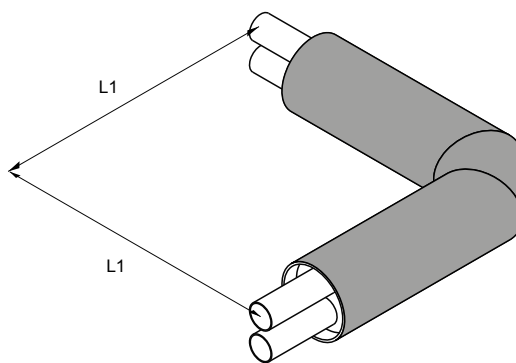
The pipe type is relatively compact but still highly efficient and effectively reduces the installation's life cycle cost.

Order example

Super insulated pipe Double++ Dn2x100, part no. 1703-100-000-**857**

Bend - Horizontal

PN25



PART NO. 2500, 2600, 2700

KMAT 2590PP

DN	Service pipe Dy x s [mm]	STANDARD	DOUBLE+	DOUBLE++	L1 [mm]
		2500	2600	2700	
		Casing DY [mm]	Casing DY [mm]	Casing DY [mm]	
20	26.9 x 2.0	125	140	160*	1 000
25	33.7 x 2.3	140	160	180	1 000
32	42.4 x 2.6	160	180	200	1 000
40	48.3 x 2.6	160	180	200	1 000
50	60.3 x 2.9	200	225	250	1 000
65	76.1 x 2.9	225	250	280	1 000
80	88.9 x 3.2	250	280	315	1 000
100	114.3 x 3.6	315	355	400	1 000
125	139.7 x 3.6	400	450	500	1 000
150	168.3 x 4.0	450	500	560	1 500
200	219.1 x 4.5	560	630	710	1 500

*) Is also available with casing 180 (KMAT 2800PP)

The standard bend is 90°

Other bends, such as 75°, 60°, 45°, 30° and 15° and/or other leg lengths can be supplied on request

Part no.

2500-DN-degrees-000 (STANDARD)

2600-DN-degrees-000 (DOUBLE+)

2700-DN-degrees-000 (DOUBLE++)

Space for sleeve

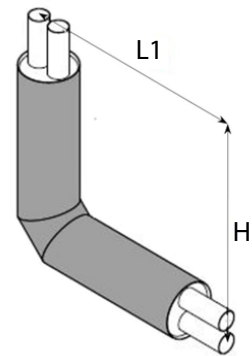
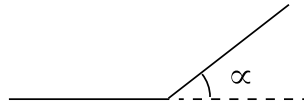
To have space for the sleeve when installing
DN ≤ 2x125, an extended leg 1500 x 1500 mm is
available. State **suffix -302**

Order example

Curved double pipe with dim DN 2x80, 90°, standard version, part number 2500-080-900-000.

Termination bend – Vertical

PN25



TERMINATION BEND 2510, 2610, 2710

KMAT 2591PP

DN	Service pipe Dy x s [mm]	STANDARD	DOUBLE+	DOUBLE++	L1 [mm]	H [mm]
		2510 Casing DY [mm]	2610 Casing DY [mm]	2710 Casing DY [mm]		
20	26.9 x 2.0	125	140	160*	1500	1500
25	33.7 x 2.3	140	160	180	1500	1500
32	42.4 x 2.6	160	180	200	1500	1500
40	48.3 x 2.6	160	180	200	1500	1500
50	60.3 x 2.9	200	225	250	1500	1500
65	76.1 x 2.9	225	250	280	1500	1500
80	88.9 x 3.2	250	280	315	1500	1500
100	114.3 x 3.6	315	355	400	1500	1500
125	139.7 x 3.6	400	450	500	1500	1500
150	168.3 x 4.0	450	500	560	1500	1500

*) Is also available with casing 180 (KMAT 2800PP)

Termination bends are delivered as standard with $\alpha = 90^\circ$ deflection. Other leg lengths and other deflections can be supplied upon request.

The termination bend is also available in a version with riser rotation 90° . See figure below.

Part no.

2510-DN-000-000 (STANDARD)

2610-DN-000-000 (DOUBLE+)

2710-DN-000-000 (DOUBLE++)

Can be ordered with end cap (suffix **-811**) with accessible alarm wires, see Chapter 8.

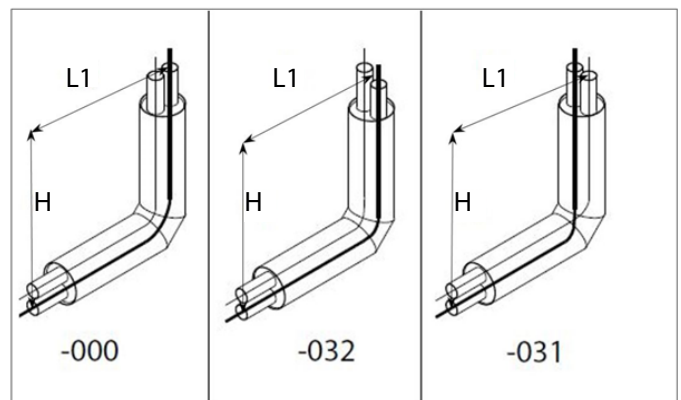
Pipe under - right, suffix **-032**

Pipe under - left, suffix **-031**

NB Plastic protection should be retained until installation takes place.

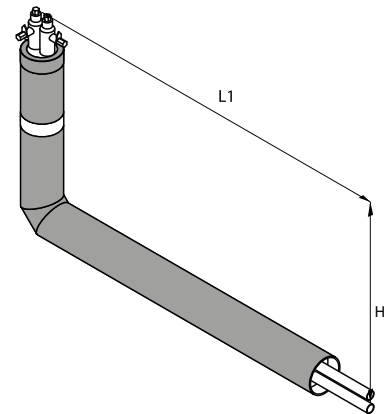
Order example

Termination bend double pipe with dim DN 2x50, standard version under - riser right, part number 2510-050-000-032.



Connection bend for façade installation, DN 20-25

PN 16/PN25



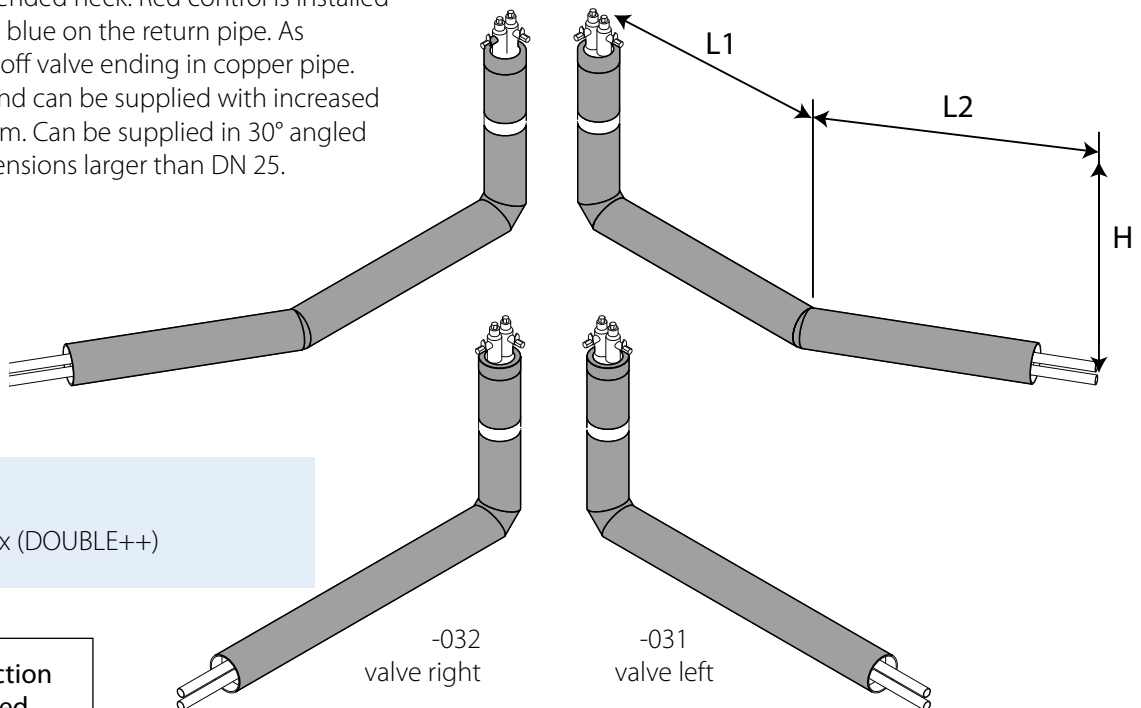
PART NO. 2540, 2640, 2740

KMAT 2593PP

DN	Service pipe Dy x s [mm]	Double++ 2740 Casing Dy [mm]
20	26.9 x 2.0	160
25	33.7 x 2.3	180

L1, L2 and H are stated separately in the order. Standard lengths are L1=1.5 m and H=0.9 m.

Connector bend for façade installation is supplied with valve with extended neck. Red control is installed on the supply pipe, blue on the return pipe. As standard with shut off valve ending in copper pipe. The connection bend can be supplied with increased leg length - max. 6 m. Can be supplied in 30° angled version and in dimensions larger than DN 25.



Part no.

2740-DN-xxx-xxx (DOUBLE++)

NB Plastic protection should be retained until installation takes place.

Order example

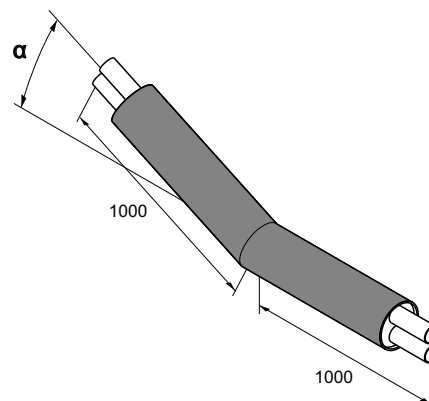
Connection valve for façade installation, DN 2x25 with handle right, part no. 2740-025-xxx-**032**

NB The valve must be operated at least twice a year in order to ensure good function.

For care instructions for valves, see Chapter 10.

Profile bends

PN25



PROFILE BENDS 2520, 2620, 2720

KMAT 2594PP

DN	Service pipe Dy x s [mm]	STANDARD 2520 Casing DY [mm]	DOUBLE+ 2620 Casing DY [mm]	DOUBLE++ 2720 Casing DY [mm]
25	33.7 x 2.3	140	160	180
32	42.4 x 2.6	160	180	200
40	48.3 x 2.6	160	180	200
50	60.3 x 2.9	200	225	250
65	76.1 x 2.9	225	250	280
80	88.9 x 3.2	250	280	315
100	114.3 x 3.6	315	355	400
125	139.7 x 3.6	400	450	500
150	168.3 x 4.0	450	500	560
200	219.1 x 4.5	560	630	710

The bend is available with a choice of angle.

NB Plastic protection should be retained until installation takes place.

Part no.

2520-DN-xxx-000 (STANDARD)

2620-DN-xxx-000 (DOUBLE+)

2720-DN-xxx-000 (DOUBLE++)

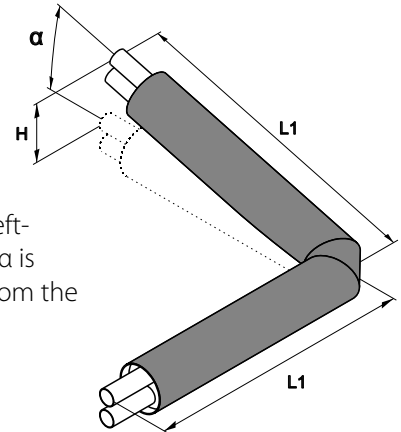
xxx = Degrees.

Order example

Profile bend double pipe with dim DN 2x80. version with 8° deflection. part number 2520-080-008-000.

Bend out of plane

PN25



The image shows the left-handed version. Angle α is defined positively up from the horizontal plane

PART NO. 2530, 2630, 2730

KMAT 2595PP

DN	Service pipe Dy x s [mm]	STANDARD	DOUBLE+	DOUBLE++	L1 x L1 [mm]
		2530	2630	2730	
		Casing DY [mm]	Casing DY [mm]	Casing DY [mm]	
25	33.7 x 2.3	140	160	180	1 000 x 1 000
32	42.4 x 2.6	160	180	200	1 000 x 1 000
40	48.3 x 2.6	160	180	200	1 000 x 1 000
50	60.3 x 2.9	200	225	250	1 000 x 1 000
65	76.1 x 2.9	225	250	280	1 000 x 1 000
80	88.9 x 3.2	250	280	315	1 000 x 1 000
100	114.3 x 3.6	315	355	400	1 000 x 1 000
125	139.7 x 3.6	400	450	500	1 000 x 1 000
150	168.3 x 4.0	450	500	560	1 500 x 1 500x)
200	219.1 x 4.5	560	630	710	1 500 x 1 500x)

90° bend out of plane to absorb changes in profile direction. Standard angle in plane is 90°. Choice of profile deflection.

α°	3	5	7.5	10	12.5	15	20	25
h, vertical [mm] where L= 1000 mm	50	90	130	170	215	260	340	420
x) h, vertical [mm] where L= 1500 mm	80	130	195	260	325	390	515	635

Part no.

2530-DN-000-032

2530-DN-000-031

STANDARD, right-hand version

STANDARD, left-hand version

2630-DN-000-032

2630-DN-000-031

DOUBLE+, right-hand version

DOUBLE+, left-hand version

2730-DN-000-032

2730-DN-000-031

DOUBLE++, right-hand version

DOUBLE++, left-hand version

NB Plastic protection should be retained until installation takes place.

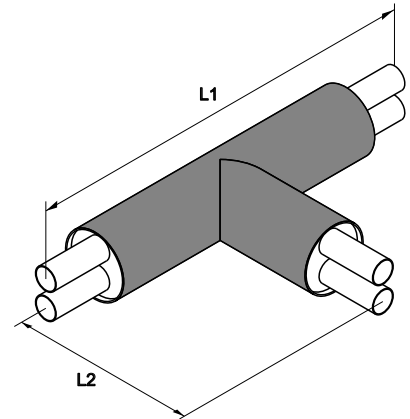
Order example

Bend double pipe with dim DN 2x80, 90°, right-hand version, part number

2530-080-000-032. Angle for deviation in profile is stated in separate row. Angle α in the figure is calculated as positive, i.e. upwards in the above image. Negative angle for downwards.

T-piece

PN25



PART NO. 3510, 3610, 3710

KMAT 3490PP

Main pipe DN	L1 [mm]	L2 [mm]	DN	STANDARD	DOUBLE+	DOUBLE++
				3510	3610	3710
				Casing Dy [mm]	Casing Dy [mm]	Casing Dy [mm]
DN25-40	1 100	700	25	140	160	180
DN50-65	1 200	700	32	160	180	200
DN80-100	1 300	700	40	160	180	200
DN125	1 500	750	50	200	225	250
DN150	1 600	800	65	225	250	280
DN200	1 700	1 000	80	250	280	315
			100	315	355	400
			125	400	450	500
			150	450	500	560
			200	560	630	710

T-pieces are delivered in reinforced version and with increased wall thickness. Branches can be designed without expansion bends. A branch cannot be designed with dimensions larger than the main pipe.

Space for sleeve

To safely have space for the sleeve during installation of the T-piece, the product is available in extended version.

State L1 and L2 when ordering.

Part no.

3510-DN main pipe-DN branch-000 (STANDARD)

3610-DN main pipe-DN branch-000 (DOUBLE+)

3710-DN main pipe-DN branch-000 (DOUBLE++)

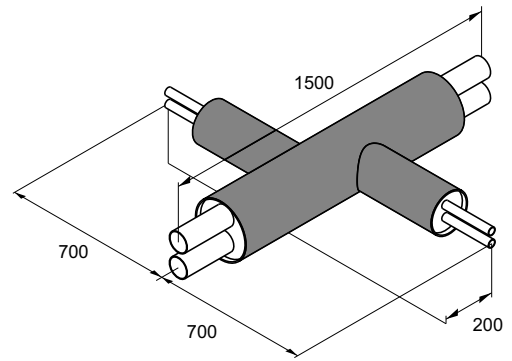
Order example

T-piece double pipe with main pipe DN 2x100 and branch DN 2x50, standard version, part number 3510-100-050-000.

Or (extended T-piece), part number 3510-100-050-XXX with associated L1 and L2.

Cross-piece

PN25



PART NO. 3570, 3670, 3770

KMAT 3495PP

Main pipe DN	Branch DN	DN	STANDARD	DOUBLE+	DOUBLE++
			3570	3670	3770
			Casing Dy [mm]	Casing Dy [mm]	Casing Dy [mm]
25-200	25-65	25	140	160	180
		32	160	180	200
		40	160	180	200
		50	200	225	250
		65	225	250	280
		80	250	280	315
		100	315	355	400
		125	400	450	500
		150	450	500	560
				200	560

T-pieces are delivered in reinforced version and with increased wall thickness.

Branches can be designed without expansion bends. A branch cannot be designed with dimensions larger than the main pipe.

Can also be supplied with branches in different dimensions, upon request

Part no.

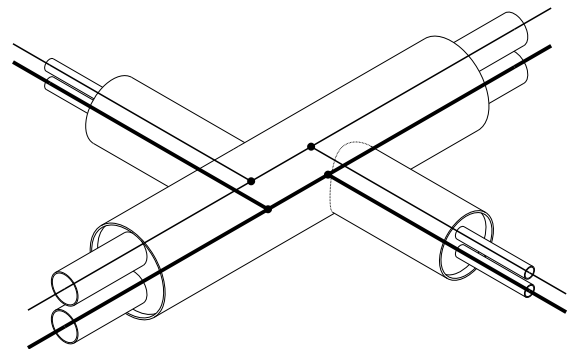
3570-DN main pipe-DN branch-000 (STANDARD)

3670-DN main pipe-DN branch-000 (DOUBLE+)

3770-DN main pipe-DN branch-000 (DOUBLE++)

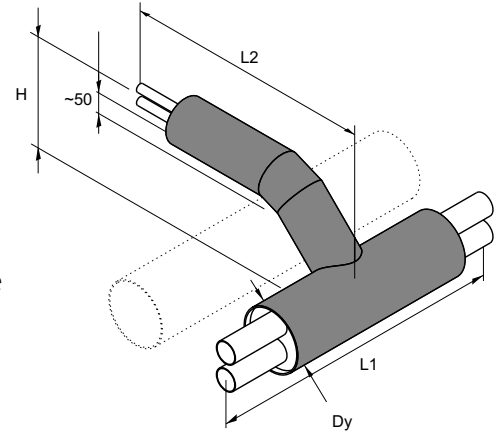
Order example

Cross-piece double pipe in standard version with main pipe DN 2x65 and branch DN 2x32, part number 3570-065-032-000.



T-piece with vertical deflection

PN25



L2 from the centre of the main pipe

PART NO. 3510, 3610, 3710

KMAT 3491PP

Main pipe DN	Branch DN	L1 [mm]	L2 [mm]	KMAT 3491PP			
				DN	STANDARD 3510 Casing Dy [mm]	DOUBLE+ 3610 Casing Dy [mm]	DOUBLE++ 3710 Casing Dy [mm]
25-100	25-100	1 200	1 000	25	140	160	180
125-200	25-100	1 200	1 200	32	160	180	200
125-200	125-200	1 500	1 500	40	160	180	200
				50	200	225	250
				65	225	250	280
				80	250	280	315
				100	315	355	400
				125	400	450	500
				150	450	500	560
				200	560	630	710

$H = D_y \text{ main pipe} + 50 \text{ mm}$ (assuming that the parallel pipe has the same dim).

T-pieces are delivered in reinforced version.

A branch cannot be designed with dimensions larger than the main pipe.

NB The branch pipe on the T-piece with bend out of plane may need an expansion bend.

Part no.

3510-DN main pipe-DN branch-**238** (STANDARD)

3610-DN main pipe-DN branch-**238** (DOUBLE+)

3710-DN main pipe-DN branch-**238** (DOUBLE++)

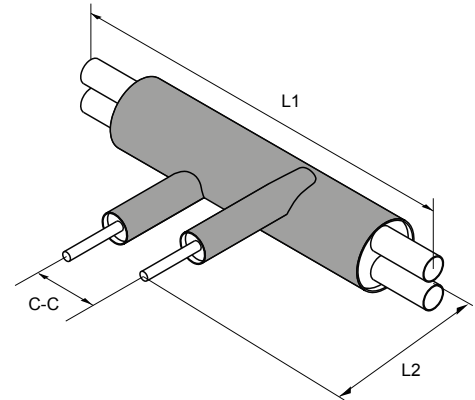
Order example

T-piece double pipe in standard version

with main pipe DN 2x100 and branch DN 2x50, part number 3510-100-050-238.

Transition T-piece Double/single

PN25



PART NO. 3520, 3620, 3720

KMAT 3492PP

Main pipe DN	Branch [mm]	L1 [mm]	L2 [mm]	Branch	c/c
DN 2x25-200	DN20-80	1500	700	20	310
				25	310
				32	325
				40	325
				50	340
				65	360
				80	380

For combinations where the branch is relatively large compared to the main pipe and a cast T-piece is used, the length can be longer.

The T-piece is delivered in reinforced version. The branch can be designed without expansion bends, in the case of thermal pre-stressing.

Standard version has branch 3520 in Series 2. 3620=S3, 3720=S4.

Part no.

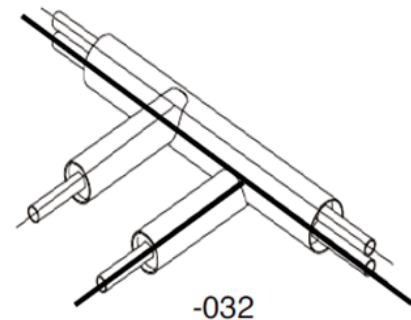
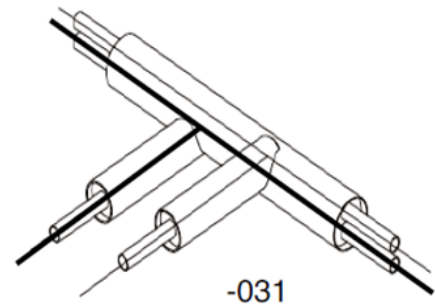
3520-DN main pipe-DN branch-000 (STANDARD)

3620-DN main pipe-DN branch-000 (DOUBLE+)

3720-DN main pipe-DN branch-000 (DOUBLE++)

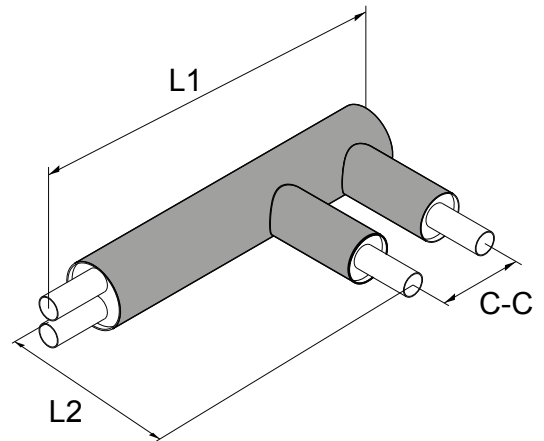
Order example

T-piece Double/single in standard version with main pipe DN 2x65 and branch DN 25 (Series 2), part number 3520-065-025-000.



Reduction unit, angle Single pipe-Double pipe

PN25



PART NO. 1580, 1680, 1780

KMAT 3072PP

Dim DN	C-C [mm]	L1 [mm]	L2 [mm]
20	265	1 586	1 000
25	265	1 586	1 000
32	280	1 593	1 000
40	280	1 610	1 000
50	305	1 630	1 000
65	330	1 603	700
80	360	1 620	700
100	435	1 740	700
125	530	1 780	700
150	580	1 835	700
200	710	2 015	900

Used as a transition between double and single pipes

NB This solution cannot absorb axial forces or expansion movements from the single pipe.
Standard version has branch 1580 in Series 2. 1680=S3, 1780=S4.

Marked steel goes together.

For design engineering, see Chapter 9:402

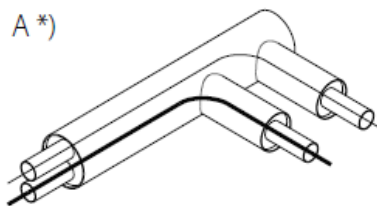
Part no.

1580-DN-000-031 (STANDARD)
1580-DN-000-032 (STANDARD)
1680-DN-000-031 (DOUBLE+)
1680-DN-000-032 (DOUBLE+)
1780-DN-000-031 (DOUBLE++)
1780-DN-000-032 (DOUBLE++)

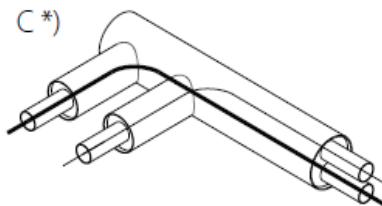
Order example

Transition unit, angle, DN 2x50, right-hand flow, STANDARD, part number 1580-050-000-032.

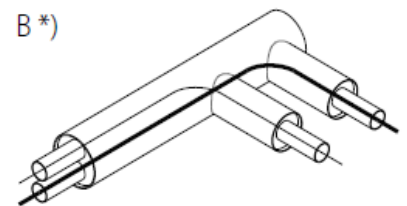
Left-hand flow with
supply line at bottom.
-031



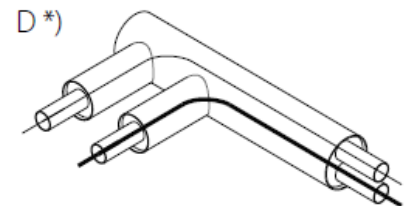
Is the same product when rotated:



Right-hand flow with
supply line at bottom.
-032



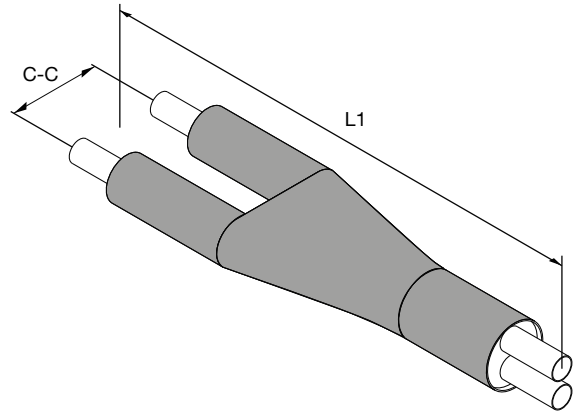
Is the same product when rotated:



*) Figure references A, B, C and D apply to part no. 4580, 4680, 4780, see page 4:307

Reduction unit, straight Single pipe-Double pipe

PN25



PART NO. 1590, 1690, 1790

KMAT 3071PP

DN	C-C [mm]	L [mm]
20	265	1 973
25	265	1 973
32	280	1 971
40	280	1 971
50	305	1 969
65	330	1 966
80	360	1 962
100	435	1 955
125	530	2 500
150	580	2 500
200	710	2 500

Used as a transition between double and single pipes in the case of large expansion forces.

Standard version has branch 1590 in Series 2. 1690=S3, 1790=S4. Marked steel goes together.

The transition pipe should be laid within the friction length corresponding to a pre-heated system, i.e. where max. axial stress is 160 mPa. See example in Chapter 9

Part no.

1590 DN main pipe-000-032 right-hand flow STANDARD

1590 DN main pipe-000-031 left-hand flow STANDARD

1690 DN main pipe-000-032 right-hand flow DOUBLE+

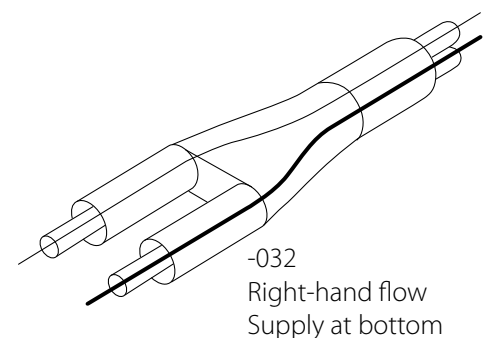
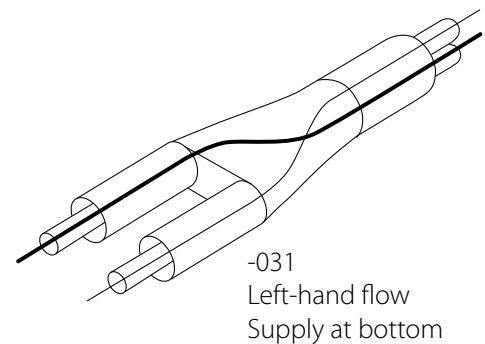
1690 DN main pipe-000-031 left-hand flow DOUBLE+

1790 DN main pipe-000-032 right-hand flow DOUBLE++

1790 DN main pipe-000-031 left-hand flow DOUBLE++

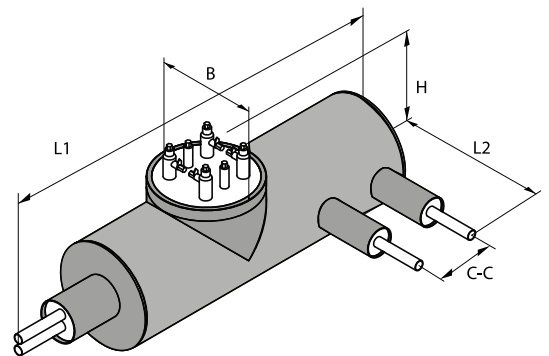
Order example

Transition unit, straight, DN 50, left-hand flow, standard version, part number 1590-050-000-031.



Transition valve angle Single pipe-Double pipe

PN 16/PN25



PART NO. 4580, 4680, 4780

KMAT 4299PP

DN	C-C [mm]	L1 * [mm]	L2 [mm]	B [mm]	H [mm]	Wrench size
20	265	1 600	1 000			19
25	265	1 600	1 000			19
32	280	1 600	1 000	295	420	19
40	280	1 700	1 000	295	435	19
50	305	1 700	1 000	295	451	19
65	330	1 800	700	295	463	19
80	360	1 900	700	295	484	19
100	435	1 900	700	415	520	27
125	530	2 500	700	415	540	27
150	580	3 000	700	415	580	27
200	710	3 200	900			50

H refers up to the shut-off device/main valve

* Approximate lengths

The alarm wire is accessible through the stainless end cap. Vent is done in DN 25. NOTE This solution cannot absorb axial forces or expansion movements from the single pipe. Standard version has branch 4580 in Series 2. 4680=S3, 4780=S4.

- 1) Supplied with mount for T-key
- 2) Supplied with mount for portable gear

The valve is delivered with an end cap for the spindle as standard.

For installation, see 9:402

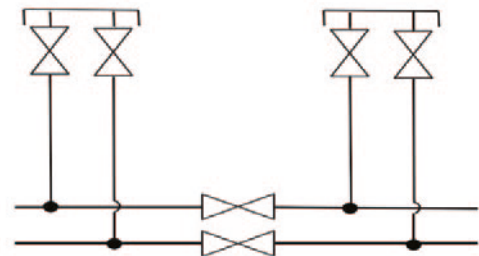
For positioning of transition valve angle, when ordering refer to one of images A, B, C or D in the description of part no. 1580, 1680, 1780.

Part no.

- 4580-DN-000-031 (STANDARD) left-hand flow
- 4580-DN-000-032 (STANDARD) right-hand flow
- 4680-DN-000-031 (DOUBLE+) left-hand flow
- 4680-DN-000-032 (DOUBLE+) right-hand flow
- 4780-DN-000-031 (DOUBLE++) left-hand flow
- 4780-DN-000-032 (DOUBLE++) right-hand flow

Ordering example

Transition valve, angle for DN2x50, left-hand flow, STANDARD, part number 4580-050-000-031



Outline diagram

NB

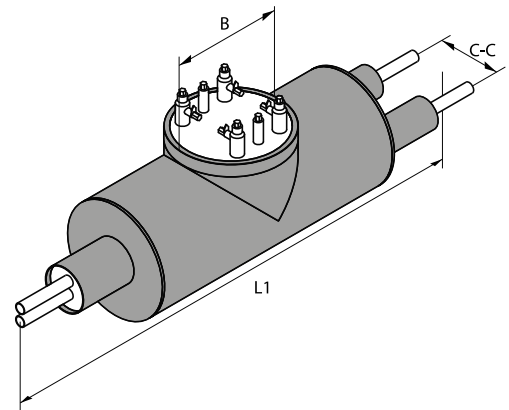
The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Transition valve, straight Single pipe-Double pipe

PN 16/PN25



PART NO. 4590, 4690, 4790

KMAT 4298PP

DN	C-C [mm]	L1 [mm]	B [mm]	H (between centre of single pipe and upper edge of main valve) [mm]
20				
25	270	2 000	315	409
32	280	2 300	315	419
40	280	2 300	315	435
50	380	2 400	315	451
65	420	2 400	315	463
80	450	2 400	315	483
100	540	2 400	340	520
125	540	3 150	355	540
150	750	3 600	450	579
200	750	3 600	500	650

1) Supplied with mount for T-key

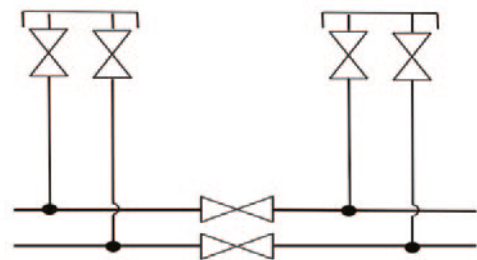
2) Supplied with mount for portable gear

The alarm wire is accessible through the stainless end cap. Vent is done in DN 25.

The valve is delivered with an end cap for the spindle as standard. The transition valve must be placed within 12-15 m from an expansion bend.

See other information under transition unit straight, Part no. 1590, 1690, 1790.

In the images -031 and -032 on p. 4:306, the centre pot is placed on the upper side.



Outline diagram

Part no.

4590-DN-000-031 (STANDARD) left-hand flow
 4590-DN-000-032 (STANDARD) right-hand flow
 4690-DN-000-031 (DOUBLE+) left-hand flow
 4690-DN-000-032 (DOUBLE+) right-hand flow
 4790-DN-000-031 (DOUBLE++) left-hand flow
 4790-DN-000-032 (DOUBLE++) right-hand flow

Ordering example

Transition valve, straight for DN 2x65 left-hand flow (DOUBLE+) part number 4690-050-000-031.

NB

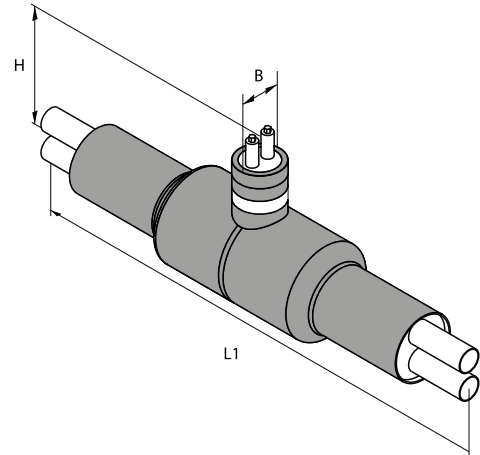
The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Preinsulated valves

PN 16/PN25



PART NO. 4500, 4600, 4700

KMAT 4290PP

DN	Service pipe, 2 pcs Dy x s [mm]	STANDARD 4500	DOUBLE+ 4600	DOUBLE++ 4700	L [mm]	H [mm]	B [mm]	Wrench size [mm]
		Casing DY [mm]	Casing DY [mm]	Casing DY [mm]				
25	33.7 x 2.3	140	160	180	1 800	409	150	19
32	42.4 x 2.6	160	180	200	1 800	422	170	19
40	48.3 x 2.6	160	180	200	1 800	435	170	19
50	60.3 x 2.9	200	225	250	1 800	451	190	19
65	76.1 x 2.9	225	250	280	1 800	463	190	19
80	88.9 x 3.2	250	280	315	2 600	483	190	19
100	114.3 x 3.6	315	355	400	2 800	519	235	27
125	139.7 x 3.6	400	450	500	3 200	540	295	27
150	168.3 x 4.0	450	500	560	3 400	578	295	27
200	219.1 x 4.5	560	630	710	3 600	652	295	50

The alarm wires are accessible through the stainless steel end cap.
The valve is delivered with an end cap for the spindle as standard.

- 1) Supplied with mount for T-key
- 2) Supplied with mount for portable gear

Part no.

4500-DN-000-000 (STANDARD)
4600-DN-000-000 (DOUBLE+)
4700-DN-000-000 (DOUBLE++)

Order example

Pre-insulated valve double pipe in standard version
with dim DN 2x100, part number 4500-100-000-000.

NB

The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

Do not backfill above the sealing.

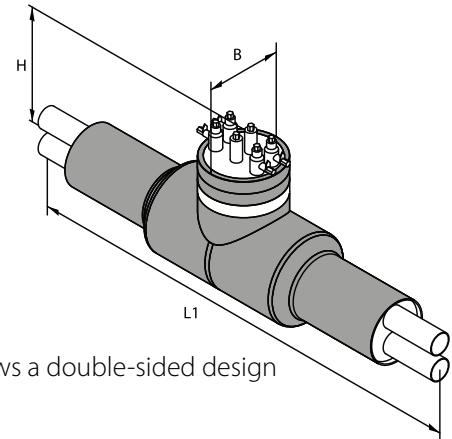
The sealing shall not lie continuously under water.

Valve with single/ double vent/drain

PN 16/PN25

KMAT 4291PP (single), KMAT 4292PP (double)

**PART NUMBER SINGLE 4541, 4641, 4741
PART NUMBER DOUBLE 4542, 4642, 4742**



The image shows a double-sided design

DN	STANDARD 4541, 4542	DOUBLE+ 4641, 4642	DOUBLE++ 4741, 4742	L1 [mm]	H [mm]	B (double) [mm]	Wrench size [mm]
	Casing DY [mm]	Casing DY [mm]	Casing DY [mm]				
25	140	160	180	2 300	409	315	19
32	160	180	200	2 300	422	315	19
40	160	180	200	2 300	440	315	19
50	200	225	250	2 400	451	315	19
65	225	250	280	2 400	463	315	19
80	250	280	315	2 600	483	315	19
100	315	355	400	2 800	519	415	27
125	400	450	500	3 200	540	415	27
150	450	500	560	3 400	578	450	27
200	560	630	710	3 600	652	500	50

H refers up to the shut-off device/main valve

The alarm wires are accessible through the stainless steel end cap. Venting and draining have same version and are produced in DN25 as standard.

- 1) Supplied with mount for T-key
- 2) Supplied with mount for portable gear

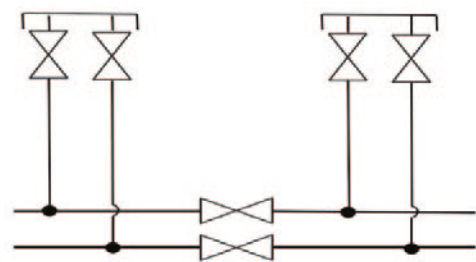
The valve is delivered with an end cap for the spindle as standard.

Part no.

4541-DN-000-000 (STANDARD) Single vent
 4542-DN-000-000 (STANDARD) Double vent
 4641-DN-000-000 (DOUBLE+) Single vent
 4642-DN-000-000 (DOUBLE+) Double vent
 4741-DN-000-000 (DOUBLE++) Single vent
 4742-DN-000-000 (DOUBLE++) Double vent

Order example

Pre-insulated valve with double vent in standard version DN 2x80, part number 4542-080-000-000.



Outline diagram

NB

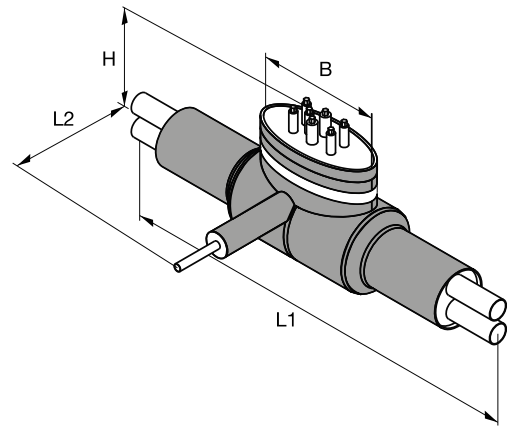
The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Combination valve, double-sided

PN 16/PN25



PART NO. 4845, 4846, 4847

KMAT 4294PP

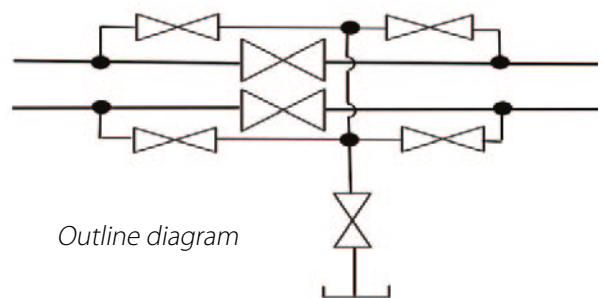
DN	Service pipe, 2 pcs Dy x s [mm]	STANDARD 4845	DOUBLE+ 4846	DOUBLE++ 4847	L1 [mm]	H [mm]	L2 [mm]	B [mm]	Wrench size [mm]
		Casing DY [mm]	Casing DY [mm]	Casing DY [mm]					
25	33.7 x 2.3	140	160	180	2 300	409	700	600	19
32	42.4 x 2.3	160	180	200	2 300	422	700	600	19
40	48.3 x 2.6	160	180	200	2 300	435	700	600	19
50	60.3 x 2.9	200	225	250	2 400	451	700	600	19
65	76.1 x 2.9	225	250	280	2 400	463	700	600	19
80	88.9 x 3.2	250	280	315	2 600	483	700	600	19
100	114.3 x 3.6	315	355	400	2 800	519	700	600	27
125	139.7 x 3.6	400	455	500	3 200	540	700	600	27
150	168.3 x 4.0	450	500	560	3 400	578	700	600	27
200	219.1 x 4.5	560	630	710	3 600	652	900	600	50

H refers up to the shut-off device/main valve

The alarm wires are accessible through the stainless end cap*. Delivered with venting in DN25 together with end cap for the spindle as standard.

- 1) Supplied with mount for T-key
- 2) Supplied with mount for portable gear

* The outlet valve and outlet pipe are in stainless material.



Outline diagram

Part no.

- 4845-DN-000-000 (STANDARD)
- 4846-DN-000-000 (DOUBLE+)
- 4847-DN-000-000 (DOUBLE++)

Order example

Pre-insulated valve double pipe in standard version with dim DN 2x100 and vent DN25, part number 4845-100-025-000.

NB

The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

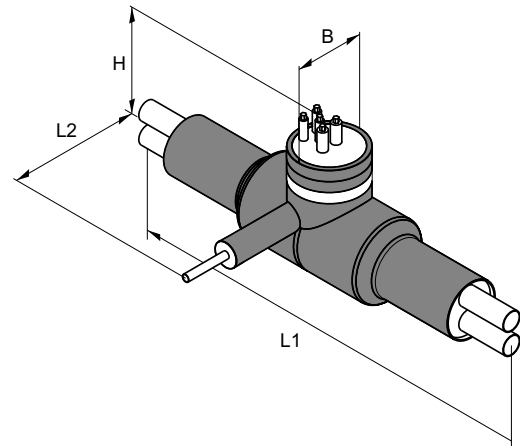
Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

Combination valve, single-sided

PN 16/PN25



PART NO. 4745, 4746, 4747

KMAT 4293PP

DN	Service pipe, 2 pcs Dy x s [mm]	STANDARD 4745	DOUBLE+ 4746	DOUBLE++ 4747	L1 [mm]	H [mm]	L2 [mm]	B [mm]	Wrench size [mm]
		Casing DY [mm]	Casing DY [mm]	Casing DY [mm]					
25	33.7 x 2.3	140	160	180	2 300	409	700	415	19
32	42.4 x 2.3	160	180	200	2 300	422	700	415	19
40	48.3 x 2.6	160	180	200	2 400	435	700	415	19
50	60.3 x 2.9	200	225	250	2 400	451	700	415	19
65	76.1 x 2.9	225	250	280	2 400	463	700	415	19
80	88.9 x 3.2	250	280	315	2 600	483	700	415	19
100	114.3 x 3.6	315	355	400	2 800	519	700	415	27
125	139.7 x 3.6	400	455	500	3 200	540	700	415	27
150	168.3 x 4.0	450	500	560	3 400	578	700	415	27
200	219.1 x 4.5	560	630	710	3 600	652	900	415	50

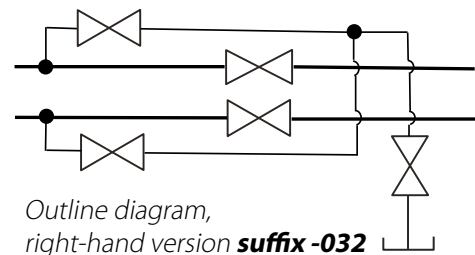
H refers up to the shut-off device/main valve

The alarm wires are accessible through the stainless end cap*.

- 1) Supplied with mount for T-key
- 2) Supplied with mount for portable gear

Delivered with venting in DN25 together with end cap for the spindle as standard.

* The outlet valve and outlet pipe are in stainless material.



Part no.

4745-DN-000-000 (STANDARD)
4746-DN-000-000 (DOUBLE+)
4747-DN-000-000 (DOUBLE++)

Right-hand version has **suffix -032**.
Left-hand version has **suffix -031**.

Order example

Pre-insulated valve double pipe in right-hand version with dim DN 2x100, part number 4745-100-000-032.

NB

The valve must be operated at least twice a year in order to ensure good function.
For care instructions for valves, see Chapter 10.

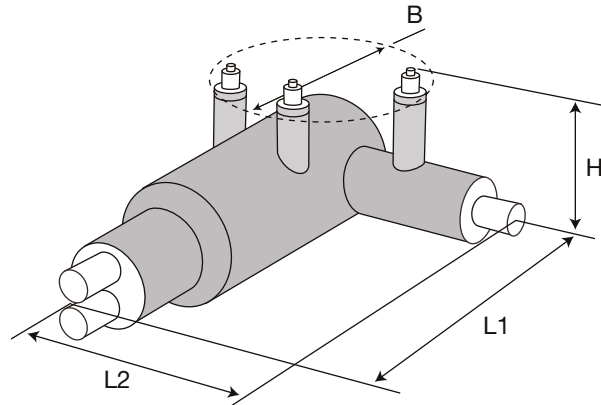
Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

Valve assembly, compact

PN 16/PN25



PART NO. 4570, 4670, 4770

KMAT 4296PP

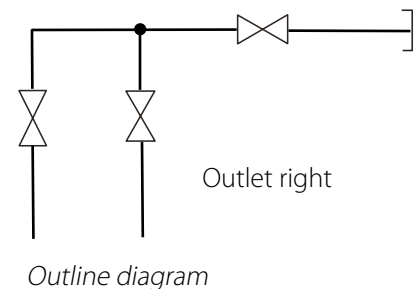
The image shows examples of combinations

DN	Standard 4570 Casing Dy [mm]	Double+ 4670 Dy [mm]	Double++ 4770 Dy [mm]	H* Standard [mm]	H* Min [mm]	B [mm]	L1 [mm]	L2 [mm]
25	140	160	180	382	190	488	850	520
32	160	180	200	388	200	521	965	560
40	160	180	200	401	200	533	885	570
50	200	225	250	411	210	569	1 055	610

* H is measured from the centre of the single pipe.

The outlet pipe is manufactured in stainless material.

Alarm wires not accessible as standard, but can be ordered.



Part no.

4570-DN-000-000 (STANDARD)

Outlet right has **suffix -032**.

Outlet left has **suffix -031**.

Valve assembly with minimal spindle height is stated separately. Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

Order example

Valve assembly, compact, right standard version dim DN 50, part number 4570-050-000-032.

NB

The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

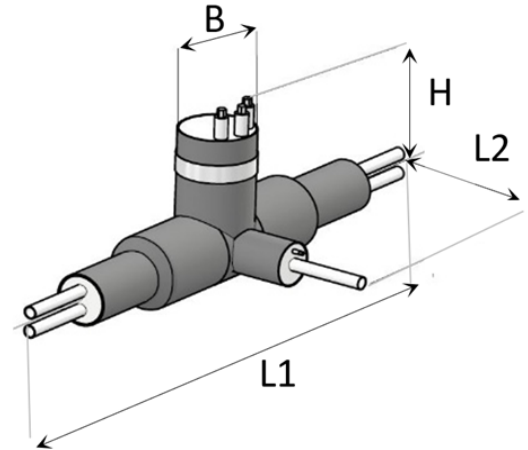
Do not refill above the end cap.

The end cap shall not lie continuously under water.

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

Valve assembly, direct

PN 16/PN25

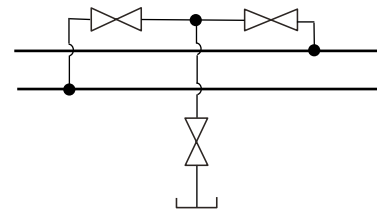


PART NO. 4575, 4675, 4775

KMAT 4297PP

DN	Dy x s [mm]	STANDARD	DOUBLE+	DOUBLE++	L1	L2	Outlet DN [mm]	Wrench size vent	B	H
		4575	4675	4775						
		Casing	Casing	Casing	[mm]	[mm]	[mm]		[mm]	[mm]
		DY [mm]	DY [mm]	DY [mm]						
25	33.7 x 2.3	140	160	180	1500	585	25	19	340	345
32	42.4 x 2.6	160	180	200	1500	645	25	19	340	345
40	48.3 x 2.6	160	180	200	1500	645	25	19	340	345
50	60.3 x 2.9	200	225	250	1500	555	25	19	340	345
65	76.1 x 2.9	225	250	280	1500	565	25	19	340	345
80	88.9 x 3.2	250	280	315	1800	700	32	19	415	485
100	114.3 x 3.6	315	355	400	1800	960	40	27	415	485
125	139.9 x 3.6	400	450	500	1800	960	40	27	415	485
150	168.3 x 4.0	450	500	560	1800	960	40	27	415	485

The unit can be used as both drain and vent.
 The alarm wires are connected through the stainless end cap.
 Outlet valve and outlet pipe in stainless material.
 The valve is delivered with an end cap for the spindle as standard.



Outline diagram

Part no.

4575-DN main pipe-000-000 (STANDARD)
 4675-DN main pipe-000-000 (DOUBLE+)
 4775-DN main pipe-000-000 (DOUBLE++)

Order example

Valve assembly left, double pipe in standard version with dim DN 2x50 (with vent/drain DN 25), part number 4575-050-000-000.

NB

The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

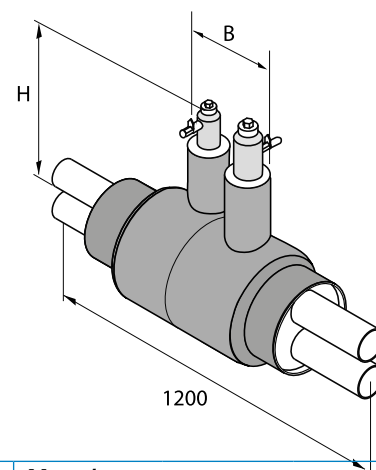
Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Allow a valve on the bypass line to be open to permit expansion during heating or freezing.

Vent/drain

PN 16/PN25



PART NO. 3540, 3640, 3740

KMAT 3790PP

Main-Service pipe		STANDARD	DOUBLE+	DOUBLE++	H [mm]	Vent/ drain	D [mm]	B [mm]
DN [mm]	2 x Dyxs [mm]	3540 Casing DY [mm]	3640 Casing DY [mm]	3740 Casing DY [mm]		DN [mm]		
40	48.3 x 2.6	160	180	200	467	25	110	325
50	60.3 x 2.9	200	225	250	479	40	110	325
65	76.1 x 2.9	225	250	280	495	50	125	325
80	88.9 x 3.2	250	280	315	510	65	140	340
100	114.3 x 3.6	315	355	400	535			
125	139.7 x 3.6	400	450	500	563			
150	168.3 x 4.0	450	500	560	596			
200	219.1 x 4.5	560	630	710	649			

Alarm wires not accessible. The sealing is manufactured in stainless material. Vent/drains are available in dim. DN 25, DN 40, DN 50, DN 65 and are equipped with threaded plugs.

The valve is delivered with an end cap for the spindle as standard.

Part no.

3540-DN main pipe-DN vent-000 (STANDARD)
 3640-DN main pipe-DN vent-000 (DOUBLE+)
 3740-DN main pipe-DN vent-000 (DOUBLE++)

Order example

Vent double pipes with main pipe DN 2x100 in standard version and vent DN 25, part number 3540-100-025-000.

NB

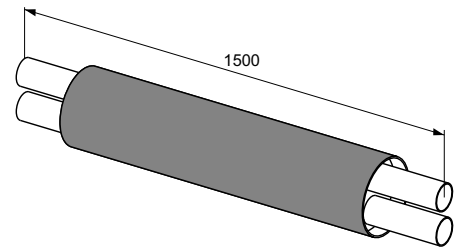
The valve must be operated at least twice a year in order to ensure good function. For care instructions for valves, see Chapter 10.

Do not backfill above the sealing.

The sealing shall not lie continuously under water.

Anchor units

PN25



FIXED PIPE SECTION 1520, 1620, 1720

KMAT 4091PP

DN	STANDARD	DOUBLE+	DOUBLE++
	1520	1620	1720
	Casing	Casing	Casing
	DY [mm]	DY [mm]	DY [mm]
25	140	160	180
32	160	180	200
40	160	180	200
50	200	225	250
65	225	250	280
80	250	280	315
100	315	355	400
125	400	450	500
150	450	500	560
200	560	630	710

Pipe sections with double pipes and which do not end in bends, transition units, valves or T-pieces must be equipped with anchor points before heating/commissioning. Alternatively, the steel pipe can be attached with fixation plates according to the manufacturer's instructions.

Part no.

1520-DN-000-000 (STANDARD)

1620-DN-000-000 (DOUBLE+)

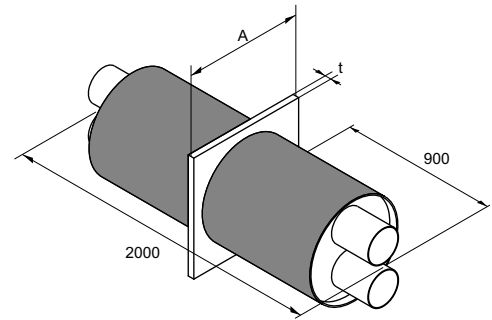
1720-DN-000-000 (DOUBLE++)

Order example

Anchor point for DN 2x50 in standard version, ordering number 1520-050-000-000.

Anchor units

PN25



FIXED PIPE SECTION 5500, 5600, 5700

KMAT 4090PP

DN	Max load [kN] $\Delta T = 60^{\circ}\text{C}$	A [mm]	h [mm]	Pressure area [cm ²]
25	63	250	20	337
32	82	300	20	505
40	93	300	20	505
50	130	300	20	390
65	167	350	30	565
80	215	400	30	765
100	315	450	30	810
125	385	550	35	1 120
150	515	650	40	1 720
200	750	800	40	1 950

The anchor unit is manufactured for casting in concrete. Quality K 250.

Design compression strength:

In concrete 5 MN/m² (50 kg/cm²), normal value.

In soil 0.15 MN/m² (1.5 kg/cm²), normal value.

ΔT here refers the deviation in the pipes' current average temperature

$$\frac{(T_f \times T_r)}{2}$$

T_p = supply pipe temperature

T_r = return pipe temperature

Part no.

5500-DN-000-000 (STANDARD)

5600-DN-000-000 (DOUBLE+)

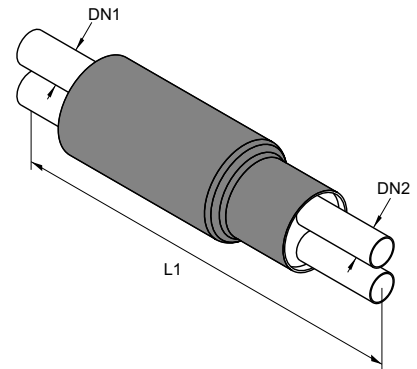
5700-DN-000-000 (DOUBLE++)

Order example

Anchor unit for 2x DN 50 in standard version, part number 5500-050-000-000.

Reduction pipes

PN16 – standard
PN25 – option



REDUCTION PIPES 1575, 1675, 1775

KMAT 4990PP

DN1	L1 [mm]
25-40	1 100
50-100	1 200
125-200	1 500

The part is used for dimension transitions.

Alternatively the reduction can be carried out in the field with eccentric steel cones and reduction sleeves.

Part no.

1575-DN1-DN2-000 (STANDARD)

1675-DN1-DN2-000 (DOUBLE+)

1775-DN1-DN2-000 (DOUBLE++)

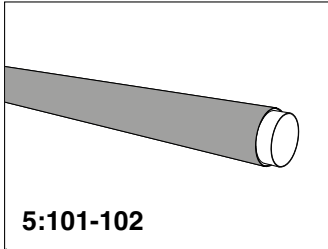
NB

Consult with the designer to determine where the transition unit should be positioned and how large it can be

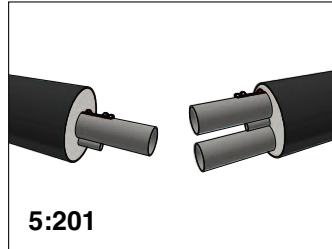
Order example

Transition unit for pipe DN 2x50 to DN 2x40 in standard version, part number 1575-050-040-000.

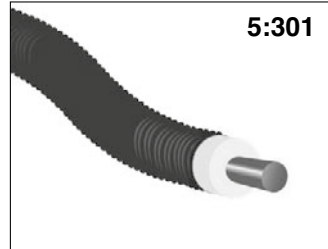
If PN25, this must be stated when ordering.



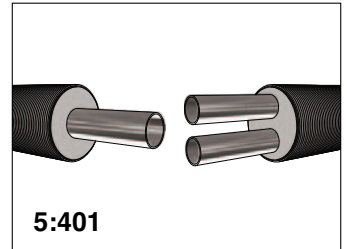
Straight pipe - district cooling



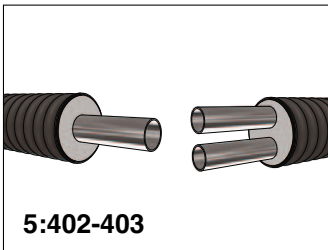
Special pipes



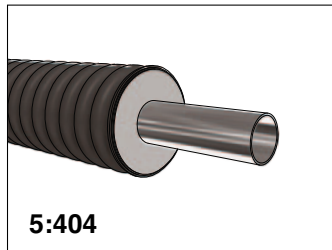
PEX, Alupex



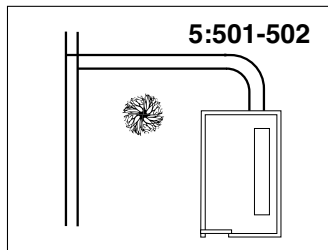
Flexible pipes



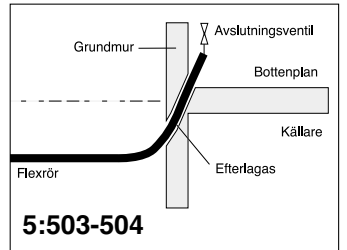
Flexible pipe, copper



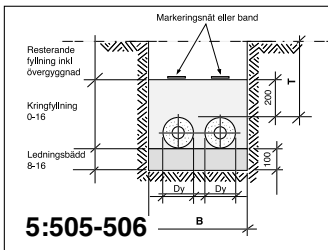
Flexible pipe, steel



District heating for individual homes



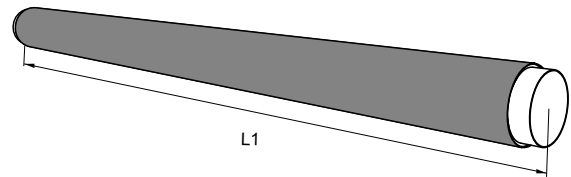
Installation of flexible pipes



Trench and backfilling

Pipe for District cooling, Series 0

PN25



PART NO. 1003, 1004

DN	Service pipe Dy x s [mm]	Casing DY [mm]	Weight [kg/m]	Water content [l/m]
100	114.3 x 3.6	180	12.5	9.0
125	139.7 x 3.6	200	15.3	13.8
150	168.8 x 4.0	225	20.0	20.2
200	219.1 x 4.5	280	30.0	34.7
250	273.0 x 5.0	355	42.0	54.3
300	323.9 x 5.6	400	58.0	76.8
350	355.6 x 5.6	450	65.0	93.1
400	406.4 x 6.3	500	83.0	122.0
450	457.0 x 6.3	560	87.0	155.0
500	508.0 x 6.3	630	101.0	193.0
600	610.0 x 7.1	710	138.0	277.0
700	711.0 x 7.1	800	190.0	378.0
800	813.0 x 8.8	900	222.0	497.0
900	914.0 x 10.0	1 000	261.0	627.0

PART NO. 2100, 3100, 4100, 5100 etc.

Bends, T-pieces, Anchor points, Curved pipes and Valves manufactured with casing diameters as shown in the above table, with the exception of DN100 which is manufactured according to series 1 (see Chap. 3).

Part no. 12 m district cooling: 1003-DN-000-000
16 m district cooling: 1004-DN-000-000

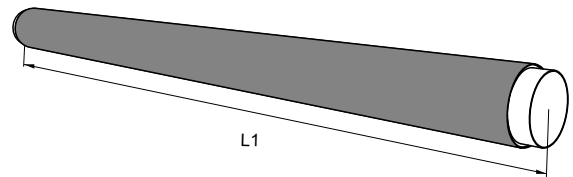
Part no.

2100-DN-degrees-000 (Bends)
3100-DN main pipe-DN branch-000 (T-piece)
4100-DN-000-000 (Valves) 5100-DN-000-000 (Anchor points)

Order example

Straight pipe, district cooling, dim DN 500 in 16 m, part no. 1004-500-000-000

Pipes for District cooling, Insulated pressure pipes PE, Series 1



PART NO. 1903, 1904

Dy pressure pipe	SDR 17/PN10 Service pipe Wall thickness [mm]	SDR11/PN16 Service pipe Wall thickness [mm]	Casing DY [mm]
32	2.0	2.9	90
40	2.4	3.7	110
75	4.5	6.8	140
90	5.4	8.2	160
110	6.6	10.0	200
140	8.3	12.7	225
160	9.5	14.6	250
200	11.9	18.2	315
225	13.4	20.5	315
250	14.8	22.7	400
280	16.6	25.4	400
315	18.7	28.6	450
355	21.1	32.3	450
400	23.7	36.4	560
450	26.7	40.9	560
500	29.7	45.4	630
560	33.2	50.8	710
630	37.1	57.3	800
710	42.1	64.5	800
800	47.4	72.6	900
900	53.3	81.7	1 000

12 m district cooling: 1903-DN-000-000

16 m district cooling: 1904-DN-000-000

According to EN 12001/EN 13244. The free end is stated when ordering, depending on the welding method on the service pipe.

Details such as bends, T-pieces, valves, etc. Part no. 2900, 3900, 4900 etc. Standard version without alarm wire, can be ordered with alarm wire of type 3DC.

When ordering, state the pressure class.

Order example

Straight pipes, insulated pressure pipes, dim DN 560 in 16 m, part no. 1904-560-000-000

Other types of special pipe system.

Powerpipe can produce many different types of pipe, not only for district heating or cooling.

The service pipe can be made of material such as stainless, PEHD or other material, and the casing can be in PEHD, galvanised spiral pipe, glass fibre reinforced, stainless etc. We also provide stainless steel insulated flexible pipes.

The insulation need not be in PUR, but can be made of mineral wool, for example.

Pipes can be produced with one or more conduits in the insulation, making it possible to lay, for example, an electric cable (heating cable), fibre etc.

Pipes can be produced to tolerate different temperatures and media in the service pipe, both to deal with higher or lower temperatures (standard 120°C).

And of course this also applies to our pipe fittings and the rest of our range.

We can produce a number of different variants which we call special pipes.

Please contact our sales team or technical advisers if you have any questions.

PertFlextra

PertFlextra is a flexible and light PE-RT pipe system designed for district heating distribution and service pipes. Its high flexibility eliminates the need to take expansion into account, making installation quicker and more cost-effective.

Components:

- Service pipe: PE-RT Type II SDR 7.4 with an aluminium barrier and a protective PE-RT layer
- Insulation: Polyurethane foam with an average thermal conductivity $\lambda_{50}=0.022$ W/mK
- Casing: Corrugated polyethylene (PE-HD) with a co-extruded diffusion barrier ensuring that the insulation gases remain in the PUR foam

Applications:

- Distribution networks
- Undulating or uneven terrain
- Installation through vegetation or obstacles

Performance:

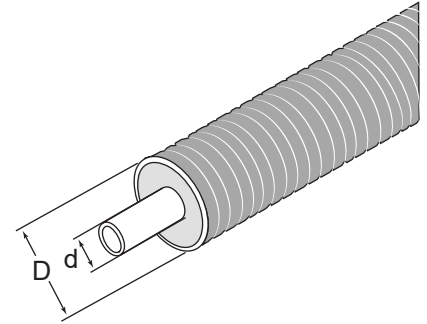
- Operating temperature: 70 °C
- Maximum temperature: 80 °C up to 7,800 hours
- Maximum pressure: 10 bar

PertFlextra offers a complete solution with both single and double pipes, plus 90° bends and T-pieces. There are two connection options. Press couplings type JT (Jentro), which are most suitable for buried systems, and compression couplings for indoor environments.

PertFlextra can easily be integrated with other systems, provided the specified temperature and pressure limits are followed. PertFlextra is delivered in rolls (coils) with a length of 100 m and a maximum width of 2.4 m.

The system fulfils the requirements in EN17878-1 and EN17878-2, which guarantees a minimum design lifetime of 50 years.

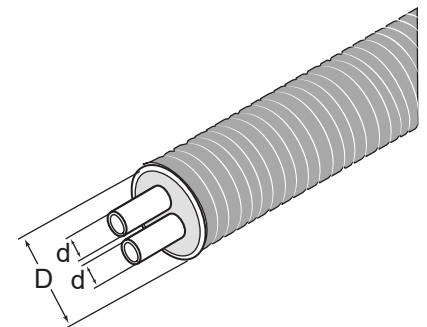
PertFlextra – Single pipes



PART NO. KMAT 2100PP

PE-RT type II SDR 7,4		Series 2	
Service pipe d [mm]	Water content [l/m]	Casing D [mm]	Weight [kg/m]
25x3.5	0.260	90x1.5	1.2
32x4.4	0.423	90x1.5	1.3
40x5.5	0.661	110x1.5	1.8
50x6.9	1.029	125x1.5	2.3
63x8.6	1.647	140x1.5	3.1

PertFlextra – Twin pipes

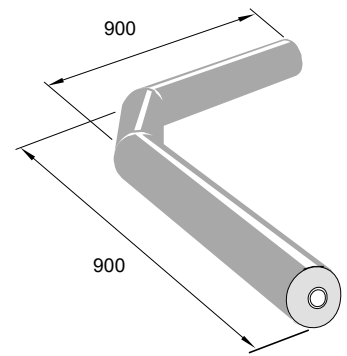


PART NO. KMAT 2190PP

PE-RT type II SDR 7,4		Series 1		Series 2	
Service pipe d [mm]	Water content [l/m]	Casing D [mm]	Weight [kg/m]	Casing D [mm]	Weight [kg/m]
25/25x3.5	0.520			125x1.5	2.1
32/32x4.4	0.845			125x1.5	2.2
40/40x5.5	1.321			140x1.5	3.0
50/50x6.9	2.058			180x1.5	4.4
63/63x8.6	3.295	180x1.5	5.0		

The distance between service pipes is 12 mm.

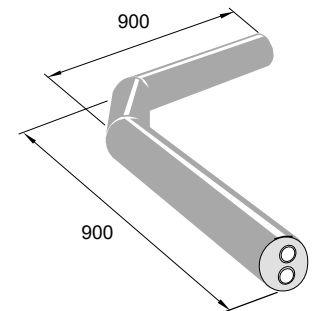
PertFlextra – Bend, single pipe



PART NO. KMAT 2500PP

Service pipe d [mm]	Casing – Series 2 D [mm]
25	90
32	90
40	110
50	125
63	140

PertFlextra – Bend, twin pipe

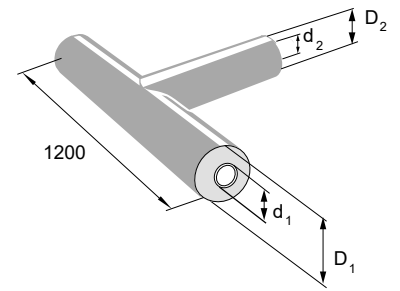


PART NO. KMAT 2590PP

Service pipe d [mm]	Casing D [mm]	
	Series 1	Series 2
25/25		125
32/32		125
40/40		140
50/50		180
63/63	180	

The distance between service pipes is 12 mm.

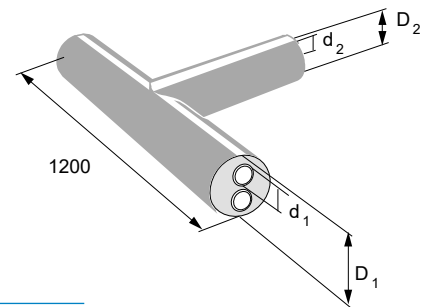
PertFlextra – T-piece, single pipe



PART NO. KMAT 3400PP

Main pipe		Branch					
d1 [mm]	D1 [mm]	d2 [mm]	25	32	40	50	63
		D2[mm]	90	90	110	125	140
25	90		×				
32	90		×	×			
40	110		×	×	×		
50	125		×	×	×	×	
63	140		×	×	×	×	×

PertFlextra – T-piece, twin pipe



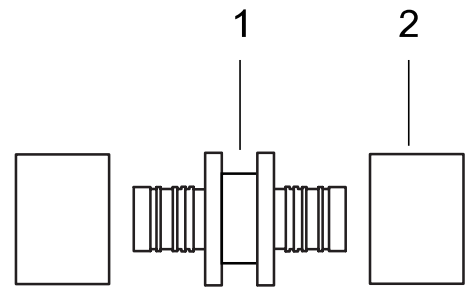
PART NO. KMAT 3490PP

Main pipe		Branch					
d1 [mm]	D1 [mm]	d2 [mm]	25x25	32x32	40x40	50x50	63x63
		D2[mm]	125	125	140	180	180
25x25	125		×				
32x32	125		×	×			
40x40	140		×	×	×		
50x50	180		×	×	×	×	
63x63	180		×	×	×	×	×

PertFlextra – Press coupling, Type JT (Jentro)

Press coupling for PE-RT – PE-RT:

1. Bushing
2. Compression sleeve



PART NO. KMAT 6006PP

Connection side 1	Connection side 2				
	25	32	40	50	63
25	x				
32	x	x			
40		x	x		
50		x	x	x	
63			x	x	x

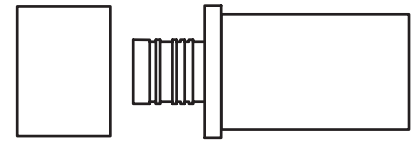
PertFlextra – Press coupling, Typ JT, closed

PART NO. KMAT 6006PP

Connection side 1	Connection side 2	
	25	32
25	x	
32		x

PertFlextra – Press coupling, Type JT (Jentro)

Press coupling for transition to steel pipe



PART NO. KMAT 6006PP

Steel side	PE-RT side				
	25	32	40	50	63
25	x				
32	x	x			
40		x	x		
50		x	x	x	
63			x	x	x

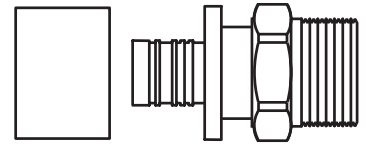
PertFlextra – Press coupling, Type JT, closed

PART NO. KMAT 2590PP

Steel side	PE-RT side	
	25	32
25	x	
32		x

PertFlextra – Press coupling with male thread, Type JT (Jentro)

Press coupling with external thread for installation in cabinet or indoors

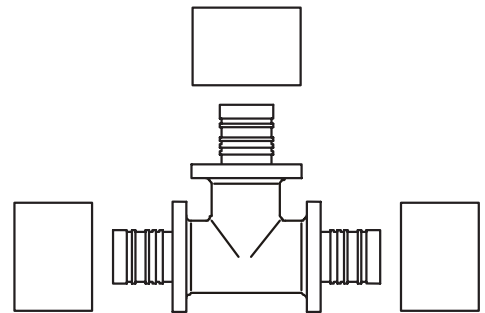


PART NO. KMAT 6006PP

Thread	PE-RT				
	25	32	40	50	63
3/4"	×				
1"		×			
1 1/4"			×	×	
1 1/2"				×	
2"					×

PertFlextra – Press coupling T-piece, Type JT

Press coupling are manufactured in brass or red brass. Welding ends for transition to steel are manufactured by S235JR.



PART NO. KMAT 6006PP

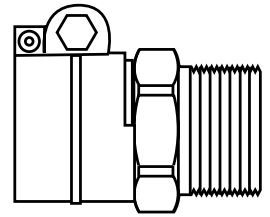
Main pipe [mm]	Branch [mm]				
	25	32	40	50	63
25-25	×				
32-32	×	×			
40-40	×	×	×		
50-50	×	×	×	×	
63-63	×	×	×	×	×

PertFlextra – Compression coupling

Compression coupling with external thread for installation in cabinet or indoors. Manufactured in brass.

Dimension 25–63 mm.

PART NO. KMAT 6106PP



Thread	PE-RT				
	25	32	40	50	63
3/4"	×				
1"		×			
1 1/4"			×		
1 1/2"				×	
2"					×

1. System description

Flexpipe is a flexible pre-insulated pipe system for temperatures up to 120°C. The pipe is typically used for connecting individual homes to a larger pre-insulated pipe network which is normally made of steel.

The media pipe is made of copper and is very simple to use. The thermal insulation consists of flexible polyurethane insulation with excellent insulation properties.

The flexibility of Flexpipe means it can adapt to virtually any conditions in piping systems without problems. The tubes can pass intersecting pipelines either above or below. Other barriers can easily be passed during installation.

Flexpipe makes it possible to choose the shortest route without having to allow for conventional considerations. Flexpipe is delivered to the construction site in 100 metre coils. The pipes can usually be laid without branching in the pipe trench, which therefore can be minimum width. This provides significant cost reductions. Another advantage is that construction time is reduced.

The above advantages mean that Flexpipe isn't merely an excellent technical solution but also provides both time and cost savings.

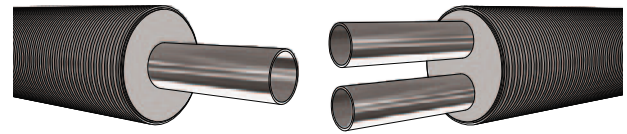
2. Applications

Copper pipes:	max 120°C / max 16 bar
Steel pipe:	max 120°C / max 16 bar

3. Specifications

3.1 Service pipes	Copper pipes	Annealed copper pipes, R220	EN 1057
	<i>Properties</i>		
	Yield strength	<140 N/mm ²	
	Tensile strength	220 N/mm ²	
	Elastic modulus	125,000 N/mm ²	
	Coefficient of linear expansion	16,6x10 ⁻⁴ 1/°C	
	Steel pipes	Soft steel pipe St 35.8 (SS1330-05)	DIN 17175
	<i>Properties</i>		
	Yield strength	225 N/mm ²	
	Tensile strength	360 N/mm ²	
	Elastic modulus	205,000 N/mm ²	
	Coefficient of linear expansion	12,3x10 ⁻⁴ 1/°C	
3.2 Insulation	Polyurethane foam made from polyol and isocyanate.		
	Propellant:	Cyclopentane	
	<i>Properties</i>		
	Density	>60 kg/m ³	
	Thermal conductivity	0.024 W/m ² K (Copper, steel flex)	
	Number of closed cells	>90%	
	Water absorption	<10%	
3.3 Casings	Casing is made of low density polyethylene (PEL)		
	<i>Properties</i>		
	Density	928–938 kg/m ³	
	Crystalline melt temperature	105°C	

Flexpipe 3E, copper



SINGLE FLEX COPPER 3E

Part no.	Service pipe Dy x s [mm]	Casing Dy [mm]	Weight [kg/m]	Water content [l/m]	Transmission capacity [kW] $\Delta T = 50^{\circ}\text{C}$, $\Delta p = 1 \text{ mbar/m}$	Bend radius min m**
1366-018-000-820	18x1.0	90 x 1.0	1.2	0.201	13	0.9
1266-022-000-820	22x1,0	90 x 1.0	1.3	0.314	23	0.9
1366-022-000-820	22x1,0	110 x 1.1	1.3	0.314	23	1.1
1366-028-000-820	28x1,2	110 x 1.1	2.1	0.515	44	1.1
1466-028-000-820	28x1,2	125 x 1.2	2.6	0.515	44	1.2

DOUBLE FLEX COPPER 3E

Part no.	Service pipe Dy x s [mm]	Casing Dy [mm]	Weight [kg/m]	Water content [l/m]	Transmission capacity [kW] $\Delta T = 50^{\circ}\text{C}$, $\Delta p = 1 \text{ mbar/m}$	Bend radius min m**
1566-018-018-820	2x18x1.0	90 x 1.0	1.7	0.402	13	0.9
1567-018-018-820	2x18x1.0	110 x 1.1	1.7	0.402	13	1.1
1568-018-018-820	2x18x1.0	125 x 1.2	2.2	0.402	13	1.2
1569-018-018-820	2x18x1.0	160 x 1.4	2.6	0.402	13	1.5
1567-022-022-820	2x22x1.0	110 x 1.1	2.4	0.628	23	1.1
1568-022-022-820	2x22x1.0	125 x 1.2	2.8	0.628	23	1.2
1569-022-022-820	2x22x1.0	160 x 1.4	3.2	0.628	23	1.5
1568-028-028-820	2x28x1.2	125 x 1.2	3.1	1.03	44	1.2
1569-028-028-820	2x28x1.2	160 x 1.4	3.9	1.03	44	1.5

3E Cu-Flex is a pipe system for transporting liquid media such as district heating or coolant. Max. $+120^{\circ}\text{C}$ and 16 bar. The service pipe fulfils the requirements in DIN 17671 and EN 1057.

The flexpipe can be bent 10 x casing diameter. The bend radius can be less than when using bending springs.

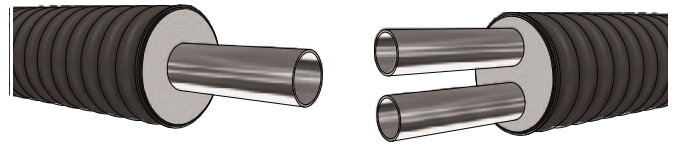
Important! Please note that it is not appropriate to bend/straighten Cu-Flex more than once.

The flexpipe is delivered in full reels (approx. 100 m). The reel diameter is approx. 2.4 m. **Not kept in stock**
Can be ordered with alarm wire, **suffix -935**.

Order example

Double flex copper 3E 2x22 in 160 mantel. Part no. 1569-022-022-820

Flexible pipe, copper



SINGLEFLEX, COPPER 1366, 1266

Part no.	Service pipe Dy x s (mm)	Casing DY (mm)	Weight (kg/m)	Water content (l/m)	Transmission capacity [kW] $\Delta T = 50^{\circ}\text{C}$, $\Delta p = 1 \text{ mbar/m}$	Bend radius min m
1366-022	22x1.0	91x2.2	1.61	0.31	27	0.8
1266-028	28x1.2	91x2.2	1.90	0.51	50	0.8
1266-035*)	35x1.5	91x2.2	2.27	0.83	85	0.8

DOUBLE FLEX, COPPER 1566, 1567

Part no.	Service pipe Dy x s (mm)	Casing DY (mm)	Weight (kg/m)	Water content (l/m)	Transmission capacity [kW] $\Delta T = 50^{\circ}\text{C}$, $\Delta p = 1 \text{ mbar/m}$	Bend radius min m
1566-015*)	2x15x1.0	91x2.2	1.35	2x0.31	9	0.8
1566-018*)	2x18x1.0	91x2.2	1.50	2x0.20	15	0.8
1566-022	2x22x1.0	91x2.2	1.72	2x0.31	27	0.8
1567-018*)	2x18x1.0	113x2.4	1.95	2x0.20	15	1.0
1567-022*)	2x22x1.0	113x2.4	2.17	2x0.31	27	1.0
1567-028*)	2x28x1.2	113x2.4	2.75	2x0.51	50	1.0

Flexible pipe primarily for connection of individual homes is supplied as a reel. (approx. 100 m). The reel diameter is approx. 2.4 m.

Delivered length may differ slightly from the ordered length. With regard to heat losses, see Chapter 9 and for Installation of T-piece, see Chapter 6.

Flexible pipe, copper, supplied with alarm with minimum order quantity 500 m.

The alarm wire is multi-strand and therefore flexible. The alarm function cannot be guaranteed after bending.

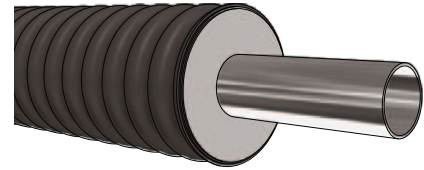
For more information regarding alarms etc., please consult Powerpipe.

***) NOTE!** These single and double flexible pipes are available by special order. **Not kept in stock**

Order example

Double flex copper 2x22/91 mm has part number 1566-022-022-**000** without alarm wire and 1566-022-022-**230** with alarm wire.

Flexible pipe, steel



SINGLE FLEX STEEL 1206, 1306, 1406, 1506

Part no.	Service pipe Dy x s (mm)	Casing DY (mm)	Weight (kg/m)	Water content (l/m)	Transmission capacity [kW] $\Delta T = 50^{\circ}C$, $\Delta p = 1 \text{ mbar/m}$	Bend radius min m
1306-020-000-000	20x2.0	91x2.2	1.52	0.2	14	0.8
1206-028-000-000	28x2.0	91x2.2	2.23	0.45	40	1.0
1406-020-000-820	20x2.0	110x1.1	2.0	0.2	13	1.1

Flexible pipe for connection of individual homes is supplied as a reel (approx. 100 m). The reel diameter is approx. 2.4 m. Delivered length may differ slightly from the ordered length. With regard to heat losses, see Chapter 9 and for Installation of T-piece, see Chapter 6 and Chapter 10.

Flexible pipe, steel, **delivered without alarm.**

Alarm is available by special order. The alarm wire is multi-strand and therefore flexible.

The alarm function cannot be guaranteed after bending.

For more information regarding alarms etc., please consult Powerpipe.

NB! These single flex pipes are available by special order. **Not kept in stock**

Order example

Single flex steel 28/90 mm has part number 1206-028-000-**000** without alarm wire and 1206-028-000-**230** with alarm wire.

General information

Powerpipe has a broad product line for connection of individual homes, providing greater opportunities to select unique solutions for each property or project.

The prerequisite for profitability in these areas is that investment costs and heat losses are kept low.

Of course this must not be at the expense of quality or reliability. When installing to individual homes, flexible pipe is advantageous due to the total investment costs.

The right quality

To obtain investment costs and heat losses that are as low as possible, double pipes are recommended.

Because the number of joints is reduced in a double pipe system, the risk of future leaks in the system is also reduced.

Dimensioning pipes and district heating control centres is also extremely important in reducing costs.

Over-dimensioning costs money both in terms of investment and operating costs.

The right dimensioning

We offer several different options for expanding district heating systems in areas of individual homes.

All types contain *Double pipes* (supply and return in the same casing), as the main pipeline.

This ensures lower costs for ground works and lower heat losses.

To reduce both thermal and temperature losses, extra insulated double pipes

(DOUBLE+ or DOUBLE++) are often preferable. See Chapter 9.

Options

We offer several different options to connect an individual home from a main pipeline (usually double pipes) in the street.

The choice of the type is governed by

- Dimension
- Ease of laying
- Size of heat losses
- Cost

We offer

- Flexpipe, copper single pipes Chapter 5
- Flexpipe, copper double pipes Chapter 5
- Flexible pipe, steel single pipes Chapter 5
- Standard double pipes Chapter 4
- Extra-insulated double pipes Chapter 4

Instructions

See also the District Heating Association's laying instructions for district heating pipes FVF D:211

System assumptions

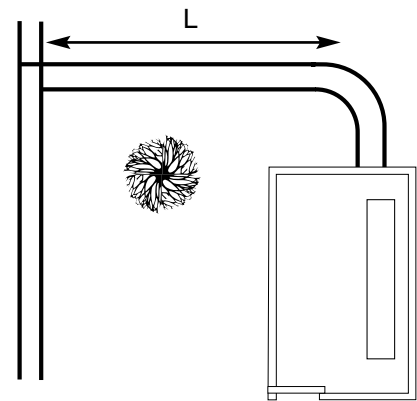
Temperature: Max. 120°C

Printing: Max. 16 bar

Dimensioning

See diagram for pressure drop calculation, Chapter 9

Flexible pipes, single and double, copper



For $L \geq 3$ m, see type drawing in Chapter 5

Assembly and jointing of service pipes

- The system is laid as a fixed system that exploits the annealed copper's flow properties. Preheating of the pipe before foaming/backfilling is recommended.
- The pipes are joined with capillary pipe fittings (SS-EN 1254-1) by hard soldering. Capillary fittings with grooves may not be used.
- Capillary fittings must be of reinforced type.
- Silver/phosphorus/copper brazing rods according to SS-EN 1044 should be used for brazing.
- Brazing expertise is required.
- For brazing technique, see SMS 3209.
- In general, see the District Heating Association's technical provisions for copper pipelines in district heating systems, FVF D213.

The main pipe-main pipe connection is assumed to be of double pipe type.

- The transition from steel pipe to copper pipe should be done with a transition piece. See p. 8:303
- To protect the connection point against harmful loads, expansion is made possible according to the figure on p. 5:503 where $L \geq 3$ m.
- Reduction of the media pipe should be supported within 6 m of the reduction cone.
- Connection to main pipe including foaming takes place according to Installation, Chapter 10 and with parts, for example, as in Chapter 6.
- Special expansion absorbing parts are not normally required.
- If expansion in the main pipe is expected to be longer than 10 mm, the flexible pipe connection should be protected with expansion absorbing material. See p. 9:401.

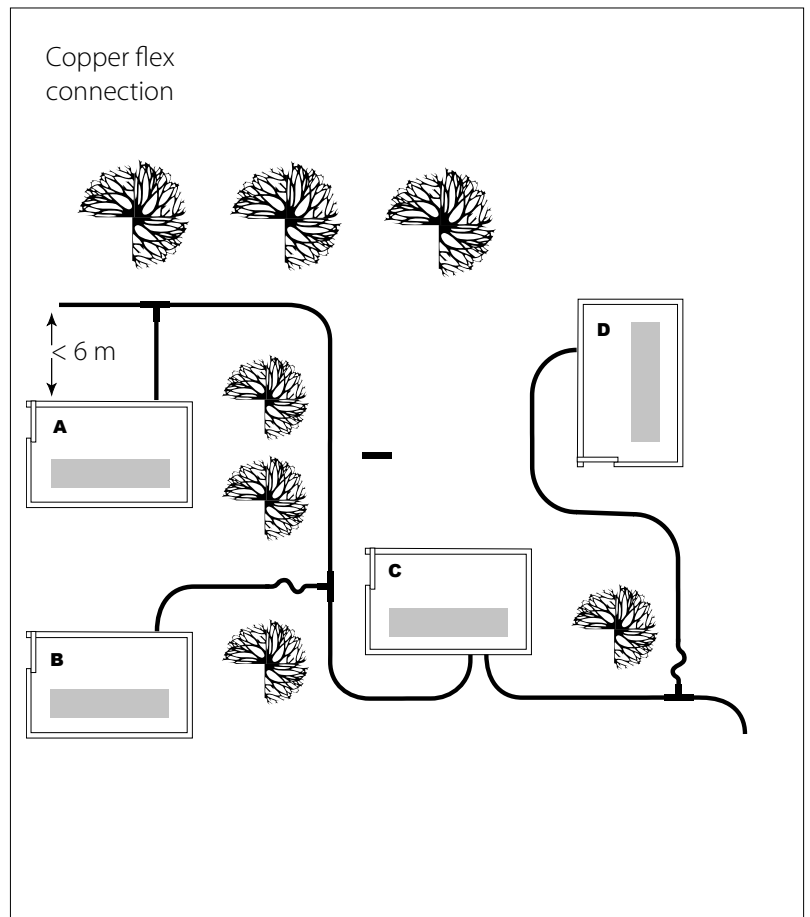
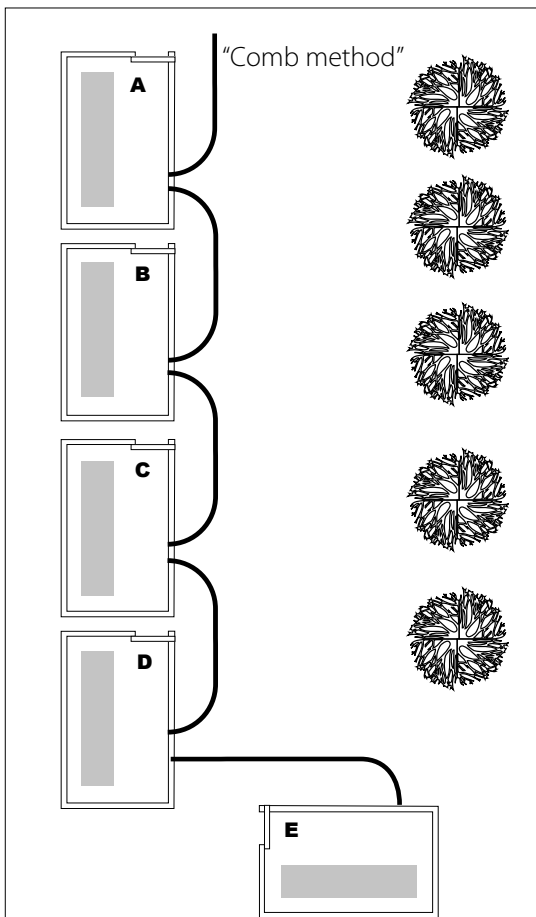
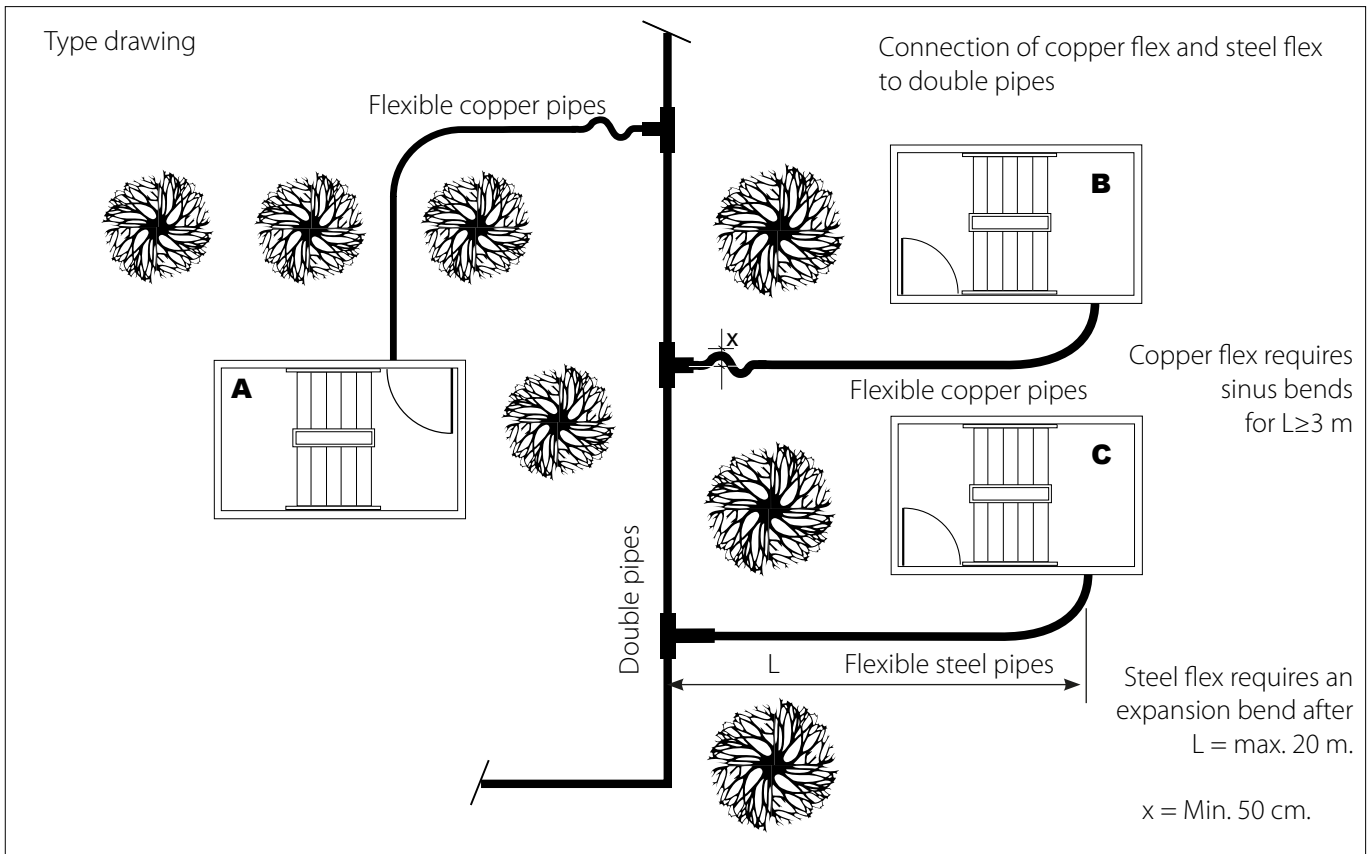
Flexpipe, single, steel

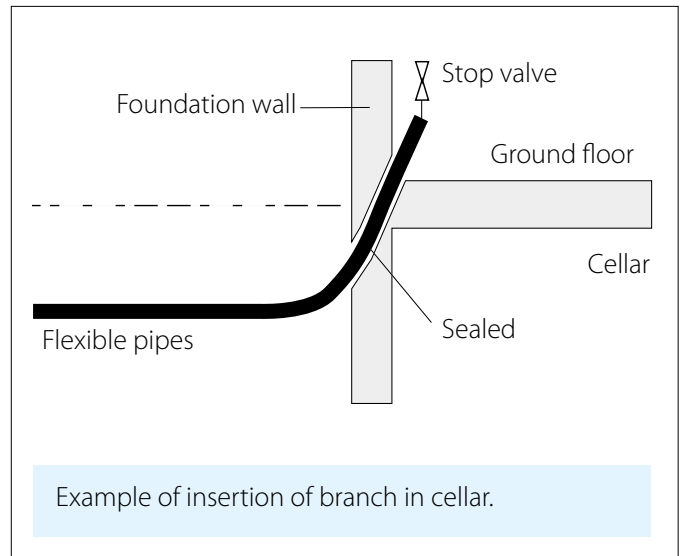
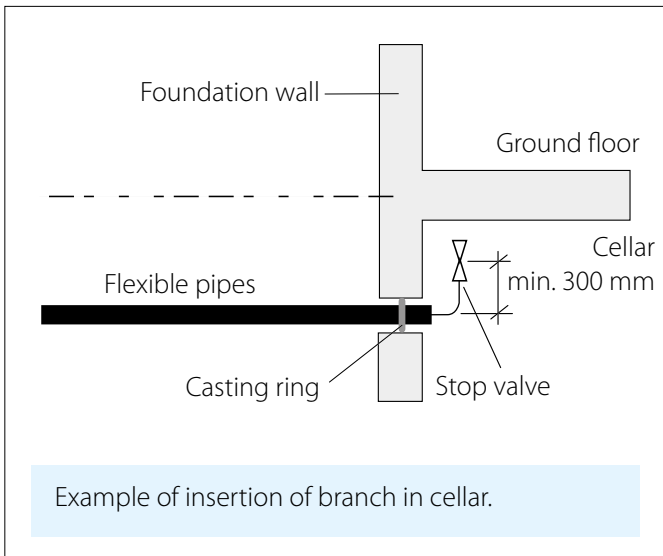
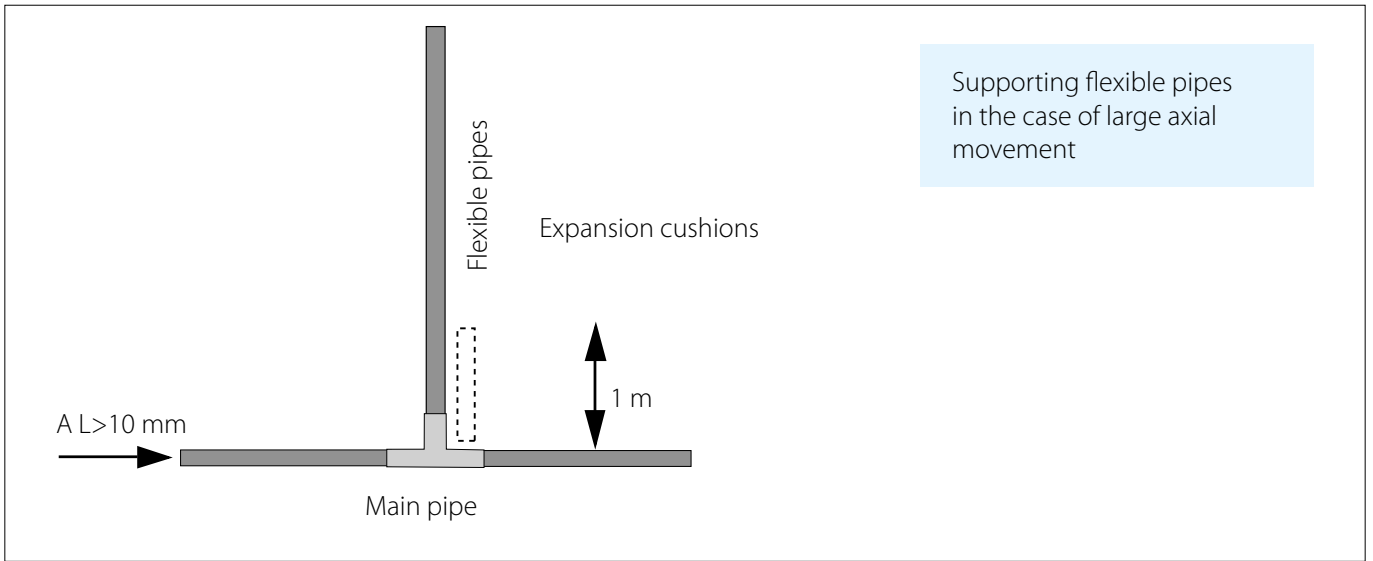
Assembly and jointing of service pipes

- The system is laid as a fixed system and may be laid cold without special expansion absorbing devices. Preheating of the pipe before foaming/backfilling is recommended.
- The branch service pipe is welded to the main pipe. Branch pipes are installed between the flexible and main pipe, see p. 8:303, or alternatively standard steel pipe.
- Welding expertise is required.

Connection main pipe

- Connection to main pipe including foaming takes place according to Installation, Chapter 10, and for example, with parts according to Sleeves, Chapter 6
- Special expansion absorbing parts are required





Trench and backfilling

Powerpipe's flexible pipes have high strength and tolerate high loads in terms of pressure, impact and abrasion.

Pipes in the street

Trench depth for the pipes in the street can be minimised and only the street owners' requirements need be taken into account. Minimum coverage of 400 mm.

Excavated soil can be reused and backfilled around the pipes. However, the largest particle size is limited to 16 mm at the joint sites and 32 mm around the pipes.

Trench width can be minimised to about 20 cm wider than the pipe DY. At each joint site, the trench must be made wider to accommodate installation work. The pipes can even be assembled above ground, to be laid in the trench later.

Mains supply pipes

Trench depth is minimised, 400 mm coverage is sufficient in non-traffic loaded surfaces. Warning mesh should be placed 100-200 mm above the pipes to prevent future damage.

Excavated soil can be reused and backfilled around the pipes. Limitations, see above.

Trench width is minimised, approx. 150-200 mm.

The pipes can easily be bent on site using suitable bending tools. Bushes, stones etc. can be passed without problems.

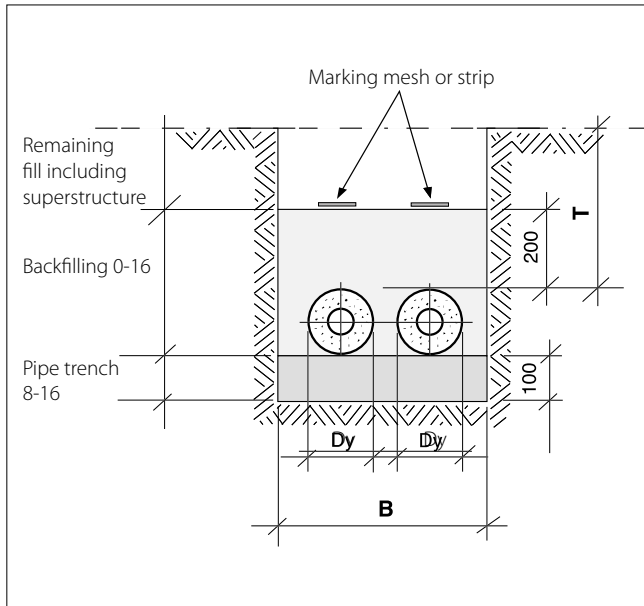
For property connections, the pipe is bent up out of the ground with the bending tool.

Connections to main pipeline are performed with Powerpipe T-sleeve. See Chapter 6, Sleeves.

For type sections flexible pipes, see Chapter 5

For type sections, fixed single and double pipes, see Chapter 10

TYPE SECTION FLEXIBLE SINGLE PIPES

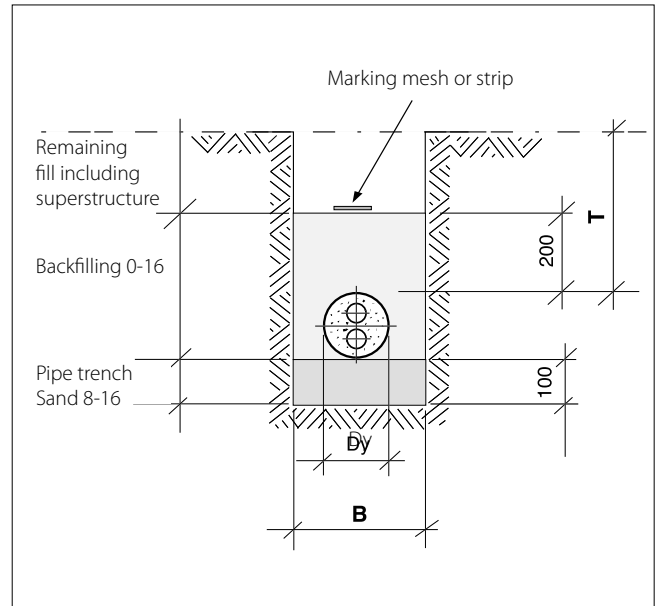


Alternatively, pipes can be laid without sand directly on the trench bottom and filled around with existing stone-free soil.

T = min 600 in street surface
min 400 in non-drivable surface

Dy (mm)	B (mm)
< 100	350
100-150	500
150-200	600

TYPE SECTION FLEXIBLE DOUBLE PIPES

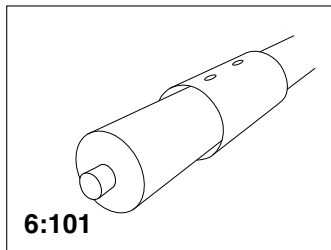


Alternatively, pipes can be laid without sand directly on the trench bottom and filled around with existing stone-free soil.

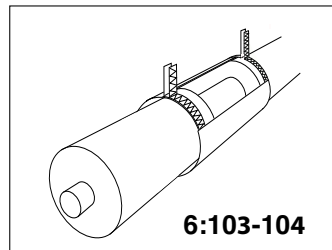
T = min 600 in street surface
min 400 in non-drivable surface

Dy (mm)	B (mm)
≤ 150	300
> 150	400

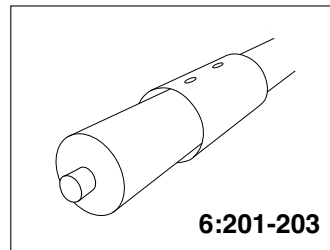
Depending on the trench method and materials, the lower requirement $B > Dy$ can apply.



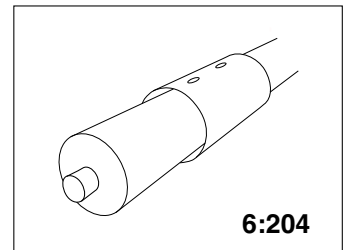
Sleeves overview



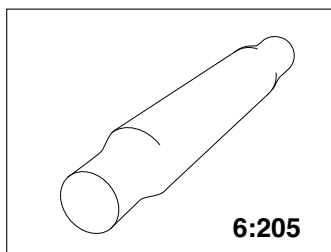
Welding sleeves



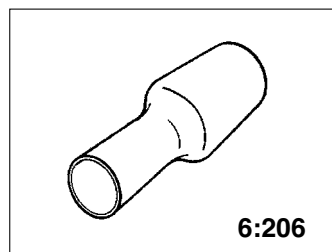
Shrinkable sleeves



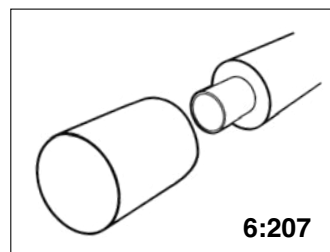
Repair kit



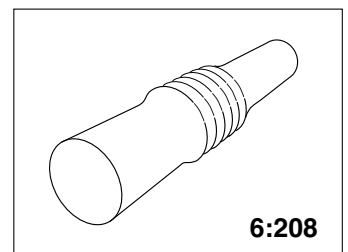
Balloon sleeves



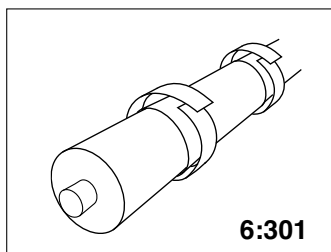
Reduction sleeve



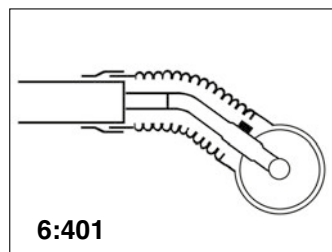
End sleeve



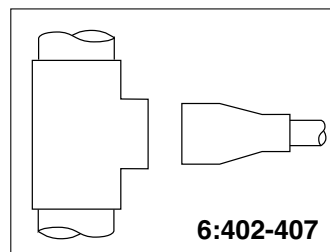
Flexible sleeve



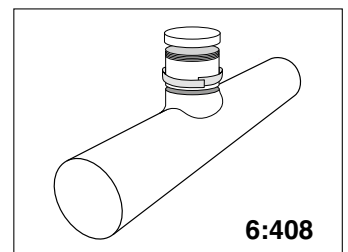
**Tightening band,
tubing**



Tapping/connection



T-sleeves



Measurement sleeve

Overview

General information

When choosing sleeve from our product portfolio, the welding sleeve is easiest to install and most cost-effective from sleeve diameter of approx. 400 mm and upwards.

Double expanded sleeve: thicker than double sealing up to and including diameter approx. 315 mm, i.e. works better if you slice it and need a longitudinal weld. Also works better in expansion zones due to a lack of tightening tube, which might otherwise be damaged.

In sections with axial movement: special double sealing shrinkable sleeve with tightening tube must be surrounded with sand. For other refilling material, double expanded sleeve or welding sleeve is recommended.

For all dimension transitions, reduction sleeves are recommended. Only in an emergency can double expanded sleeve be used for a dimension transition to the nearest size. In this case, extra mastic is required.

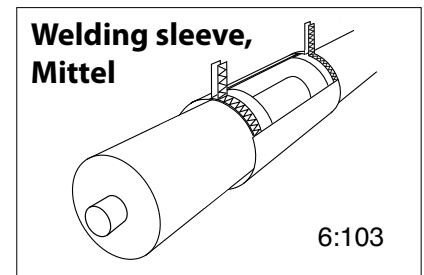
The most common types are straight sleeves as stated below:

Welding sleeve, Mittel

Sleeve welded to the casing with a welding machine. Larger diameters are slitted and must be longitudinally extrusion welded.

Material requirements

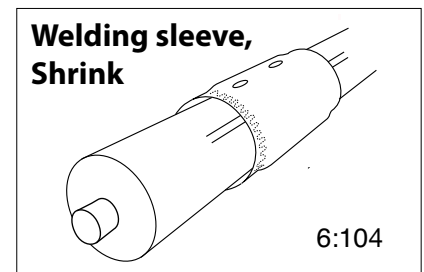
Sleeve
Welding band
Welding plugs



Welding sleeve, Shrink

The sleeve is manufactured from PEHD material which is first shrunk and then welded to the casing with a welding machine.

Shrinkable sleeve
Welding band
Welding plugs



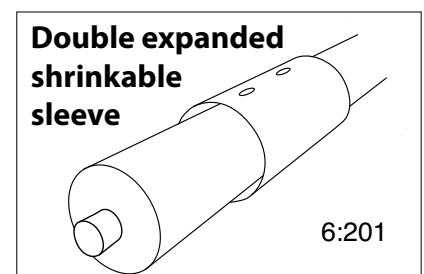
Shrinkable sleeve

The sleeve is a joint between the district heating pipe's casing and the sleeve. Heating with a gas torch causes shrinkage of the sleeve onto the casing. The sealing is carried out using a layer of mastic between the pipe and sleeve.

Double expanded sleeve PEHD

The shrinkable sleeve is manufactured from PEHD and expanded in a two-stage process.

Shrinkable sleeve DX
Mastic strip
Welding plugs
FOPS

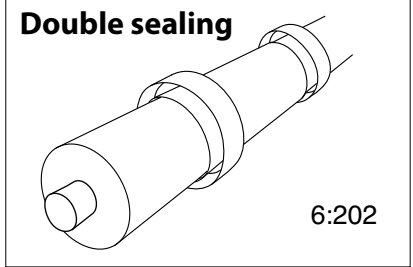


Double sealing sleeve, PEHD

The shrinkable sleeve is manufactured in PEHD and is always equipped with tightening tube for additional sealing, in which case it is called "double sealing".

Material requirements

Shrinkable sleeve DTK
Mastic strip
Tightening tube/
tightening band
Welding plugs
FOPS



Shrinkable sleeve , PEX

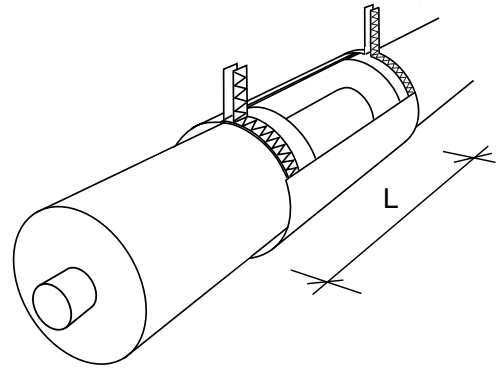
The shrinkable sleeve is manufactured from PEX. This shrinkable sleeve can be used without shrink sleeves.

Shrinkable sleeve PEX
Mastic strip
Welding plugs
FOPS



Other than the above, balloon, end, flex, reduction and T-sleeves are also available. See the following pages.

Welding sleeve, Mittel



PART NO. 6110

Powerpipe offer a joint made by Mittel AB. The method involves welding the sleeve to the casing with a metal mesh which is made electrically conducting by the welding machine, and which melts the PEHD material together. This takes place under pressure and controlled temperature conditions. Larger sleeve dimensions are slitted. They are longitudinally extrusion welded together with specially designed extrusion welding equipment. The joint is pressure tested before foaming.

Can be delivered in different lengths (standard $L = 700$ mm), for example for repairs. See exhaustive instructions under Chapter 10, Installation.

Welding sleeve, Mittel

Part no.	Casing Dy [mm]
----------	----------------

6110-Dy	90-1000
---------	---------

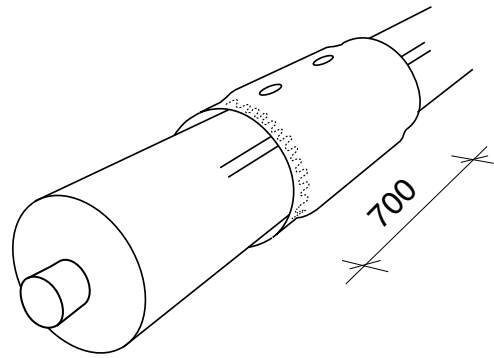
For sleeve dimensions, $Dy = 450$, the sleeves are supplied slitted in a pack of 6.

For larger dimensions ($Dy \geq 500$ mm) and volumes, delivery can be made in racks, slitted and packed as 12 per rack

Order example

Welding sleeve, Mittel for DN 500/710 (Series 2), part number 6110-710-000-000.

Welding sleeve, Shrink



PART NO. 6111, 6112

Powerpipe offers a welding sleeve with shrink in two versions. The choice depends on the welding machine used. The method involves a welded joint of the shrinkable sleeve and the casing. The weld consists of a metal mesh that is made electrically conducting by the welding machine and which melts the PEHD material together. This takes place under pressure and controlled temperature conditions. The joint is pressure tested before foaming.

See exhaustive instructions under Chapter 10, Installation.

Welding sleeve, shrink

Part no.	Dy casing [mm]	For welding machine
6111-Dy	200-1 000	(Belmaflex welding method)
6112-Dy	225-1 000	(Salling welding method)

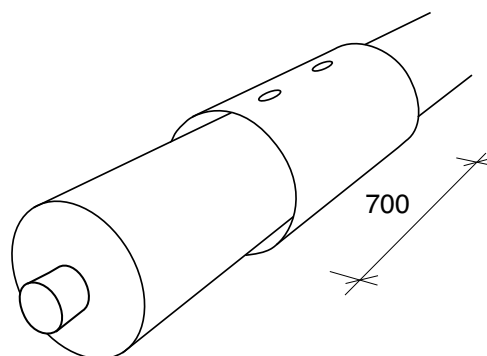
Order example

The welding sleeve shrinkage is determined according to the welding method;

Belmaflex: DN500/710 (series 2), part number 6111-710-000-000

Salling: DN500/800 (series 3), part number 6112-800-000-000

Double expanded shrinkable sleeve PEHD



PART NO. 6361

Double expanded shrinkable sleeve, DEX, is a heat shrinkable sleeve manufactured from PEHD. Manufactured with a greater wall thickness for extrusion welding. The sleeve shrinks when heated by a gas torch.

A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch.

See exhaustive instructions under Chapter 10, Installation.

Double expanded shrinkable sleeve

Casing Dy [mm]

90-900

Part no.

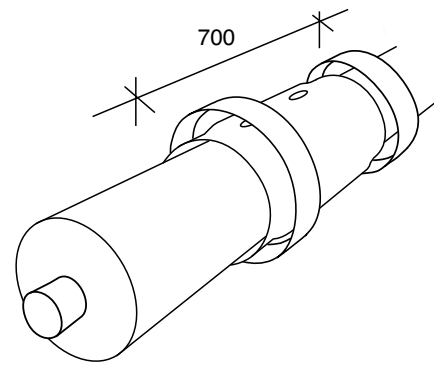
6361-Dy-000-000

Woven mastic band is recommended and ordered separately. See p. 8:301.

Order example

Shrinkable sleeve, double expanded for DN 80/180, part number 6361-180-000-000

Double sealing shrinkable sleeve, PEHD



PART NO. 6364

Double sealing shrinkable sleeve, DTK, is a heat shrinkable sleeve manufactured from PEHD material. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint.

See exhaustive instructions under Chapter 10, Installation.

Part no.	Casing Dy [mm]	Tubing/wrap Width [mm]
6364-090	90	150
6364-110	110	150
6364-125	125	150
6364-140	140	150
6364-160	160	150
6364-180	180	150
6364-200	200	150
6364-225	225	150
6364-250	250	150
6364-280	280	150
6364-315	315	225
6364-355	355	225
6364-400	400	225
6364-450	450	225
6364-500	500	225
6364-560	560	225
6364-630	630	300
6364-710	710	300
6364-800	800	300
6364-900	900	300

} Tightening tube

} Tightening band

Woven mastic band is recommended and ordered separately. See p. 8:301.

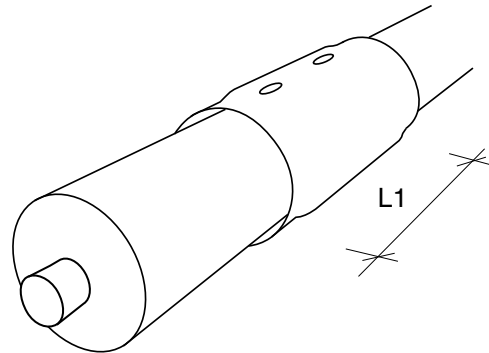
Part no.

6364-Dy -000-000 includes two pcs of shrinkable tightening tube/band.
If extra tightening tube/tightening band is required, see part no. 6241 - p. 6:301

Order example

Shrinkable sleeve, double sealing for DN 80/180, part number 6364-180-000-000.

Shrinkable sleeve PEX

**PART NO. 6362**

Shrinkable sleeve, PEX, is a heat shrinkable sleeve manufactured from cross-linked multi-layer PEX material. Installation is carried out using a gas torch, and due to the cross-linked material, the shrinkage is both predictable and easily controlled. The shrinkable sleeve can be equipped with tightening tubes/bands as extra sealing. Not weldable.

See exhaustive instructions under Chapter 10, Installation.

Shrinkable sleeve PEX

Casing Dy [mm]	L1 [mm]
90-900	750

The product is delivered in a kit with loose mastic.

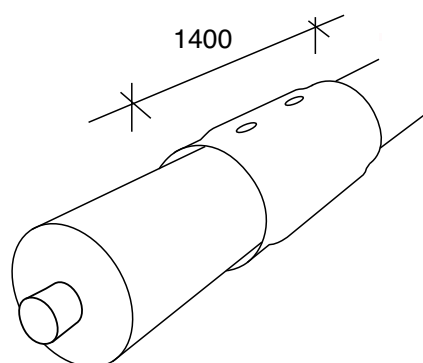
Not kept in stock.

Part no.
6362-Dy-000-000

Order example

Shrinkable sleeve, PEX for DN 80/180, part number 6362-180-000-000.

Shrinkable sleeve Repair kit PEHD



PART NO. 6364

Double sealing shrinkable sleeve, DTK, is a heat shrinkable sleeve manufactured from PEHD material. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. See exhaustive instructions under Chapter 10, Installation.

Repair kit

Casing Dy [mm]

90-710

The minimum wall thickness in the shrinkable sleeve is 4.5 mm.

Part no.

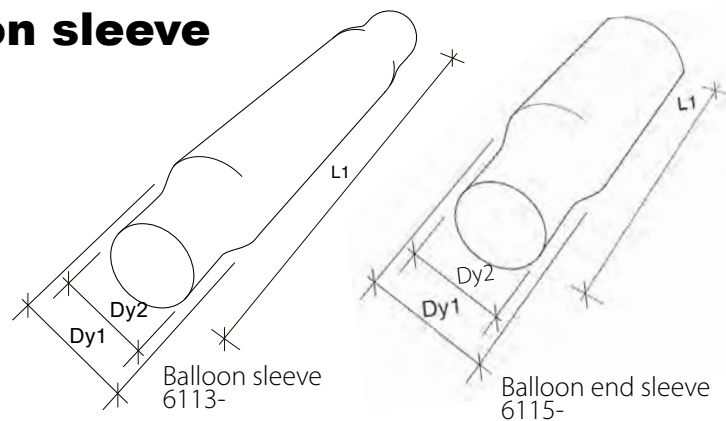
6364-Dy-140-000

Woven mastic band is recommended and ordered separately. See p. 8:301.

Order example

Shrinkable sleeve, double sealing repair kit for DN 80/180, part number 6364-180-140-000

Double sealing balloon sleeve



PART NO. 6113, 6115

The balloon sleeve is used for single-use compensators, single-use valves or for other purposes. This is a heat shrinkable casing manufactured from PEHD material. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint.

See exhaustive instructions under Chapter 10, Installation.

Casing diam. connecting pipe Dy [mm]	Dy2 [mm]	Dy1 [mm]	L1 for 6113- [mm]	Tubing/wrap [mm]
90	110	125	900	150
110	125	140	900	150
125	140	160	900	150
140	156	180	1 200	150
160	177	200	1 200	150
180	197	225	1 200	150
200	218	250	1 200	150
225	244	280	1 500	150
250	269	315	1 500	150
280	300	355	1 500	150
315	336	400	1 500	225
355	377	450	1 500	225
400	425	500	1 500	225
450	474	560	1 500	225
500	530	637	1 500	225
560	590	710	1 500	225

Length L1 for 6115- is **1100 mm for all Dy**

Woven mastic band is recommended and ordered separately. See p. 8:301.

Balloon sleeve, Part no.

6113-Dy-000-000 includes two pcs of shrinkable tightening tube/band.

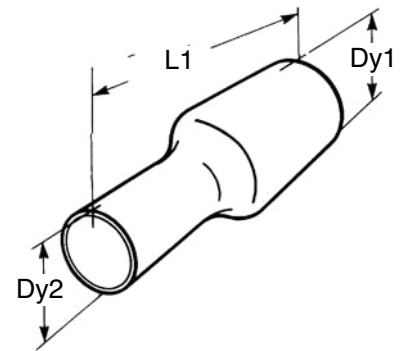
Balloon end sleeve, Part no.

6115-Dy-000-000 for single-use valve, length 1100 mm

Order example

Balloon sleeve for a single-use valve in dim. DN200/355 (Series 2), part number 6113-355-000-000

Double sealing reduction sleeve



PART NO. 6124

The reduction sleeve is used for jointing two different dimensions of outer casing. This is a heat shrinkable casing manufactured from PEHD material. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint. See exhaustive instructions under Chapter 10, Installation.

Dimension connecting pipe [mm]		
Dy1	Dy2	L1
110		900
125		900
140		900
160		900
160		900
180		900
200		900
225		900
250		900
280		900
315		900
355		900
400		900
450		900
500		1 200
560		1 200
630		1 200
710		1 200
800		1 200

Transition units in several steps and other lengths can be manufactured to special order. Woven mastic band is recommended and ordered separately. See p. 8:301.

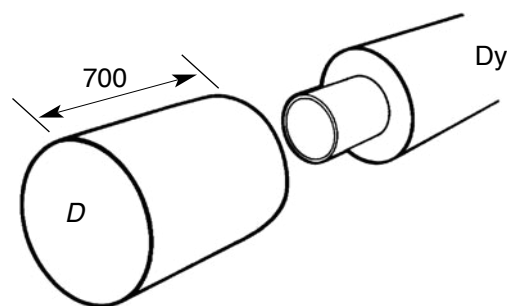
Part no.

6124-Dy1-Dy2-000 includes two pcs of shrinkable tightening tube/band.

Order example

Reduction sleeve for DN 80/180 - 65/160, part number 6124-180-160-000.

Double sealing end sleeve



PART NO. 6134

The end sleeve is used at the end of a district heating pipe. This is a heat shrinkable casing manufactured from PEHD material. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint. See exhaustive instructions under Chapter 10, Installation.

Casing Dy [mm]

90-900

The end sleeve can be delivered with length = 1000, 1100 and 1200 mm. Part no. for 1100 mm 6134-Dy-110-000.

Woven mastic band is recommended and ordered separately. See p. 8:301.

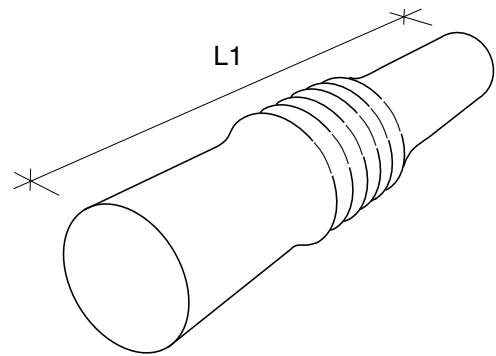
Part no.

6134-Dy-000-000 includes two pcs of shrinkable tightening tube/band.

Order example

End sleeve for DN 80/180, part number 6134-180-000-000

Double sealing flexible sleeve (kit) PEX



PART NO. 6200

The flexible sleeve is a bendable, heat shrinkable casing manufactured from PEX. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. The flex casing can be equipped with tightening tubes/bands as extra sealing.

After the joint has cooled, seal testing, foaming and sealing of the foam hole are carried out. See exhaustive instructions under Chapter 10, Installation.

Double sealing flexible sleeve

Casing Dy [mm]	Radius steel pipe bend [mm]	L1 [mm]
90	200	815
110	200	865
125	200	865
140	240	865
160	240	865
180	240	975
200	240	975
225	300	980
250	380	980
280	420	1 225
315	550	1 225

Flexible sleeve with kit is available for Series 2 and double pipes. Woven mastic band is recommended and ordered separately. See p. 8:301.

Part no.

6200-Dy-000-000 inc. steel pipe bend and tightening tube.

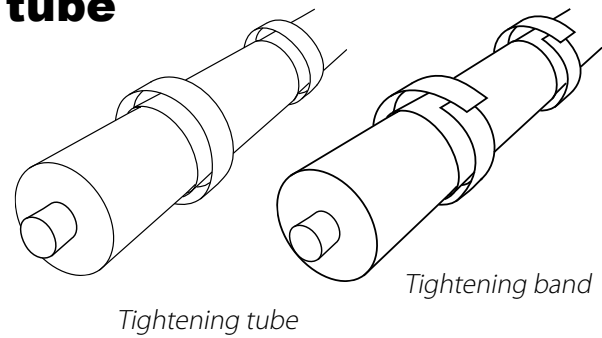
NB! For double pipe bends, fixation plates are required between the steel pipes. These are ordered separately. See Chapter 8.

Not recommended for bends greater than 60°.

Order example

Flexible sleeve for double pipe DN 40/160 including parts above, order number 6200-140-160-000.

Tightening band, tightening tube



PART TIGHTENING TUBE NO. 6241, TIGHTENING BAND 6240

The **tightening tube** is thick walled, internally covered with mastic and has a high tensile strength. Delivered individual packaged in protective plastic, which protects from dirt before assembly.

During assembly, the **tightening band** is attached using a closure strip. The wrap is delivered packed in pre-cut lengths.

Dy casing [mm]	Dy sleeve [mm]	Width [mm] Hose Part no. 6241	Double sealing		Miscellaneous Tubing/wrap	Shrink ratio	
			Wrap Part no. 6240			Tubing*	SS
90	110	150			225	121/81	25%
110	125	150			225	141/93	25%
125	140	150			225	156/104	25%
140	153	150			225	172/127	25%
160	174	150			225	196/153	25%
180	193	150			225	215/150	25%
200	215	150			225	230/170	25%
225	242	150			225	255/190	25%
250	267	150			225	300/225	25%
280	299	150			225	340/255	25%
315	336	225			300	380/285	25%
355	377	225			300	405/325	25%
400	425	225	225		300	460/360	25%
450	477	225	225		300	510/410	25%
500	533	225	225		300	565/450	25%
560	595	225	225		300	605/490	25%
630	666		300		300		25%
710	750		300		300		25%
800	846		300		300		25%
900	947		300		300		25%

* Original/shrunk D [mm] / D [mm]

Tightening tube part no.

6241 - Tightening tube-000-000

Order example

1 pcs tightening tube for DN 80/180, part number 6241-180-000-000.

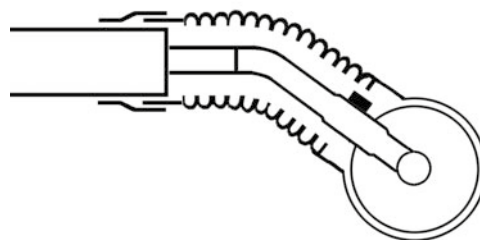
Tightening band part no.

6240 - Tightening tube-000-000

Order example

1 pcs tightening band for DN 200/400, part number 6240-400-000-000.

Tapping/connection



Ordinary T-piece

Powerpipe has a complete system for tapping/connection of branches.

Tapping must take place according to Swedenergy's Technical Provisions on tapping, D: 217 (2021)

Requisite parts and instructions are available for

- 45° branch single pipe DN 20 - DN 150
- Branch double pipe DN 20 - DN 100

All parts for tapping/connection are made for double sealing function.

The main sleeve is split before being slid onto the main pipe, after which it is longitudinally extrusion welded.

After shrinking the sleeve, tightening bands are applied to the sleeve, creating a double sealing joint

See exhaustive instructions under Chapter 10, Installation.

Woven mastic band is recommended and ordered separately. See p. 8:301.

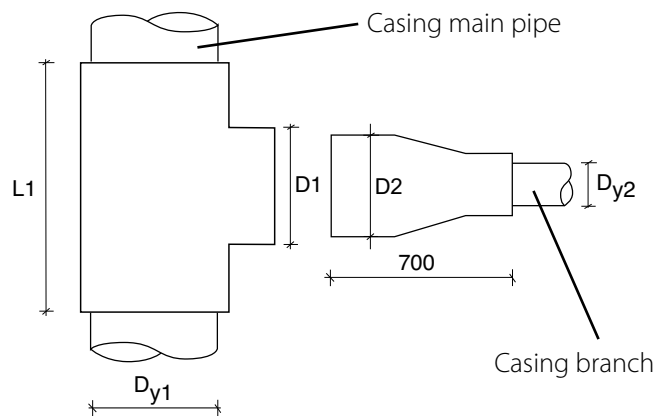
A complete tapping/connection requires:

- Steel parts (p. 8:201, 8:303, 10:304)
- Sleeve parts (p. 6:404-407)
- Foam liquids (p. 10:323-325)

When tapping double pipes, the spindles should be rotated in position so there is room for the sleeve.

Double sealing T-sleeve for connecting double pipe to double pipe, straight

PART NO. 6530



Double sealing T-sleeve is a heat shrinkable casing manufactured from PEHD material. Installation is done by extrusion welding the split sleeve. Woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint. See exhaustive instructions under Chapter 10, Installation.

D2 is inserted into D1, then D1 is shrunk.

Woven mastic band is recommended and ordered separately. See p. 8:301.

See branch pipe 8205-, Chapter 8

Dy₁ = External diameter casing main pipe in mm

Dy₂ = External diameter casing branch in mm

Part no.

6530-Dy₁-Dy₂-000 includes shrinkable casing, two pcs tightening tubes and two pcs tightening bands. For dimension table, see next page.

D1 inv. Ø [mm]	D2
125	110
140	125
156	140
177	160
197	180
218	200
244	225
269	250
300	280
336	315
377	355
425	400

For part no. and dimensions, see next page.

Order example

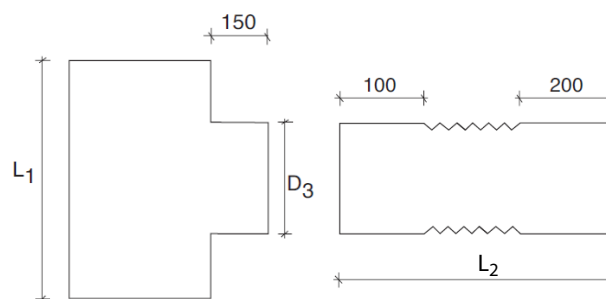
T-sleeve Double-Double for main pipe, two pcs tightening tube and two pcs tightening band DN 2x100, part no. 6530-315-200-000.

Double sealing T-sleeve for connecting double pipe to double pipe (cont.)

Part no.	Dim [mm]			D1		L1 [mm]
	Dy1	Dy2	000	Ext. Ø [mm]	Int. Ø [mm]	
6530	110	090	000	132	125	700
6530	110	110	000	149	140	700
6530	140	090	000	168	156	700
6530	140	110	000	168	156	700
6530	140	125	000	168	156	700
6530	140	140	000	188	177	1 000
6530	160	090	000	188	177	700
6530	160	110	000	188	177	700
6530	160	125	000	188	177	700
6530	160	140	000	208	197	1 000
6530	160	160	000	254	244	1 200
6530	180	090	000	188	177	700
6530	180	110	000	188	177	700
6530	180	125	000	188	177	700
6530	180	140	000	188	177	700
6530	180	160	000	254	244	1 200
6530	180	180	000	254	244	1 200
6530	200	090	000	188	177	700
6530	200	110	000	188	177	700
6530	200	125	000	208	197	700
6530	200	140	000	208	197	700
6530	200	160	000	254	244	1 000
6530	200	180	000	254	244	1 000
6530	200	200	000	279	269	1 000
6530	225	090	000	208	197	700
6530	225	110	000	208	197	700
6530	225	125	000	208	197	700
6530	225	140	000	227	218	700
6530	225	160	000	254	244	700
6530	225	180	000	254	244	700
6530	225	200	000	279	269	1 000
6530	225	225	000	308	300	1 000
6530	250	090	000	227	218	700
6530	250	110	000	227	218	700
6530	250	125	000	227	218	700
6530	250	140	000	254	244	700
6530	250	160	000	279	269	700
6530	250	180	000	279	269	700
6530	250	200	000	279	269	700
6530	250	225	000	308	300	1 000

Part no.	Dim [mm]			D1		L1 [mm]
	Dy1	Dy2	000	Ext. Ø [mm]	Int. Ø [mm]	
6530	280	090	000	227	218	700
6530	280	110	000	227	218	700
6530	280	125	000	227	218	700
6530	280	140	000	254	244	700
6530	280	160	000	279	269	700
6530	280	180	000	279	269	700
6530	280	200	000	279	269	700
6530	280	225	000	308	300	700
6530	280	250	000	348	336	700
6530	315	090	000	254	244	700
6530	315	110	000	254	244	700
6530	315	125	000	254	244	700
6530	315	140	000	279	269	700
6530	315	160	000	308	300	700
6530	315	180	000	308	300	700
6530	315	200	000	308	300	700
6530	315	225	000	348	336	700
6530	315	250	000	348	336	700
6530	400	090	000	279	269	700
6530	400	110	000	279	269	700
6530	400	125	000	279	269	700
6530	400	140	000	308	300	700
6530	400	160	000	348	336	700
6530	400	180	000	348	336	700
6530	400	200	000	348	336	700
6530	400	225	000	390	377	1 200
6530	400	250	000	390	377	1 200
6530	450	090	000	348	336	700
6530	450	110	000	348	336	700
6530	450	125	000	348	336	700
6530	450	140	000	348	336	700
6530	450	160	000	390	377	900
6530	450	180	000	390	377	900
6530	450	200	000	390	377	900
6530	450	225	000	390	377	900
6530	450	250	000	440	425	1 200
6530	500	250	000			1 260

Double sealing T-sleeve, 45° flexible, branch ≤ Dy 25



PART NO. 6540

T-sleeve 45° flexible, is a shrinkable casing manufactured from PEHD material. Installation is done by extrusion welding the split sleeve. Place a woven mastic band between the casing and sleeve, which are heated with a gas torch.

After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint.

See exhaustive instructions under Chapter 10, Installation.

Woven mastic band is recommended and ordered separately. See p. 8:301.

Main pipe L1=1000 [mm]	Branch casing [mm]													
	75		90		110		125		140		160		180	
	D3	L2	D3	L2	D3	L2	D3	L2	D3	L2	D3	L2	D3	L2
90	103	690	125	690										
110			125	690	140	690								
125			125	690	156	820	156	820						
140			125	690	156	820	177	820	197	820				
160			125	690	156	820	177	820	218	820	218	820		
180			125	690	156	820	177	820	218	820	244	820	218	820
200-250			125	690	156	820	177	820	218	820	244	820	269	820
280-710			125	690	156	820	177	820	218	820	244	820	269	820

Main pipe [mm]	L1	Branch casing [mm]					
		200		225		250	
		D3	L2	D3	L2	D3	L2
100-250	1000	279	860	308	950	348	1 100
280-710	1200	279	860	308	950	348	1 100

NB! The corrugated pipe requires careful heating to become flexible. There is space to install Vexve's tapping valve for Series 2 and Series 3. The installed steel bend (branch pipe p. 8:303) must have a radius of 5D or greater. C-C dimension for tapping must be min. 650 mm.

Part no.

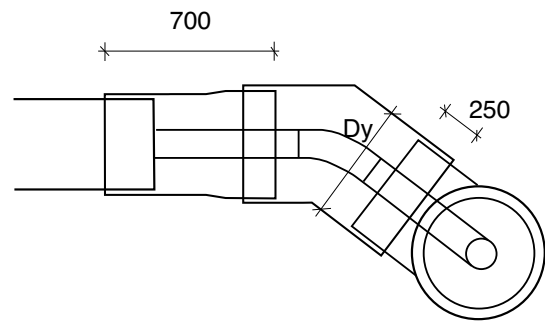
6540-Dy main pipe-Dy branch-000 includes shrinkable casing, two pcs tightening tube and two pcs tightening band

Order example

T-sleeve 45° flexible including two pcs tightening tube and two pcs tightening band for main pipe DN 400/630 and branch DN 80/180, part no. 6540-630-180-000.

The branch must be at least one DN smaller than the main pipe.

T-sleeve, 45° Branch \geq Dy 280



PART NO. 6540

T-sleeve 45°, is a heat shrinkable casing manufactured from PEHD material. Installation is done by extrusion welding the split sleeve. Place a woven mastic band between the casing and sleeve, which are heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint.

See exhaustive instructions under Chapter 10, Installation.

Outer casing main pipe: 355-900 mm, Dy = 355 mm.

There is space to install Vexve's tapping valve for Series 2 and Series 3.

Part no.

6540-Dy main pipe-Dy branch-000 includes shrinkable bottom sleeve, 45° knee (or flex up to and including branch 315 mm), reduction, three tightening tubes and two heat shrink wraps.

Woven mastic band is recommended and ordered separately. See p. 8:301.

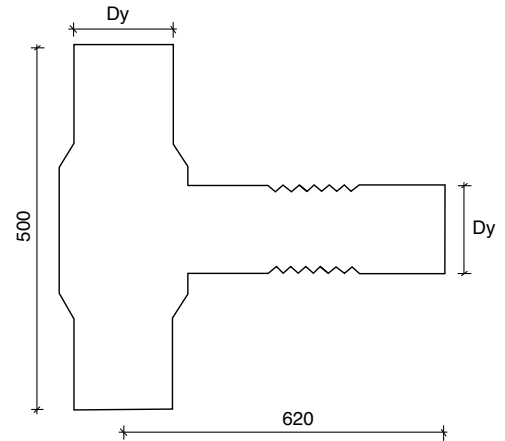
For foam liquid requirements, see Chapter 8

Order example

T-sleeve for main pipe DN 400/630 and branch DN 200/355, part no. 6540-630-355-000.

The branch must be at least one DN size smaller than the main pipe.

Double sealing T-sleeve for flexible pipe



PART NO. 6540

Double sealing T-sleeve for flexible pipes, is a heat shrinkable casing manufactured from PEHD material. Installation is done by extrusion welding the split sleeve. Place a woven mastic band between the casing and sleeve, which are heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint. See exhaustive instructions under Chapter 10, Installation.

Woven mastic band is recommended and ordered separately. See p. 8:301.

Part no.	Outer casing branch/main pipe [mm]	Dy [mm] shrinkable
6540-090	90	105
6540-110	110	125

T-sleeve for flexible pipes is adapted for simple assembly of flexible pipe to flexible pipe.

NB! The corrugated PEHD pipe requires careful heating to become flexible.

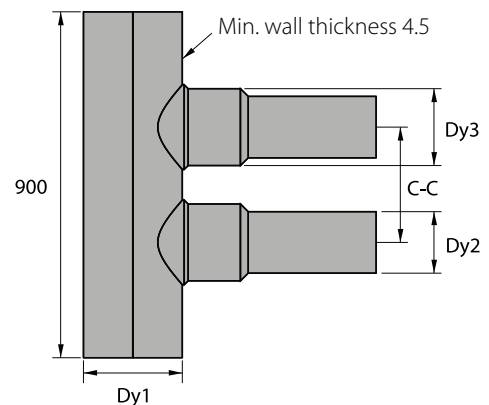
Part no.

6540-Dy main pipe-Dy branch-395 includes T sleeve, one pcs tightening tube and two pcs tightening band

Order example

T-sleeve with main pipe Dy 110 for branch Dy 110 mm, part no. 6540-110-110-395

Double sealing T-sleeve for connection/tapping of single pipe to double pipe

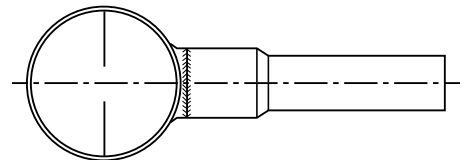


PART NO. 6535

T-sleeve for double/single pipes, is a heat shrinkable casing manufactured from PEHD material. Installation is done by extrusion welding the split sleeve. Place a woven mastic band between the casing and sleeve, which are heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint. See exhaustive instructions under Chapter 10, Installation.

When using this sleeve, the tapping valve and steel pipe must be angled in towards the centre line of the double pipe, and the C-C distance must agree.

The sleeve is vertically symmetrical, i.e. according to the image.



Woven mastic band is recommended and ordered separately. See p. 8:301.

DN / DY main pipe	Dy1 [mm]	Dy 2 branch [mm]	Dy 3 (tapping) [mm]	c/c [mm]
2 x 25 / 140	174	90	125	310
2 x 32 / 160	193	110	140	325
2 x 40 / 160	193	125	160	340
2 x 50 / 200	242	140	180	360
2 x 65 / 225	255	160	200	380
2 x 80 / 250	281			
2 x 100 / 315	348			
2 x 125 / 400	435			
2 x 150 / 450	533			
2 x 200 / 560	660			

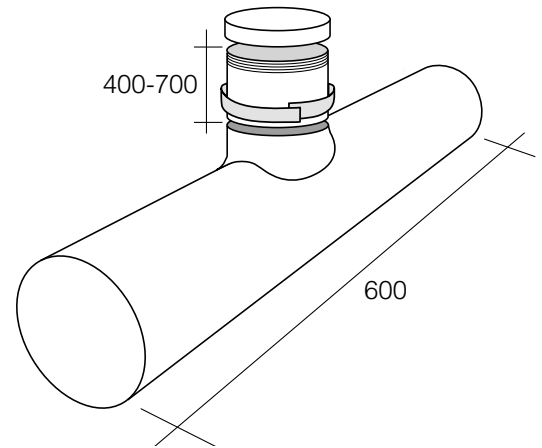
Double-sealing PEHD sleeve double/single part no.

6535-Dy1-Dy2-000 includes shrinkable sleeve, two pcs tightening tubes and two pcs tightening band. The branch must be at least one DN smaller than the main pipe, and the opening must not exceed 600 mm.

Order example

T-sleeve double/single including two pcs tightening tube and two pcs tightening band for main pipe DN 2x80/250 and branch DN 25/90, part no. 6535-250-090-000.

Measurement sleeve



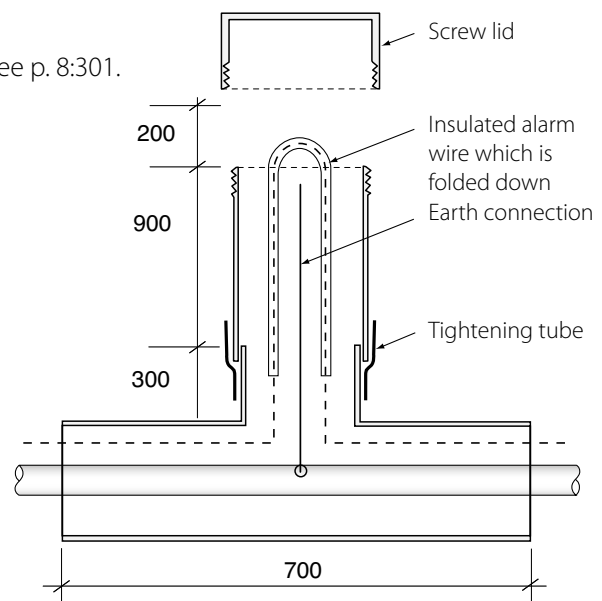
PART NO. 6270

Measurement sleeves are used where you require access to alarm wires for simple measurement of any faults. Delivered with lid and branch pipe. Can be customised in terms of height (400-900 mm).

The measurement sleeve is a heat shrinkable casing manufactured in PEHD. A woven mastic band is placed between the casing and sleeve, which is heated with a gas torch. After this, tightening tubes are applied to the sleeve joint, creating a double sealing joint.

See exhaustive instructions under Chapter 10, Installation.

Woven mastic band is recommended and ordered separately. See p. 8:301.



Example application

Part no.

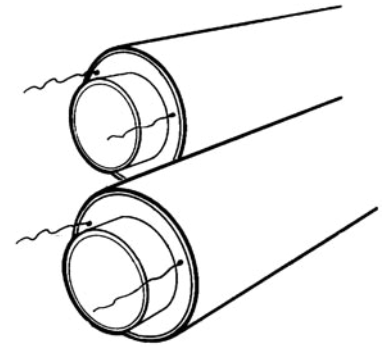
6270-Dy casing-000-000

Order example

Measurement sleeve for DN 300/500, part number 6270-500-000-000

7. Moisture surveillance system

The purpose of a moisture surveillance system is to detect and locate moisture in the pipe insulation. This provides a cost-effective and easy-to-use tool to monitor and troubleshoot the pipes during their entire lifetime. A permanently installed surveillance system is used for continuous monitoring of the pipes. When the system detects moisture in the pipes, or faults in the alarm wires, it automatically sends a message to the maintenance staff. This means that you discover any damage and can take action at an early stage, avoiding operational disruptions and expensive leakage.



ALARM WIRES

Steel service pipes

Two alarm wires (diameter 1.38 mm, cross-section area 1.5 mm², soft copper wire) are inlaid in all insulated pipes and pipe fittings.

The position of the alarm wires is at 10 and 2 o'clock as standard. TDR speed PVF (Propagation Velocity Factor) is normally 273 m/ μ s (0.91). The resistance in the copper wire is 1.2-1.3 ohms/100 m of alarm wire.

Plastic service pipes

Another solution is required here because the service pipe is not electrically conductive. Instead, the electrical properties are measured between the conductors. This solution can work in different ways. See more in this chapter.

7.1 System Wideco

3dc

The WiDetect Cooling 3dc sensor cable patented by Wideco is intended for use in remote cooling systems with steel or plastic service pipes. The cable's unique construction allows for the avoidance of problems with condensation moisture between wire/wire and service pipe along the pipes, but above all on the ends of the pipes and pipe fittings and in other parts of the sleeve.

When manufacturing district cooling pipes and pipe fittings, the WiDetect Cooling 3dc is installed directly against the service pipe with double sided tape in between – a fast and easy process. In joints and branches in the field, the cable is also laid directly against the service pipe. The special construction of the cable makes it possible for impedance changes of certain sizes from wet insulation to be detected even if the cable is insulated along the entire pipe length.

The alarm cable should be positioned at 5 o'clock. TDR speed PVF (Propagation Velocity Factor) is normally 238 m/ μ s.

The resistance in the copper wire is 2.54 ohms/100 m of alarm wire. The 3dc is monitored via the WiDetect X6 alarm unit which continuously sends information from the alarm wire/pipe insulation to the XTool PC) and WISION (web) system software.

Please note that the sensor cable must be handled with great care to prevent damage occurring during transport, production etc. Wideco's installation instructions must be followed.



WiDetect™ system

Even smaller leaks can cause significant damage. This can result in heat losses, corrosion on the pipes or operational disruptions. The WiDetect™ system has been developed to guarantee continuous monitoring of the entire pipe and to report any faults at an early stage.

WiDetect™ is used to automatically monitor insulated pipes for district heating, district cooling and non-conductive media such as oil (point monitoring with sensors).

The system consists of both alarm units for easy monitoring without software and more advanced units for central monitoring and analysis together with a range of associated services. The web software WISION offers a complete system for all platforms, giving you as a customer total control over all of your units. WISION consists of several different widgets that can be adapted to your needs. Read more about WISION at www.wideco.se

WiDetect's primary strengths are:

- Wide range of proven measurement units.
- High reliability.
- Easy to add more units when your network grows.
- Easy to maintain because the units can be updated wirelessly.
- WiDetect Online, a service for more convenient management of measurement data.
- Flexible communication via network or wirelessly.
- Can be integrated with SCADA systems.

WiDetect™ monitoring units

Level 1 units – fault detection only

WiDetect X1e

WiDetect™ X1e has been developed to monitor and detect faults in insulated pipes. WiDetect™ X1e is the easiest way to monitor each section. Connect the alarm wires to WiDetect™ X1e in an alarm loop of up to 2 x 2500 m pipe. WiDetect™ X1e can be connected to both the supply and return pipe. The alarm control centre reports changes in insulation resistance, breaks in alarm wires or short circuits between alarm wires and service pipes.

Reporting can be optical (red lamp on alarm control centre). Buzzer and alarm can be forwarded through the relay output. After an alarm the fault must be located using a traditional wireless pulse echometer (TDR) or the WiDetect™ XPM portable measurement system. An integrated 2G/3G modem is available as an option for wireless communication to the parent software, together with an integrated battery pack with a lifetime of up to 7 years.

WiDetect X1L

WiDetect X1L has been developed to monitor and detect faults in insulated pipes. Connect the alarm wires to WiDetect X1L in an alarm loop of up to 4 x 3500 m pipe. WiDetect X1L can be connected to both the supply and return pipe.

WiDetect A1e

WiDetect A1e is an advanced monitoring unit for registering moisture, temperature, water levels etc. in manholes, water/sewage manholes, data centre flooring or other low points and for detection of moisture in insulated pipes.

WiDetect A1e has four PT 1000 inputs and four analogue or digital inputs (4-20mA, 0-10V) to measure values such as room temperature and air humidity, supply and return temperatures on service pipes and water levels, in several steps, in manholes and other wet spaces. The unit can also register insulated pipe loop and insulation resistance. WiDetect A1e is available in several different models with battery operation or mains operation and modems for different means of communication.



Level 2 units – fault detection and location

WiDetect X6

The X6 has been developed to monitor and detect faults in insulated pipes and can monitor lengths up to 8 x 9000 m (depending on the sensor cable type), immediately detecting and locating where a leak has occurred. The X6 also continuously checks that the sensor wires are functional and undamaged. The X6 detectors can connect to up to 8 sensor wires, and it is therefore possible to monitor four separate pipes. For optimal use, the WiDetect X6 is connected via wireless connection (2G/3G) to the hosting service WiDetect Online – WDO, where you can easily handle and analyse your entire system.

The WiDetect X6 consists of a base unit and various connection boxes. You choose the connection box depending on what type of alarm wire you want to monitor.

CB Heating – connection box using copper alarm wires (Nordic system)

CB Cooling – connection box for 3dc sensor cable

CB Water – connection box for W3 sensor cable

PORTABLE MEASUREMENT SYSTEM

WiDetect XPM

The XPM system is used for maintenance and troubleshooting on your pipes or moisture band.

WiDetect XPM™ is a portable, modern and convenient measurement system that makes it easy for you as an operator to measure different types of alarm wire systems with high accuracy while working in the field, to follow up warranties and to protect facilities from operational disruptions. The system gives you full control of measurements, analyses in the field, and in addition a safer working environment.

XPM™ can be used in all types of environments and on almost all types of measurement wires, for example the Nordic system, 3dc sensor cable, W3 sensor cable, MultiZone sensor cable, moisture band etc. The system consists of a measurement unit to which the alarm wire can easily be connected. The XTool XPM software has been specially developed for touchscreens and is run on a rain, dust and impact resistant, powerful touchscreen computer.

As standard, XPM™ is equipped with a 3G module to facilitate synchronisation, but also field measurements via our central WiDetect Online hosting service. The system also has GPS for effective site identification, together with Wi-Fi for quick and wireless connection between the touchscreen and measurement unit. A simple, convenient way to measure, analyse and consider in your vehicle instead of on site where the measurement unit is connected.

A free user account for the WiDetect Online hosting service is included when you buy WiDetect XPM™. The major advantage with WiDetect XPM™ is that all measurements and reports are integrated into XTool 5, where your other stationary alarm units can be found, rather than separate systems.

SOFTWARE

WiDetect XTool

XTool is the WiDetect system's software for managing data, units, reports and users etc. XTool gives you full control of alarm units, channels, markers etc. The system is very easy to install and use. XTool includes measurement database, language database, OPC server (option), documentation database, comparison function, group divisions, dynamic report management, GPS positioning, automatic measurement reports, manual measurements and lots more. XTool automatically detects the alarm units you connect and adapt the system accordingly. XTool is available in Arabic, Chinese, Danish, English, Finnish, French, German and Swedish.

WISION

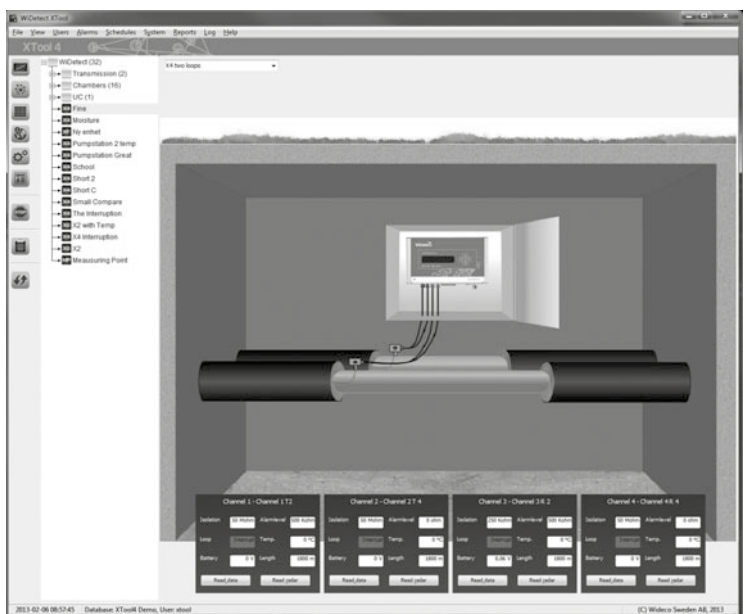
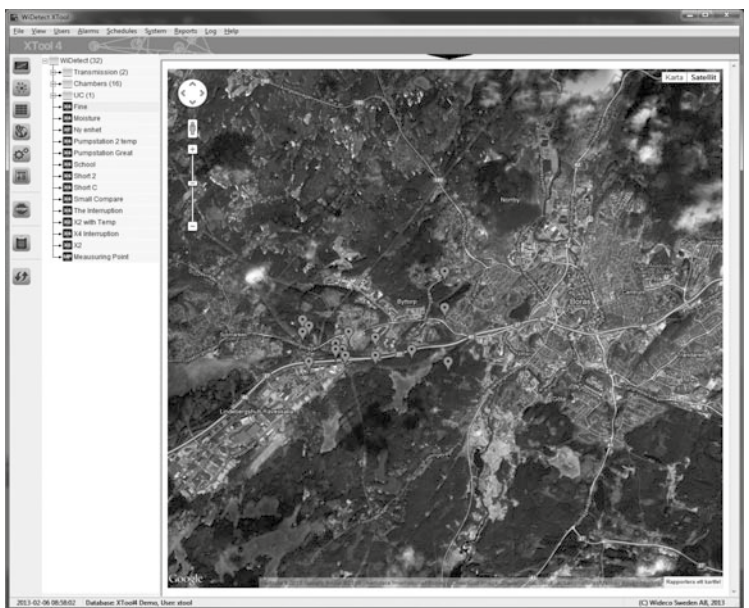
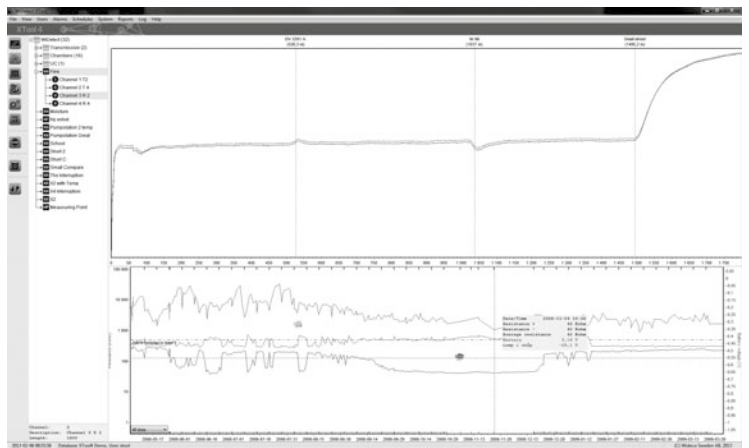
WISION is a software platform that simplifies monitoring, analysis and statistics for your units. WISION allows you to measure and monitor almost anything – water levels, temperature, gas, flow etc. – in a user-friendly way. WISION is cloud-based and comes with a widget design for full access, anywhere. You simply carry our smart unit with you to get total control. Read more about WISION at www.wideco.se

WiDetect Online (Hosting)

WiDetect Online – monitors your insulated pipes, any time, anywhere. WiDetect Online contains everything you need: Wireless communication via 2G/3G/4G or LoRaWan, XTool software on our server for analysis and presentation of measurement data, together with continuous operation, maintenance and support.

Advantages

- Your own XTool account on Wideco's server for analysis, documentation and presentation of data.
- Plug & Play monitoring units.
- Wireless communication.
- More effective maintenance and support.



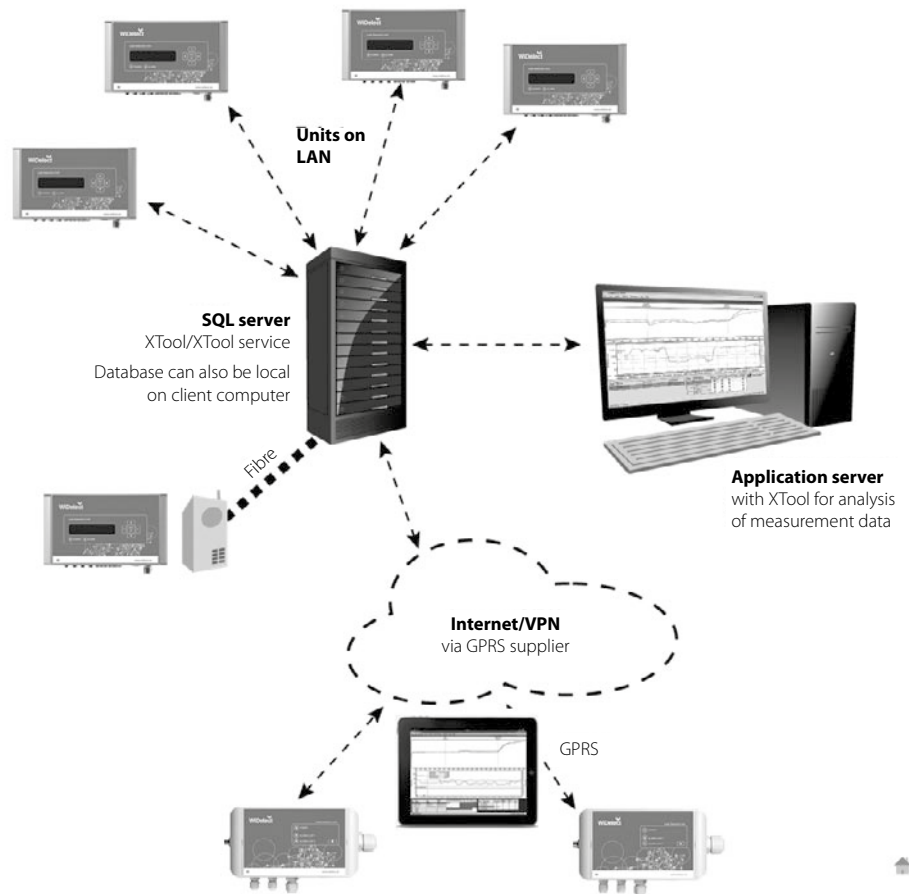
A flexible system

The image shows examples of different communication solutions.

Software

XTool is developed to cope with several different users and alarm units simultaneously and functions in a client/server environment. It is also possible to use remote access, for example via Citrix solutions to control the software.

The XTool software also includes an integrated OPC server that makes it possible to forward different parameters to the parent SCADA system.



There are many accessories for the WiDetect™ system. For more information, please visit www.wideco.se.

Connection boxes

Connection boxes (MultiBox) are available in different versions and are used when you want to connect the alarm wires to other cables.

Control cabinets

IP67 control cabinet for secure mounting of alarm equipment.

Communication modem

Where the existing network cannot be used, we recommend 2G/3G communication via the internet. We can help you with subscriptions and modems.

Antennas

We have several different types of antennas which are suitable for and tested with WiDetect™.

Cabling

93 ohm RG62 coaxial cable for connection of WiDetect™ X6 alarm units to district heating or district cooling pipes. Available in lengths of 2.5 and 5 m including BNC contacts. Delivered with red and blue bend protection. Can be extended.

Network cables

Available in different lengths for connection of WiDetect™ alarm units to network equipment or external modems.

Take Off

WiDetect Sensor Take Off cable is used when alarm wires are to be removed from the pipe. Available in 10 metre lengths. Other lengths available to order. Tool for simple installation is sold separately.

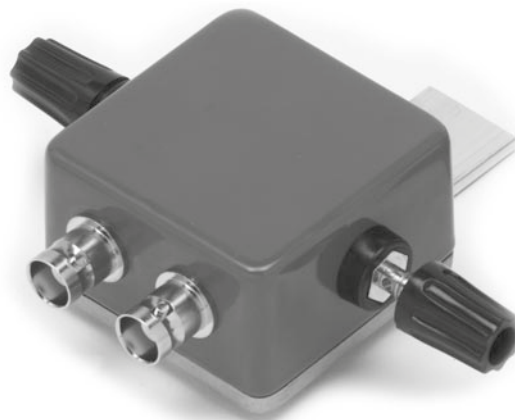


Overview of alarm components

Part no.

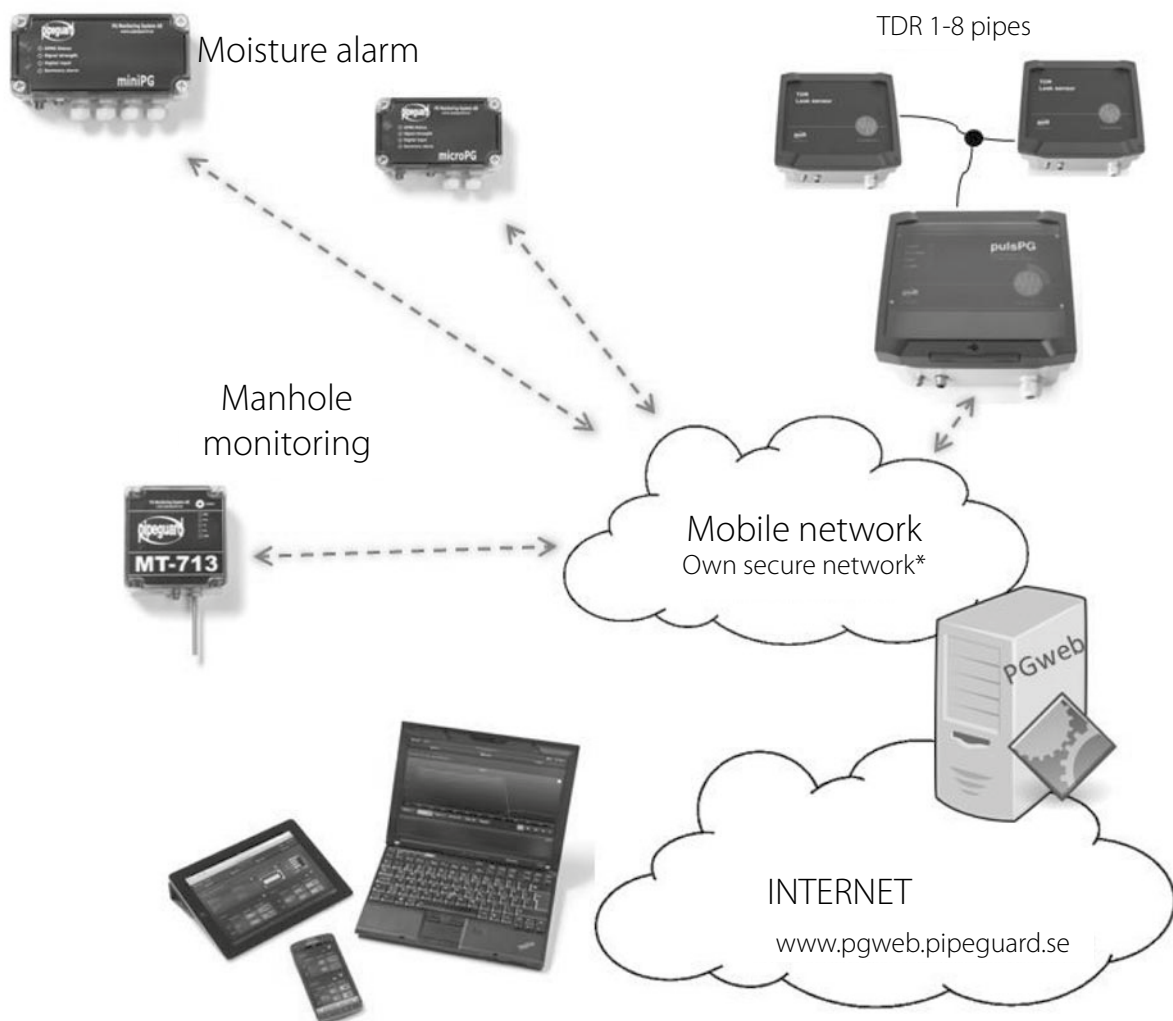
WiDetect X1e	6810-901-000-000
WiDetect X1L	6810-901-001-000
WiDetect A1e	6810-906-000-000
WiDetect X6	
WiDetect XTool	6810-907-000-000
WiDetect XPM	6810-908-000-000
Multibox C2	6810-900-000-000
Multibox S2	6810-910-000-000
Multibox CS	6810-915-000-000
Multibox M1	6810-920-000-000

State the required length for connection cable in a separate row.



Use a connection box (Multibox C2) for easy connection.

7.2 System Pipeguard



Pipeguard provides maintenance staff with a current image of the condition of the pipe network. The system is suitable for facilities where data from many different sensors needs to be stored and presented in a clear manner.

Pipeguard develops and supplies monitoring modules and surveillance systems, provides support, and always keeps facility operation and function in focus.

Pipeguard's primary advantages:

- A proven system with reliable technology that copes with the stressful challenges faced by alarm modules installed in the field.
- Management of alarms, history and settings from a number of sensors in a single system.
- Accessibility from computers, tablets or smartphones.
- Easy customisation of the system to your own needs through the flexible range of modules for collection of several different types of measurement values. In addition to moisture surveillance, it also offers manhole surveillance, pressure and temperature measurement, boiler surveillance, pump surveillance etc.
- Easy administration of the system as the modules are updated and configured remotely.
- An open system with the possibility of linking to a central GIS/NIS system.

PGweb monitoring system

The Pipeguard system is a web-based monitoring system that collects measurement values from alarm units and other sensors, and presents them in a way that gives the user an overview so they can quickly make the right decision. The programme has a clear and well-designed interface, making alarms, log values and settings easy to find and work with. Alarms can be set to automatically be sent via mail or SMS to a range of recipients.



The built in map view shows all modules with status indication. It is also possible to export your own map information to PGweb, such as pipe systems, manholes, alarm wires etc.

The system is easily accessible and connection takes place to a website from computers, tablets and smartphones. If necessary you can even integrate information from the Pipeguard system into your own GIS/NIS system to make the information more accessible to your own organisation.

Moisture surveillance with status assessment microPG/miniPG

The Pipeguard modules are compact alarm units with built-in GPRS modems.

A special measurement method means that the length of the alarm loop does not affect the measurement values. This means that it is easier to interpret alarms and trend curves because same moisture quantity always gives the same result, regardless of how far from the module the leakage occurs. The modules send alarms via SMS or provide data to Pipeguard via GPRS.

You can also review your log data in an easy-to-use website. The modules are intended to be configured and updated remotely. The Pipeguard modules are available in two versions. microPG has connections to two pipes (four wires) and miniPG has connections for four pipes (eight wires).

Insulation resistance	0-10 000 Kohm	Section length module type (Pipe/Alarm wire loop) microPG (2 x 4 000 m/2 x 8 000 m) miniPG (4 x 4 000 m/4 x 8 000 m)
Loop resistance	0-100 ohm	
Terminal voltage	0-1 000 mV@1Mohm	I/O Alarm input Disconnection/ connection
Communication	GSM, GPRS and SMS	
Power supply	Mains, battery	LED indication Yes
Voltage	10-30 Volt (14.4 Volt)	
Current 15 mA (Max 500 mA)	Alarm output 48 V/200 mA	
Degree of protection	IP 67	

miniPG:



microPG:



Moisture surveillance, status and location with TDR pulsPG

pulsPG is a localised alarm control centre that uses TDR (time-domain reflectometry) technology, which is also known as pulse echometry. The unit is used to monitor district heating, district cooling and pipes containing, for example, oil. The unit consists of a module system with a main unit together with 1-8 external measurement modules. Unique advantages of pulsPG:

The measurement modules are directly connected to the pipe without signal cables.

Modular construction, can be adapted to 1-8 measurement loops per pipe.

External measurement cards, can collect measurement data from measurement points, for example, in separate buildings. Pay only for the equipment you really need.

Easily adapt the system when the pipe network changes.

Accessible monitoring via the PGweb Surveillance system.

Proven TDR technology based on measurement cards from Stateview.

The measurement modules consist of pulse echometers for two wires (loop). pulsPG collect and sends the measurement values to the Pipeguard system via GPRS or Ethernet. The system is fully compatible with Stateview System II.

Pulse echometer/TDR

Range (PVF 0.90) 8 000 m

Measurement card

Insulation resistance 0-10 000 Kohm

Loop resistance 0-100 ohm

Terminal voltage 0-1 000 mV@1Mohm

Power supply Mains/Battery

Voltage 110-230VAC / 15-30VDC

Power 30w

Protection level IP 65

Communication GPRS, Ethernet

Measurement values:

In addition to resistance and galvanic voltage, pulsPG also measures a pipe status, the TDR curve deviation from reference, and in the case of damage the distance to the fault. In the case of faults, a TDR curve is also saved for analysis of the damage.

Control unit:



Expansion module for external TDR card:



Module overview Moisture alarm

Module	Monitoring	Number of pipes	Max. length pipe/ wire [m]	Resistance Galvanic volt. Mohm/mV	Loop	Power supply	Indications	Communication	Inputs
micro PG	Resistance, voltage	2	4 000 / 8 000	0-10 / 0-1 000	Yes/No	Mains 110-230 VAC Battery 12V	LED on front, Summary alarm relay	GPRS	2 pcs, e.g. for level switches
mini PG	Resistance, voltage	4	4 000 / 8 000	0-100 / 0-1 000	Yes/No	Mains 110-230 VAC Battery 12V	LED on front, Summary alarm relay	GPRS, Network	2 pcs, e.g. For level switches Analogue input for temp, moisture, pressure input (option)
puls PG	TDR Resistance	1-8	4 000 / 8 000	0-65 / 0-1 000	Yes/No	Mains 110-230 VAC Low volt. 15-30VDC	LED on front, Summary alarm relay	GPRS, Network	2 pcs, e.g. for level switches

Alarm and Measurement value collection

Using the alarm modules, you can for example collect values from sensors for moisture, pressure, flow, air and pipe temperature, hatch alarms, sabotage alarms. The modules have a long lifetime even in tough environments. They have protection level IP 67/68, and as extra protection the circuit boards are equipped with moisture and temperature alarms that report directly in Pipeguard if the unit is in danger. The modules are available in different types customised for different situations.

The Pipeguard system contains several different types of modules for different types of conditions. For more information, contact your salesperson at Powerpipe, or visit www.pipeguard.se.

MT713

MT713 is a compact alarm/measurement value collection module with a built-in battery and GPRS modem.

MT713 is used for monitoring manholes and detecting water level, temperature and moisture. You can easily set alarm levels in PGweb, where trends over time are displayed. MT713 is also suitable for collection of media temperatures (return temperatures) and pressures from sites where external power supply is missing.

**Power supply**

Internal battery (up to 5 years)

IP class

IP68

Inputs:**Alarm input DI**

5 pcs NO contact

Measurement

3st

input AI**Miscellaneous:**

Built-in hatch alarm, condensation protection, moisture membrane, indication on front.

Accessories:

Level sensors with brackets, Combined temp/moisture sensor, contact temperature sensor, pressure sensor, spare battery, various versions of antennas, antenna cable.

Accessories

There is a wide range of accessories. Contact Pipeguard for more information.

Fixbox®,

Fixed measurement point with perfect earth.
When measuring pipes, it's important to have a good connection to wires and pipes earth. Fixbox is used as a fixed measurement point and is installed directly on the pipe or as a coupling between the coaxial cabling and alarm module. Fixbox also has a FixID which is used by pulsPG or the Stateview System II measurement system.



Installation kit for Fixbox,

for installation direct on pipe without welding equipment
As an alternative to a welded bolt, a Fixbox can be installed on a pipe with an installation kit containing a wrap and a clamping bolt.

Connection cables,

Prepared delivery for fast installation.
On delivery, we can supply alarm modules with connected cables so installation in the field is quick and convenient.

Installation plates,

microPG, miniPG, MT713
For simpler insulation on uneven surfaces, for example in manholes.

Street cabinet

for alarm output.
Cabinet with space for alarm output, Fixboxes and alarm modules. Can be supplied assembled and ready to use. Grey or painted green.

Battery packs,

for microPG, miniPG
Up to 5 years' operation

Antennas,

for different needs
Good antennas are important. We have a selection of antenna types to suit different installation methods.

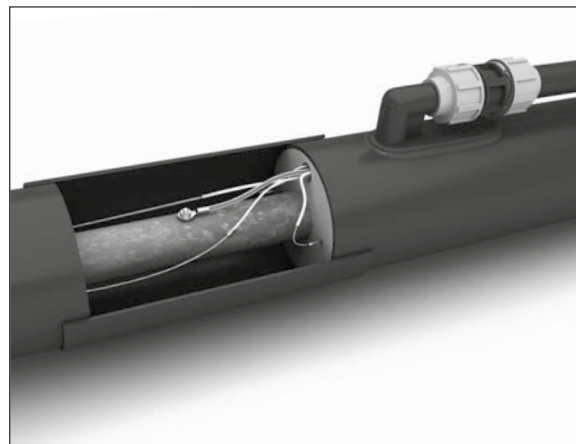


cTube™ alarm output

cTube™ provides secure and flexible access to the district heating pipe alarm wires. This means time savings, a better working environment and a simpler, more economical surveillance system.

Advantages:

- Easily accessible measurement points.
- Better working environment.
- Less disruption for the end customer.
- Rationalise inspections and service by connecting several sections to a central point.
- The cables are protected by impact resistant PEM conduit.
- Cast weld part – fully watertight.
- Low profile – remains clear of ground movements.
- Flexible cable length.
- Minimal damping of echometer pulse.
- Facilitate monitoring where no manhole or building is present.
- Alarm and communication equipment is placed above ground level – no risk of flooding, better transmission from wireless units.
- Delivered with FixBox® for simple and secure connection of measurement equipment.
- Can be pressure tested.



Specifications

Standard lengths	8 m, 12 m
Other lengths	According to order
Number of cables	2 or 4
Contacts	BNC + FixBox®
Impedance	180 Ω
Installation	Extruder weld, shrink mat



Ordering

Alarm output, 2 wire, part number 6890-020-000-000

Alarm output, 4 wire, part number 6890-025-000-000

State desired cable length on separate row.

cTube, coaxial cable 2-wire/m 6890-020-001-000

cTube, coaxial cable 4-wire/m 6890-025-001-000

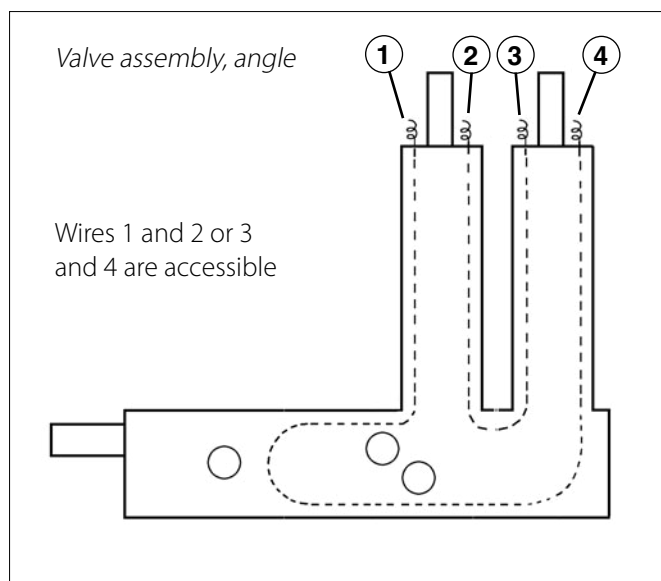
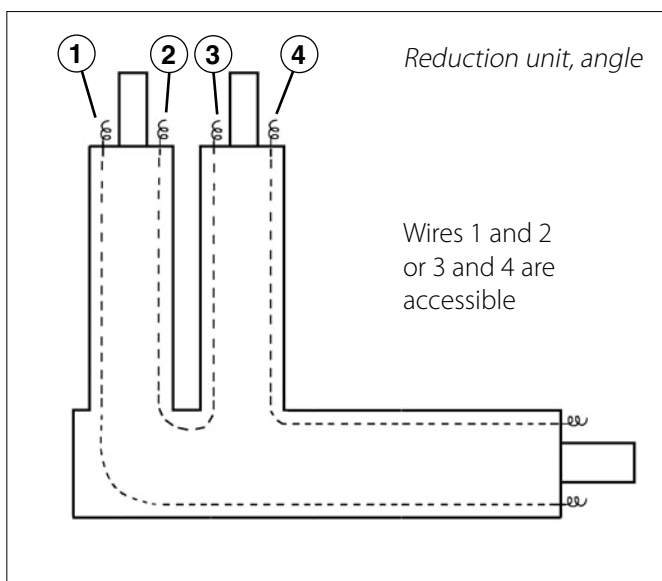
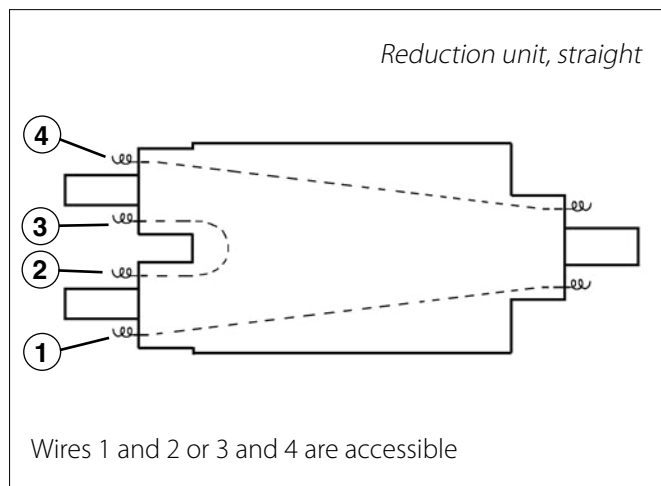
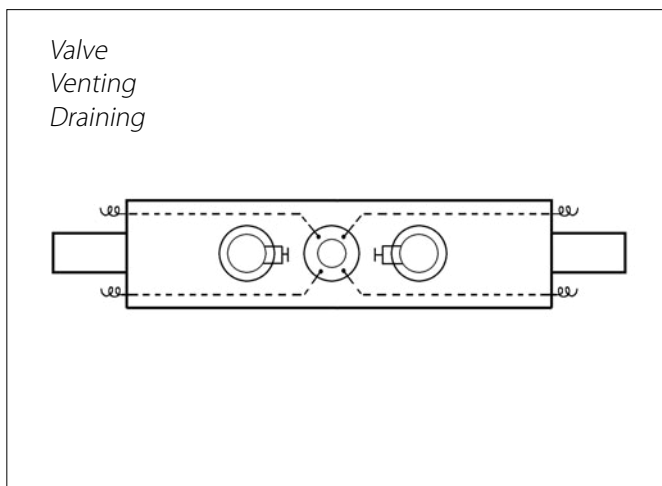
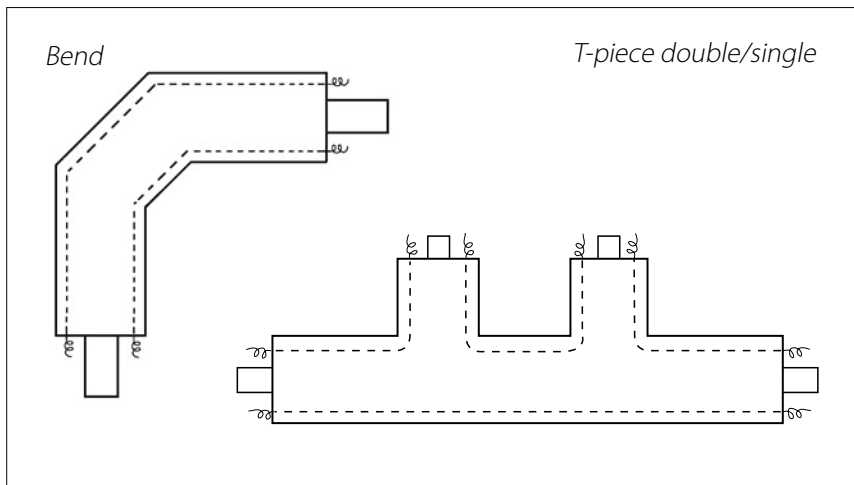
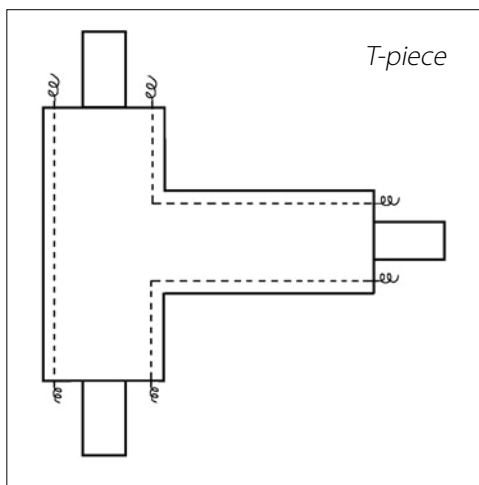
Alarm box

The alarm box is an alternative to bridging the alarm wires directly over the stainless steel end cap. By installing the device in the end cap, it is easier to check the alarm wires as these can be conveniently measured via the contact points in the device.

The alarm box is manufactured in steel and the upper part is protected with a plastic cap manufactured in polyoxymethylene (acetal). The plastic cap is normally opened and closed manually, but there is a knob to open it with pliers if the cap is too tight. The alarm box can be installed on valves with article number 4X42 Variant A and on combination valves 484X.

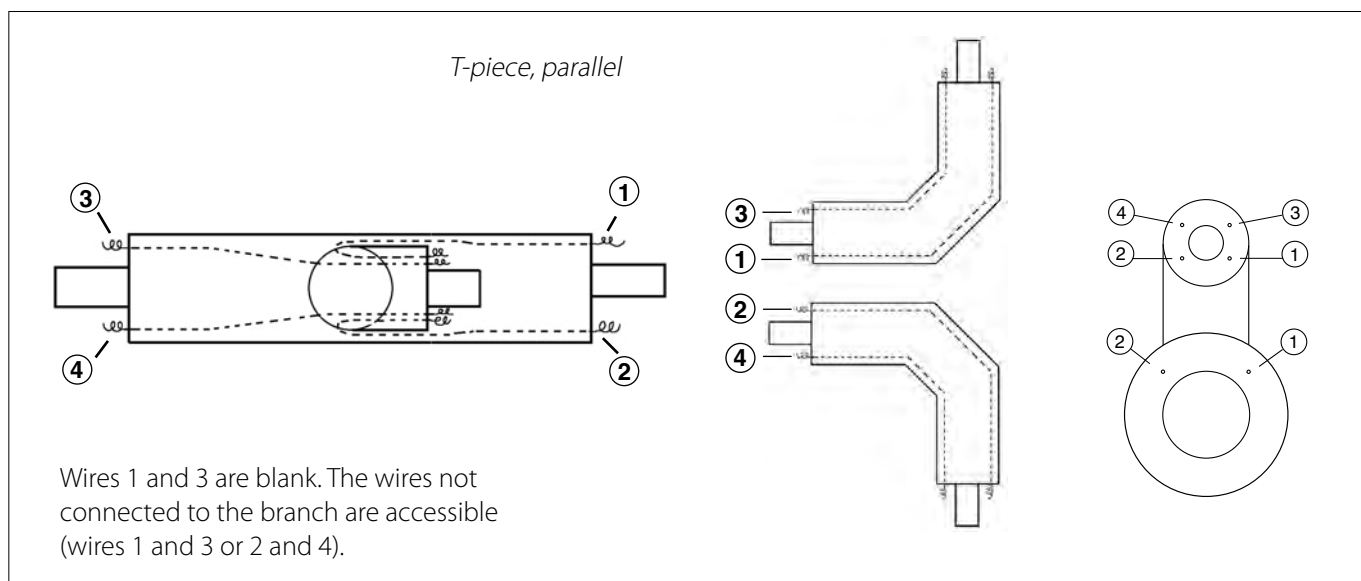
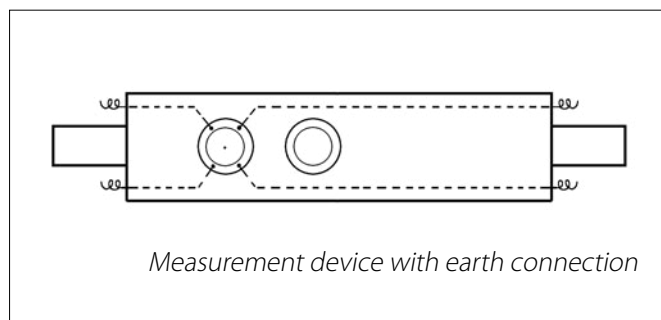
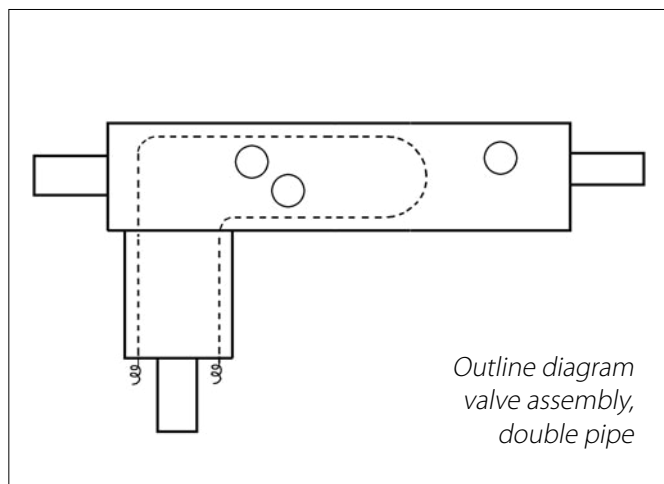
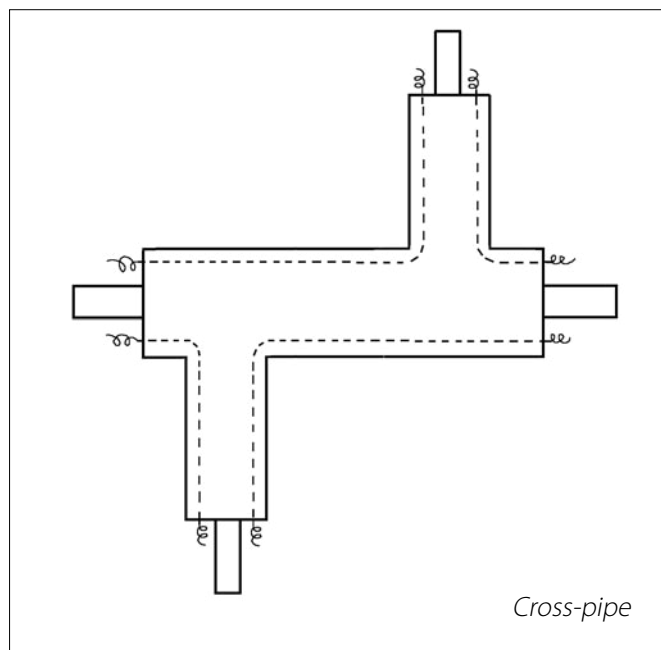
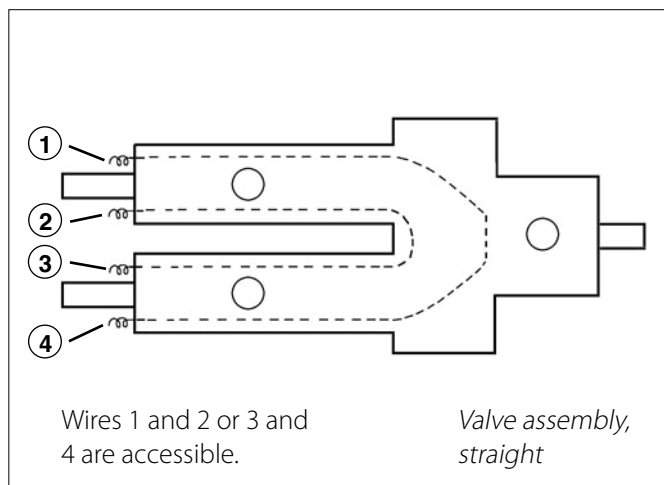


7.3 Type drawings, Alarm



For alarm wire lengths, see the last page in Chapter 7.

Type drawings, Alarm



For alarm wire lengths, see the last page in Chapter 7.

Alarm wire loop for certain components

The information below on the length of alarm wire in affected components facilitates accurate measurement of any future damage. The length has been calculated from the steel pipe edge.

Part number suffix for our standard alarm wires:

-239 means 4 wires at the top (10, 11, 1 and 2 o'clock) for straight pipes from DN350. Other 4-wires have positioning (4, 8, 10 and 2 o'clock).

-566 for "Alarm wires not accessible" (applies to valves)

Preinsulated valves

	DN 25 - 125	DN 150 - 250	DN 300
Accessible alarm wires	2.3 m	2.5 m	3.0 m
Standard	1.5 m	1.5 m	1.5 m

Reduction unit, straight

	DN 25 - 50 L = 1 400	DN 65 - 150 L = 2 250 mm
Wire 1.3	1.4 m	2.3 m
Wire 2	0.8 m	0.9 m

Reduction unit, angle

	DN 25 - 40	DN 50 - 100	DN 125 - 150
Wire 1	2.0 m	2.3 m	2.5 m
Wire 2	1.5 m	1.7 m	1.8 m
Wire 3	1.7 m	1.7 m	1.8 m

Valve assembly, angle, single pipe

	DN 25 - 80
Wire 1	1.3 m
Wire 2	3.7 m

Valve assembly, straight, single pipe

	DN 25 - 80
Wire 1	1.9 m
Wire 2	1.4 m

Parallel T-piece

	DN 20 - 400 / DN 20 - 100 L = 1200 m	DN 125 - 400 / DN 125 - 300 L = 1500 m
Wire 1, 2, 3, 4	1.4 m	1.7 m

Valve assembly, straight, double pipe

	DN 25 - 80
Wire length	3.3 m

Valve assembly, angle, double pipe

	DN 25 - 80
Wire length	2.3 m

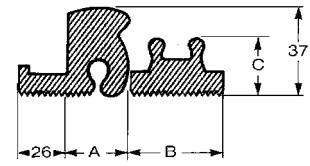
Measurement device

Addition for normal laying depth for choice of measurement device

	DN 25 - 125	DN 150 - 250	DN 300
	0.8 m	1.0 m	1.5 m

Wall penetration 6510

Our original W801 seal is intended as a water and radon barrier during casting of pipes in concrete walls and floors. It is designed to function without fault with both low and high water pressure and for all types of pipe material. W801 also permits axial movements in the embedded pipe. The seal is adjustable after casting.



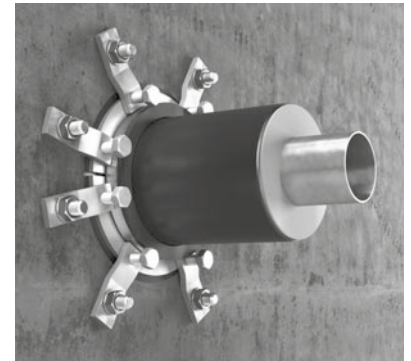
Dimension	A	B	C
DY 110-180	25	40	22
DY 200-1000	31	50	27

Part no.

6510-DY PEHD pipe-000-000

Order example

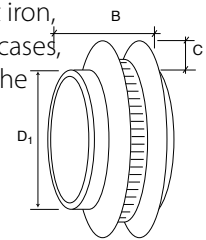
Wall penetration for dim DN 200/355, Part number 6510-355-000-000.



Wall penetration W801 is used as a seal between pipe and concrete wall where the axial movement is large and there is a high risk of groundwater pressure.

Embedding ring 6520

The W802 embedding ring is the market's most effective seal for water and/or radon sealing during casting of round pipes in concrete walls and floors. It suits all types of pipe material, such as plastic, steel, cast iron, concrete etc., and should be installed directly on the casing pipe to be cast together with it. In some cases, where necessary the ring can also be used on corrugated plastic pipes. The unique profile design of the ring, together with the associated hose clamp, provides effective sealing between the pipe and the concrete. The excellent sealing properties result from the hose clamp's ability to hold the rubber ring firmly against the pipe during the casting process. The "ears" of the ring also become efficiently embedded in the concrete when it shrinks during the curing process. The W802 ring is ideal for use where the pipe will not be exposed to major axial movement.



Dimension	B	C
DY 90-180	40	22
DY 200-1000	50	27



The embedding ring is used as a seal between district heating pipe and concrete wall where the axial movement is small.

Part no.

6520-DY PEHD pipe-000-000

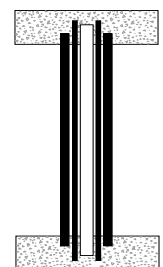
Order example

Embedding ring for dim DN 200/355, Part number 6520-355-000-000.

Positioning the W802 in concrete

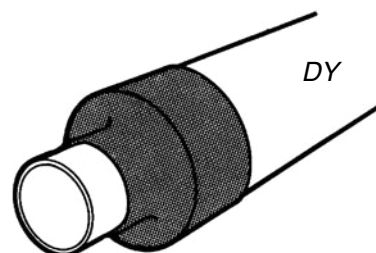
If holes are to be drilled in the concrete wall for later casting of pipes/rubber rings, we recommend the following minimum drill holes:

PEHD dim	B
90-180	PEHD Casing dim. + 100 mm.
≥200	PEHD Casing dim. + 120 mm.



For installation in other types of holes (e.g. rectangular), there should be free space above the rubber ring of 20 mm

End caps



PART NO. 6291, 6292

Heat shrinkable end caps for installation over the free pipe end to prevent water penetrating into the insulation foam. It is internally covered with seal mastic that tolerates the same temperatures as the insulation foam. The end caps are available for dimensions Ø 90–Ø 500 (on the casing pipe).

Table showing end cap sizes

Single pipes (CSS)			Double pipes (CSS2)		
Part no. to be delivered	Interval DI	Interval DY	Part no. to be delivered	Interval DI	Interval DY
6291-030	24-40	75-105	6292-010	10-28	85-135
6291-040	24-55	75-135	6292-030	60-24 50-20	105-160
6291-050	24-60	75-148	6292-040	48-24 28-14	135-185
6291-060	30-60	135-175	6292-060	48-24	140-200
6291-070	40-90	90-150	6292-070	60-24	140-235
6291-080	50-95	130-195	6292-090	85-55	175-250
6291-090	68-145	145-240	6292-100	105-55	175-260
6291-100	68-150	145-270			
6291-110	120-180	220-295			
6291-120	120-255	220-360			
6291-130	200-280	340-420	Flexpipe Single (rubber, not heat shrinkable))		
6291-140	200-415	340-540	6297-001	14-32	90
6291-150	360-570	480-680	6297-005	15-35	110
			Flexpipe Double (rubber, not heat shrinkable))		
			6297-002	15-25	90
			6297-006	14-35	110
			6297-007	14-45	125-130
			6297-008	14-45	160

See exhaustive instructions under Chapter 10, Installation.

Part no.

6291-XXX (according to table above for suitable DI and DY) followed by -000-000.

6292-XXX (according to table above for suitable DI and DY) followed by -000-000.

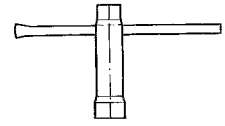
6297-XXX (according to table above for suitable DI and DY) followed by -000-000.

Order example

End cap for single pipe DN 100/250, Part number 6291-100-000-000.

T-KEY FOR VALVE AND VENTING

Part no. 4130-019-027-000 - Key widths 19 and 27 mm.	H=1200
Part no. 4130-019-000-000 - T-key 6K-19 DN25-80	H= 800
Part no. 4130-027-000-000 - T-key 6K-27 DN100-150	H= 1200
Part no. 4130-050-000-000 - T-key 6K-50 PN200-250	H= 1200



END CAP FOR VALVE AND VENTING

Part no. 6136 - Dim valve-000-000.
Standard length 250 mm

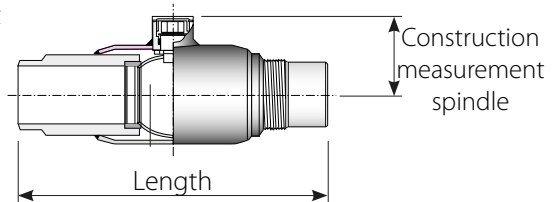


PORTABLE GEAR

Valve	Part no.
DN 100-150	7801-027-090-000
DN 200-400	7801-050-090-000



		Length [mm]	Construction measurement spindle [mm]
TAPPING VALVE	DN 25	209	46
DN25-150	DN 32	209	55
Part no. 9260-DN-000-000	DN 40	228	63
<i>Consult Powerpipe if reinforcement plate is required</i>	DN 50	260	74
	DN 65	280	88
	DN 80	312	102
	DN 100	349	123
	DN 125	363	143
	DN 150	350/365	143



DN25-DN125 are full flow valves, DN150 is a reducing valve.

TAPPING TOOL

Valve	Part no.
DN 20	7871-002-000-000
DN 25-100	7871-001-000-000

CENTRAL DRILL

Part no. 7871-004-000-000

ADAPTER FOR TAPPING TOOL

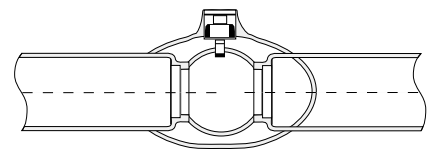
Dim: DN 125-150 - Part no. 7871-003-000-000

REPAIR KIT TAPPING TOOL

Part no. 7871-006-000-000

SINGLE-USE VALVE REDUCED

		Length [mm]
DN 20 - DN 200	DN 20-25	230
Part no. 9247-DN-000-333	DN 32-40	260
	DN 50-80	300
Part no. 9247-DN-000-000 (with handle)	DN 100-125	325
	DN 150	350
	DN 200	390



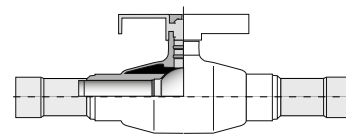
Balloon sleeves are required for single-use valves. See p. 6:205.

FULL-FLOW VALVE

Part no. 9247-DN-000-907

SERVICE VALVE FOR CONNECTING INDIVIDUAL HOME

Copper/int. thread	Ø 15-88, DN 10-25	9247-DN-000-456
Copper/copper	Ø 15-54	9247-DN-000-675
Weld/copper	DN 15-50, Ø 15-54	9247-DN-000-332
Weld/weld with handle		9247-DN-000-000
Weld/weld with knob		9247-DN-000-334



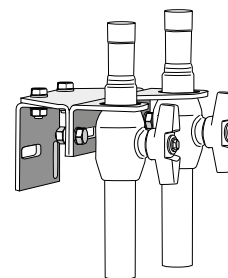
TWIN VALVE FOR CONNECTING INDIVIDUAL HOME, incl. brackets

Copper/copper	Ø 18-28
Copper/int. thread	Ø 22 / 3/4" – Ø 28 / 1"
Weld/copper	DN 20 / Ø 18, 22, 28 – DN 25 / Ø 22, 28
Weld/weld	DN 20, 25
Weld/int. thread	DN 20 / 3/4"
Int. thread/int. thread	3/4"

Part no. 7750-DN-000-000.

Only knob Ø22: part no. 7751-022-000-00X (X is for blue knob=B, red knob=R)

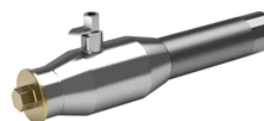
Only knob Ø28: part no. 7751-028-000-00X (X is for blue knob=B, red knob=R)



VENTING VALVE STEEL

DN 25-50 inc. plug

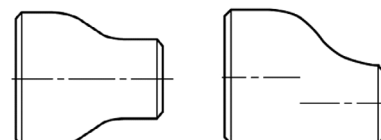
Part no. 9300-DN-000-000



STEEL CONE

Concentric version for single pipe DN 25-500, Part no. 9190-DN₁-DN₂-000

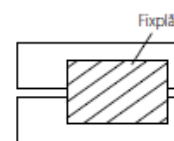
Eccentric version for double pipe DN 25-500, Part no. 9190-DN₁-DN₂-325



FIXING PLATE FOR DOUBLE PIPE

See Chapter 10. Alternative to anchor point

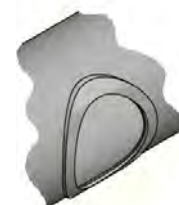
Part no. 8500-DN-000-000



REINFORCEMENT PLATES

Used to reinforce a branch from the service pipe where the construction requires.
Manufactured to order.

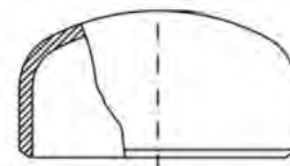
Reinforcement plate, Part no. 9191-DN (main pipe) -DN (branch) -000



END CAP STEEL

DN25-500

Part no. 9192-DN-000-000

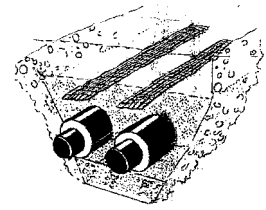


WARNING MESH

Width 500 mm, length 100 m, purple, approx. 20 pcs per pallet.
Part no. 6990-000-000-000.

WARNING STRIP

Width 150 mm, length 250 m, purple, 4 pcs per carton.
Part no. 6990-001-000-000
Part no. 6990-002-000-000 (Marked district cooling).

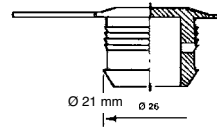


VENTING PLUG

21 mm, pre-drilled with 20 mm drill, approx. 2000 pcs per bag.
Part no. 6550-035-000-000.

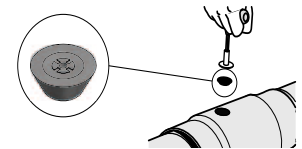
CONICAL DRILL

Part no. 6890-100-201-000.



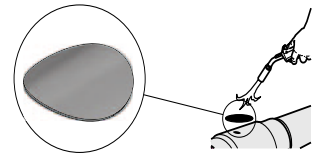
WELDING PLUG

Width 22 mm. Used for sealing foam holes. Requires special tool.
See instruction Chapter 10. Pack size: 2000 pcs.
Part no. 6550-050-000-000.



FOPS (COVER PATCH)

Diameter 90 mm. Used above the weld plug to provide extra security.
Pack size: 100 pcs.
Part no. 6550-040-000-000



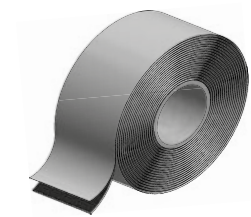
PLASTIC COATED MASTIC

Width: 70 mm, 30 m/reel. 2 pcs per carton.
Part no. 6550-004-000-000.

WOVEN MASTIC

Width approx. 50 mm, 25 m/reel. 8 pcs per carton.
Part no. 6550-012-000-000

Width approx. 100 mm, 25 m/reel. 4 pcs per carton.
Part no. 6550-011-000-000



SHRINK MAT

30 metres/roll
Part. no. 6226-225-000-000
30 metres/roll
Part. no. 6226-150-000-000

CLOSURE STRIP

15 metres/roll
Part. no. 6232-100- (CLR)
Part. no. 6232-000- (CLW)

THERMAL PROTECTION MEMBRANE

30 m reel: Part no. 6890-001-000-000

WELD WIRE PEHD

Black. Diameter 4 mm. approx. 2.3 kg/reel
Part no. 9551-001-000-000.

ALARM GUIDE

Length 400 mm Pack size 100 pcs
Part no. 6890-010-000-000.

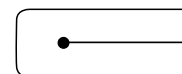


TAPE

Part no. 9901-022-000-000,
red, 66 m x 15 mm, 120 pcs per carton.

HYGROSCOPIC FELT

400 x 100 mm. Pack size: 100 pcs.
Part no. 6890-011-000-000



SPLICING JOINT FOR ALARM WIRE

Pack size: 1000 pcs.
Part no. 6890-100-000-000.



INSULATED ALARM WIRE

(for special applications, such as bridging in buildings, manholes).
Part no. 9720-020-000-000

STANDARD ALARM WIRE

Diameter 1.38 mm. Cross-section area 1.5 mm². 1 kg = 75.2 m.
Roll of approx. 10 kg: part. no. 9720-010-000-000
Roll of approx. 1 kg: part. no. 9720-001-000-000

ALARM GUIDE FOR ALARM WIRE, WIDETECT

Part no. 6890-013-000-000 (for district cooling and steam).

SPLICING JOINT, WIDETECT

Part no. 6890-100-050-000

T-CONNECTION, WIDETECT

ALARM WIRE, WIDETECT

Part no. 9720-100-050-000-00

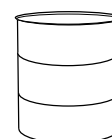
SPLICING PLIER

Used to insert the alarm wire into the splicing joint
Part no. 6890-100-100-000.



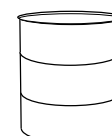
POLYOL (delivered in drums)

One drum contains approx. 200 kg. For smaller deliveries, please contact Powerpipe.
Study the instructions in Chapter 10 before use.
Part no. 6707-000-000-000.



ISOCYANATE (delivered in drums)

One drum contains approx. 250 kg. For smaller deliveries, please contact Powerpipe.
Study the instructions in Chapter 10 before use.
Part no. 6721-000-000-000



MEGGER INSULATION TESTER 1000V

Part no. 6870-000-000-000.



PULSE ECHOMETER

Part no. 6871-000-000-000.



EXPANSION CUSHIONS

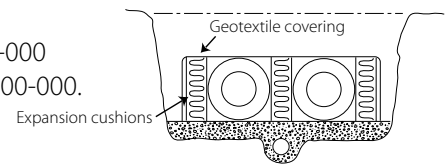
Flat: Length 1200 mm, height 2000 mm, thickness 40 mm: Part no. 9607-005-000-000

Slitted: Length 1000 mm, height 2000 mm, thickness 40 mm: Part no. 9607-003-000-000.

The slit length is 1000 mm.

50 pcs per pallet.

For Installation, see p. 9:401



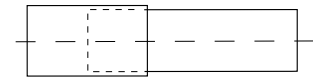
TRANSITION COPPER-STEEL

Straight Ø 22 - DN 20 (26.9)

Ø 28 - DN 25 (33.7)

Ø 35 - DN 32 (42.4)

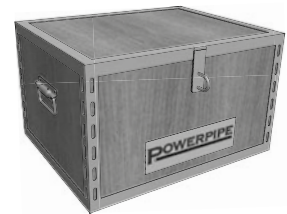
Part no. 6800-ØCu-DN-000.



EQUIPMENT BOX FOR SLEEVE WORK

- megger
- plug
- splicing plier
- conical drill
- mm. (according to equipment list)
- plug welding equipment
- splicing joints
- FOPS press
- pressure testing equipment

Part no. 9908-000-000-000.



PLUG WELDING EQUIPMENT

Plug welder, electronic MSG 41E inc. requisite equipment

Part no. 6890-100-200-000.

CONICAL DRILL

Part no. 6890-100-201-000

BRANCH PIPES

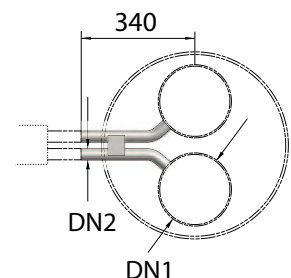
Used when connecting double pipe to double pipe.

Available for DN 25, 32, 40 and 50.

Part no. 8205-DN2-450-000

Connection for single pipe - Part no. 8202-DN2-450-000

DN1 is stated separately when ordering

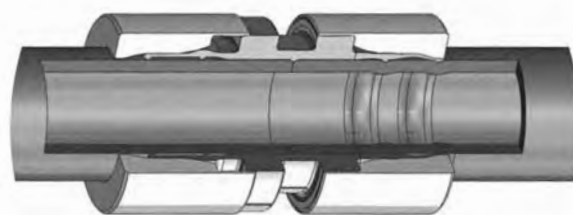


STEEL BEND 5D

Part no. 8201-DN-900-000

Haelok press fittings

HAELOK
SWISS PRECISION



Haelok brand tools and press fittings for district heating. Facilitates and accelerates connections above ground, primarily indoors. The advantage is that no "hot works" are required. Can be installed without the pipe having to be "dried out" (which is required for welding). Extremely short installation time. More dimensions can be added later. The range below is only part of the total range. For more information on the product, range or technology, contact our sales team or technical advisers

	Powerpipe Part no.	Haelok Part no.	Name
Tool (Box)			
DN12-DN20	7870-012-020-000	HLK-60PT-PN28	Tool box 12-28 mm
DN25-DN50	7870-025-050-000	HLK-60PT-PN60	Tool box 30-60 mm
Insert for Tool (must be ordered separate from box)			
DN20	7870-020-000-000	HLK-60PT-IN-28	Insert (4 pcs) DN20
DN25	7870-025-000-000	HLK-60PT-IN-33	Insert (4 pcs) DN25
DN32	7870-032-000-000	HLK-60PT-IN-34	Insert (4 pcs) DN32
DN40	7870-040-000-000	HLK-60PT-IN-35	Insert (4 pcs) DN40
DN50	7870-050-000-000	HLK-60PT-IN-36	Insert (4 pcs) DN50
Straight couplings			
DN20	6806-020-000-000	HLK-10SF-26-CC	Straight coupling DN20
DN25	6806-025-000-000	HLK-10SF-33-CC	Straight coupling DN25
DN32	6806-032-000-000	HLK-10SF-42-CC	Straight coupling DN32
DN40	6806-040-000-000	HLK-10SF-48-CC	Straight coupling DN40
DN50	6806-050-000-000	HLK-10SF-60-CC	Straight coupling DN50
Repair couplings			
DN20	6806-020-000-200	HLK-10SR-26-CC	Rep coupling DN20
DN25	6806-025-000-200	HLK-10SR-33-CC	Rep coupling DN25
DN32	6806-032-000-200	HLK-10SR-42-CC	Rep coupling DN32
DN40	6806-040-000-200	HLK-10SR-48-CC	Rep coupling DN40
DN50	6806-050-000-200	HLK-10SR-60-CC	Rep coupling DN50
Reduction couplings			
DN25-DN20	6806-025-020-000	HLK-10RE-33-26-CC	Red coupling DN25-DN20
DN32-DN25	6806-032-025-000	HLK-10RE-42-33-CC	Red coupling DN32-DN25
DN40-DN32	6806-040-032-000	HLK-10RE-48-42-CC	Red coupling DN40-DN32
DN50-DN40	6806-050-040-000	HLK-10RE-60-48-CC	Red coupling DN50-DN40

For warranty conditions, refer to Haelok: https://www.haelok.com/wp-content/uploads/2019/07/2019_General-Terms-and-conditions-of-Sale-and-Supply-HAELOK-AG.pdf

Bottle foam Joints, single pipe



FOAM PACKS, 6480 Dimensioning table, single pipe

Dim. DN [mm]	Series 1 Bottle no.			Series 2 Bottle no.			Series 3 Bottle no.			Series 4 Bottle no.		
	PEHD Dy	Stand.	Flex	PEHD Dy	Stand.	Flex	PEHD Dy	Stand.	Flex	PEHD Dy	Stand.	Flex
20				110	3	4	125	4	5	140	6	7
25	90	2	3	110	3	4	125	4	5	140	6	7
32	110	3	4	125	4	5.1	140	5	6.1	160	6.1	8.1
40	110	3	4	125	4	5.1	140	5	6.1	160	6.1	8.1
50	125	4	5.1	140	5.1	6.1	160	6.1	8	180	7	9
65	140	5	6.1	160	6.1	8	180	7	8.1	200	8	10.1
80	160	6	7	180	7	8.1	200	8	10.1	225	9	11.1
100	200	7	8	225	8.1	10	250	9.1	12	280	11	13
125	225	8	9.1	250	9	11.1	280	10.1	12	315	11.1	13
150	250	8.1	11	280	10	12	315	11	13	355	12	
200	315	10	12	355	11.1		400	12		450	13	
250	400	11.1		450	12		500	13.1		560	12+12	
300	450	12		500	13		560	13.1+6.1		630	12+13	
350	500	13		560	13.1		630	13.1+11		710	13.1 + 13.1	
400	560	13		630	13.1+9		710	13.1+13				
450	630	13.1+5		710	12+13		800	13.1+13.1				
500	710	13.1+11.1		800	13.1+13.1		900	13.1+13.1+13.1				
600	800	13.1+12		900	13.1 + 13.1							

"Flex" above refers to installation of T-piece with bend and flexible sleeve for flexible pipe.

For conditions, see p. 10:321.

Part no.

6480-bottle no.-000-000.

Order example

Bottle set no. 5.1, part no. 6480-051-000-000.

Bottle foam Joints, double/twin pipe



FOAM PACKS, 6480 Dimensioning table, double pipe

Dimension DN	STANDARD PEHD		DOUBLE+ PEHD		DOUBLE++ PEHD	
	Dy [mm]	Bottle no.	Dy [mm]	Bottle no.	Dy [mm]	Bottle no.
2 x 20	125	3	140	5	160	6.1
2 x 25	140	5	160	6.1	180	8
2 x 32	160	6.1	180	7	200	8.1
2 x 40	160	6.1	180	7	200	8.1
2 x 50	200	8	225	9	250	10.1
2 x 65	225	8.1	250	10	280	11
2 x 80	250	9.1	280	10.1	315	11.1
2 x 100	315	11	355	12	400	13
2 x 125	400	12	450	13	500	11.1 + 12
2 x 150	450	13	500	13.1	560	12+12
2 x 200	560	12+12	630	13+12	710	13.1 + 13.1

For conditions, see p. 10:321

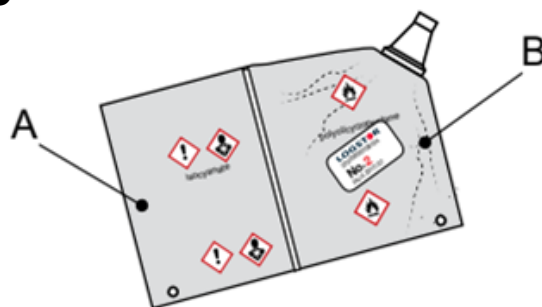
Part no.

6480-bottle no.-000-000.

Order example

Bottle set 8.1, part no. 6480-081-000-000.

Foam packs, Joints, single pipe



FOAM PACKS, 6481 Dimensioning table, single pipe

DN	Series 1		Series 2		Series 3		Series 4	
	Foam pack no. PEHD	Foam pack no. Stand.	Foam pack no. PEHD	Foam pack no. Stand.	Foam pack no. PEHD	Foam pack no. Stand.	Foam pack no. PEHD	Foam pack no. Stand.
20			110	3	125	1+1	140	6
25	90	2	110	3	125	1+1	140	6
32	110	3	125	1+1	140	5	160	7
40	110	3	125	1+1	140	5	160	7
50	125	1+1	140	2+2	160	7	180	4+4
65	140	5	160	7	180	4+4	200	5+5
80	160	6	180	4+4	200	5+5	225	6+6
100	200	4+4	225	9	250	10	280	10+5
125	225	5+5	250	6+6	280	10+2	315	9+9
150	250	9	280	7+7	315	10+5	355	12+2
200	315	7+7	355	9+9	400	12+2	450	12+9
250	400	9+9	450	12+2	500	12+11	560	12+12+2+2
300	450	12+2	500	12+9	560	12+11+7	630	12+12+9+2
350	500	12+9	560	12+11	630	12+11+10+5	710	12+12
400	560	12+9	630	12+11+6+6	710	12+12+11+9		
450	630	12+11+5	710	12+12+9+2	800	12+12+11+11		
500	710	12+11+9+9	800	12+12+11+11	900	3x12+3x11		
600	800	12+12+11+2	900	12+12+11+11				

Ready to use packs for each sleeve joint are delivered in bags.

For conditions, see p. 10:321.

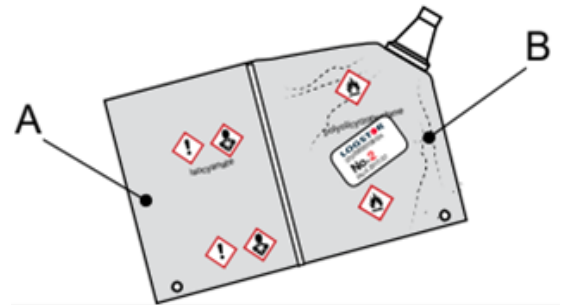
Part no.

6481-foam pack no.-000-000

Order example

Foam pack set no. 5, part no. 6481-050-000-000.

Foam packs, Joints, double pipe Twin pipes



FOAM PACKS, 6481 Dimensioning table, double pipe

DN	STANDARD PEHD		DOUBLE+ PEHD		DOUBLE++ PEHD	
	Dy [mm]	Foam pack no.	Dy [mm]	Foam pack no.	Dy [mm]	Foam pack no.
2x20	125	3	140	5	160	7
2x25	140	5	160	7	180	5+5
2x32	160	7	180	4+4	200	9
2x40	160	7	180	4+4	200	9
2x50	200	5+5	225	6+6	250	10+2
2x65	225	9	250	7+7	280	10+5
2x80	250	10	280	10+2	315	9+9
2x100	315	10+5	355	12+2	400	12+9
2x125	400	12+2	450	12+9	500	12+9+9+2
2x150	450	12+9	500	12+11	560	12+12+2+2
2x200	560	12+12+2+2	630	12+12+9+2	710	12+12+11+11

Ready to use packs for each sleeve joint are delivered in bags.

For conditions, see p. 10:321.

Part no.

6481-foam pack no.-000-000

Order example

Foam pack set no. 8, part no. 6481-080-000-000.

EN 13941

In Sweden, as in the rest of Europe, standard EN 13941, which is divided into two parts, applies to calculation of district heating pipes. The standard is not harmonised with the Pressure Equipment Directive (PED) and may only be applied for pipes in the ground. In Sweden, AFS 2017:3 applies overall. The standard provides regulations regarding calculation, design and installation of pre-insulated pipes laid in the ground.

A calculation program for static calculations can be requisitioned from Powerpipe

The standard sets requirements for three aspects of pipe calculation:

1. Stresses due to internal overpressure (force controlled load)
Limitations are stated within "Limit state A" and are essentially the same as in RN 78.
2. Loads that result from repeated loads; "Fatigue".
The limitations are stated in "Limit state B".
The following applies:
Transmission pipes should withstand 100 cycles.
Distribution pipes should withstand 250 cycles.
House connections should withstand 1000 cycles.
Each cycle should be based on a temperature change of 110°C.
3. Loads which can lead to instability or buckling.
(Movement controlled load). The limitations are stated in "Limit state C".
The pipes are divided into three project classes:

- Project class A (secondary facilities)
- Project class B (primary facilities with $DN \leq 300$)
- Project class C (primary facilities with $DN > 300$)

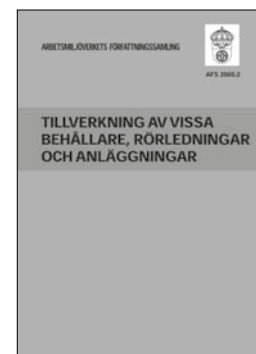
Project class	Weld inspection during installation	Safety factor fatigue	Documentation
A	> 5%	5	Generalised
B	> 10%	6.67	Generalised
C	> 20%	10	Specific

The generalised documentation can be company standard or manufacturer manuals. The specific documentation should contain:

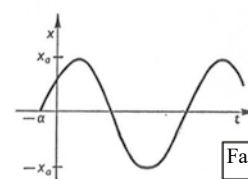
Design pressure and temperature, together with the number of expected cycles including calculations according to "Limit state A-C".

Pipe information such as drawings, dimensions, material data, installation assumptions, as-built drawings.

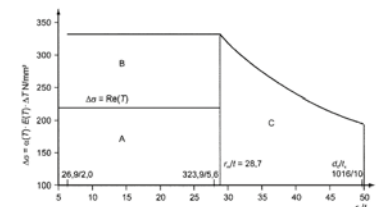
Quality assurance



Internal overpressure



Fatigue



Project classes

Forces, movements and expansion bends

Expansion

When a buried district heating pipe is exposed to a temperature increase, this means that the pipe tries to expand.

The expansion is prevented by friction that occurs between the moving pipe and the surrounding sand (the soil).

This friction creates an axial tension in the pipe and counteracts free expansion.

The district heating pipe has two different zones:

1. The part which is fixed (may be in the middle of a straight section) (Zone 1).
2. The part which moves (located at both ends of a straight section) (Zone 2).

The stress in the fixed part is only due to the temperature change from the temperature which applied when the pipe trench was filled. The force in the pipe is the stress multiplied by the steel pipe's cross-section area.

The part of the pipe which moves is designated the "Friction length". This acts as an attachment for the fixed part.

Pre-stressing

For purposes including limiting stresses and movements, it is common to thermally pre-stress the pipe.

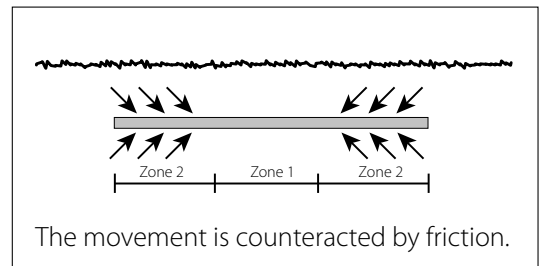
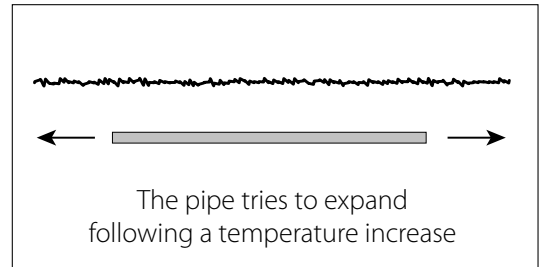
This means that you get pressure stresses in the pipe at high temperatures and tensile stresses at low temperatures.

Cold laying

Narrow and medium dimensions can be cold laid. This means that you get very high (but acceptable in terms of the standard) axial stresses. For example, the movements in a bend can be up to four times as large as where pre-stressing is used.

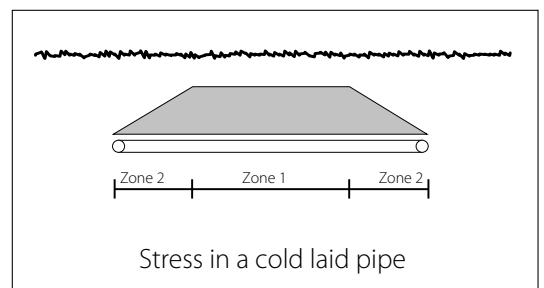
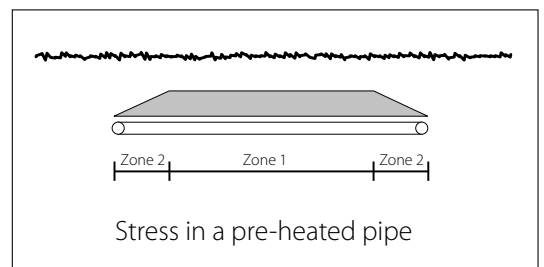
Table of friction lengths and movements

The table of friction lengths and movements is on the next page. The values shown are based on a number of conditions, which are stated. In the case of changes in the conditions, the data stated naturally also changes.



$$\sigma = E \cdot \alpha \cdot \Delta T$$

σ = Stress
 E = Elastic modulus
 α = Coefficient of linear expansion
 ΔT = Temperature change



Example calculations, pre-heated system

Max. axial stress 150 MPa for single pipe (corresponds to $\Delta T=60^{\circ}\text{C}$). Max. axial stress 150+50 MPa for double pipes (temperature difference between supply and return pipe is 40°C), coverage 0.6 m, friction coefficient $\mu=0.4$.

Bend radius: Powerpipe standard, number of full cycles: 1000 for DN 25-65; 250 cycles for DN80-300; 100 cycles for DN 350-900.

Series 1				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
25	912	43	16	0.6
32	1 122	44	16	0.7
40	1 125	51	19	0.8
50	1 289	62	23	1.1
65	1 457	70	26	1.2
80	1 680	79	29	1.4
100	2 137	90	33	1.7
125	2 438	97	36	2.1
150	2 755	115	42	2.6
200	3 577	130	48	3.3
250	4 690	138	51	3.9
300	5 424	158	59	4.7
350	6 126	154	57	4.7
400	7 052	172	64	5.3
450	7 202	190	70	7.3
500	8 293	184	68	6.6
600	9 801	210	78	9.4
700	11 563	234	87	10.8
800	13 594	251	93	12.1
900	15 781	276	102	13.4

Series 2				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
25	1 118	35	13	0.5
32	1 279	39	14	0.7
40	1 281	45	17	0.8
50	1 447	55	20	1.0
65	1 669	61	23	1.1
80	1 895	70	26	1.3
100	2 412	80	29	1.6
125	2 716	87	32	2.0
150	3 094	102	38	2.4
200	4 046	115	43	3.1
250	5 301	122	45	3.7
300	6 050	142	52	4.4
350	6 896	137	51	4.4
400	7 978	152	56	5.0
450	8 128	168	62	6.8
500	9 386	162	60	6.2
600	11 075	186	69	8.8
700	13 035	208	77	10.1
800	15 123	225	83	11.4
900	17 369	251	93	12.8

Series 3				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
25	1 275	31	11	0.5
32	1 436	35	13	0.6
40	1 439	40	15	0.8
50	1 659	48	18	1.0
65	1 884	54	20	1.0
80	2 112	63	23	1.2
100	2 690	71	26	1.5
125	3 055	77	29	1.9
150	3 496	91	33	2.3
200	4 584	101	38	2.9
250	5 928	109	40	3.5
300	6 821	126	47	4.2
350	7 823	121	45	4.1
400	9 072	134	49	4.7
450	9 221	148	55	6.4
500	10 661	143	53	5.8
600	12 547	164	61	8.3
700	14 564	186	69	9.6
800	16 712	204	75	10.9

Series 4				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
25	1 433	27	10	0.5
32	1 649	30	11	0.6
40	1 651	35	13	0.7
50	1 874	43	16	0.9
65	2 101	49	18	1.0
80	2 387	55	20	1.2
100	3 029	63	23	1.5
125	3 457	68	25	1.8
150	3 965	80	30	2.2
200	5 195	89	33	2.7
250	6 698	96	36	3.3
300	7 747	111	41	3.9
350	8 916	106	39	3.9
400	10 346	117	43	4.4
450	10 496	130	48	6.0
500	12 133	125	46	5.5
600	14 077	146	54	7.8
700	16 153	168	62	9.1

Other input data gives other results. It is easiest to use Powerpipe's calculation program for the relevant case.

Example calculations, pre-heated system

Max. axial stress 150 MPa for single pipe (corresponds to $\Delta T=60^{\circ}\text{C}$). Max. axial stress 150+50 MPa for double pipes (temperature difference between supply and return pipe is 40°C), coverage 0.6 m, friction coefficient $\mu=0.4$.

Bend radius: Powerpipe standard, number of full cycles: 1000 for DN 25-65; 250 cycles for DN80-300; 100 cycles for DN 350-900.

Double, standard				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
2x20	1 437	42	14	0.5
2x25	1 443	54	18	0.6
2x32	1 660	60	20	0.8
2x40	1 669	68	23	0.9
2x50	2 116	75	26	1.1
2x65	2 411	84	29	1.2
2x80	2 713	97	33	1.5
2x100	3 505	109	37	1.8
2x125	4 565	103	35	2.1
2x150	5 257	120	41	2.5
2x200	6 822	136	46	3.2

Double+				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
2x20	1 650	37	13	0.4
2x25	1 655	47	16	0.6
2x32	1 878	53	18	0.7
2x40	1 883	60	21	0.9
2x50	2 391	67	23	1.1
2x65	2 690	76	26	1.2
2x80	3 052	86	29	1.4
2x100	3 974	96	33	1.7
2x125	5 177	91	31	2.0
2x150	5 883	107	37	2.4
2x200	7 748	119	41	3.0

Double++				
Dimension	Friction force N/m	Friction length m	Movement mm	Length L bend m
2x20	1 864	32	11	0.4
2x25	1 870	41	14	0.6
2x32	2 095	47	16	0.7
2x40	2 101	54	19	0.8
2x50	2 670	60	20	1.0
2x65	3 029	67	23	1.1
2x80	3 454	76	26	1.3
2x100	4 512	85	29	1.6
2x125	5 803	81	28	1.9
2x150	6 654	95	32	2.3
2x200	8 841	105	36	2.8

Other input data gives other results. It is easiest to use Powerpipe's calculation program for the relevant case.

Calculating pressure drop for flexible pipes

Requisite flow

Each connected building has a specific power demand at design temperature.

This power demand together with available temperature drop determines the required flow.

For example	Power demand	Q	12kW.	
	Temperature drop	ΔT	40°C	
	Requisite flow	m	258 kg/h	$m = Q \times 860 / \Delta T$

Required dimension

For copper pipes, see calculation diagram 9:203

With a pressure drop of 1 mbar/m (10 mm vp/m) the dimension required for the example stated above is 18x1 mm.

Total pressure drop

The available pressure drop is divided up over the longest pipe section from the connection point to the furthest district heating control centre.

E.g.: The average pressure drop can generally be estimated as 1 mbar/m.

The pressure drop for the connection pipe (copper flex 18x1) if it is 14 m long is $2 \times 14 \times 1 = 28$ mbar

Higher pressure drops can be taken on connection pipes located closer to the connection point. However, the water speed should not exceed 2 m/s in a copper pipe.

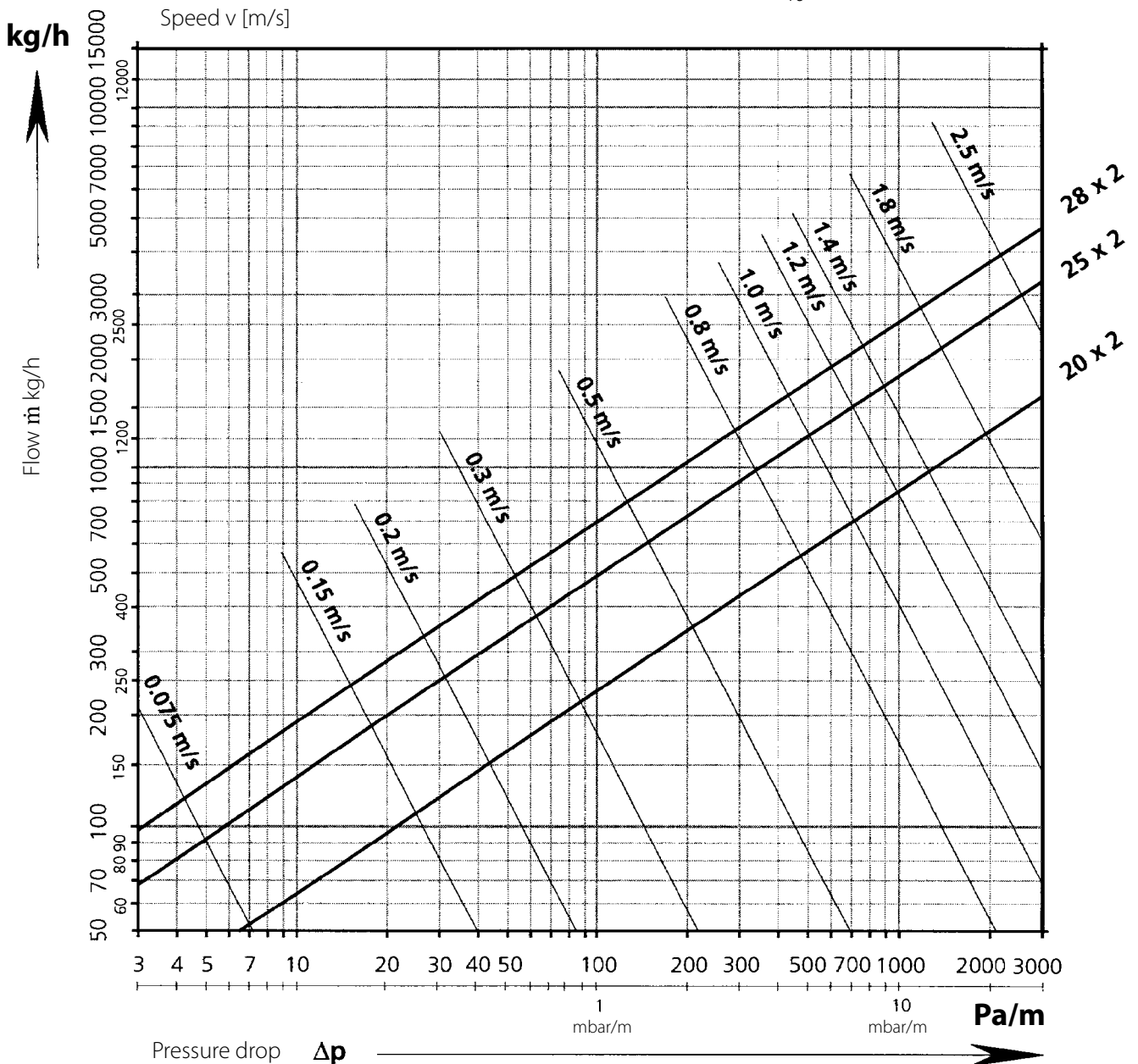
Flexible steel pipes

Average temperature, water 80°C – Roughness $\epsilon = 0.0016$ mm steel flex (1 mm vp = 9.81 Pa)

$\dot{m} \approx \frac{Q \cdot 860}{\Delta T}$	\dot{m} = flow in kg/h Q = power kW ΔT = temperature difference °C
--	--

Example: Power demand 30kW
 $\Delta T = 40^\circ\text{C}$

$$\text{Requisite flow} = \frac{30 \times 860}{40} = 645 \text{ kg/h}$$



Flexible copper pipes

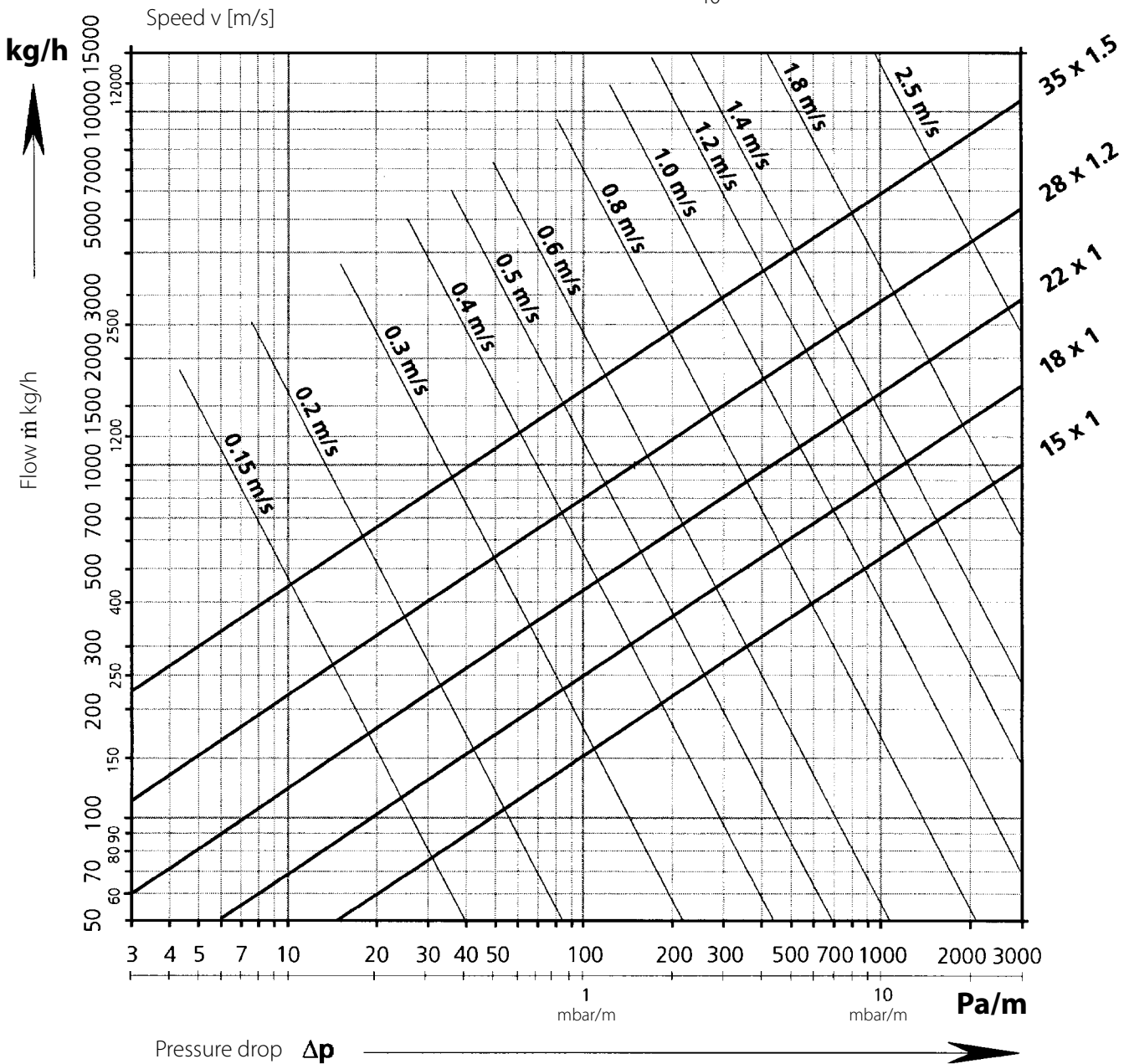
Average temperature, water 80°C – Roughness $\epsilon = 0.0015$ mm steel flex (1 mm vp = 9.81 Pa)

$$\dot{m} \approx \frac{Q \cdot 860}{\Delta T}$$

\dot{m} = flow in kg/h
 Q = power kW
 ΔT = temperature difference °C

Example: Power demand 30kW
 $\Delta T = 40^\circ\text{C}$

$$\text{Requisite flow} = \frac{30 \times 860}{40} = 645 \text{ kg/h}$$



Steel pipes

DN	External diam. [mm]	Thick-ness [mm]	Average speed [m/s]	Flow [liter/s]	Pressure drop [Pa/m]	Transmission cap. at $\Delta T=50^{\circ}\text{C}$ [kW]
20	26.9	2.6	0.8	0.3	300	60
25	33.7	2.6	0.8	0.5	200	100
32	42.4	2.6	0.8	0.9	200	180
40	48.3	2.6	0.9	1.3	200	270
50	60.3	2.9	0.9	2.1	200	430
65	76.1	2.9	1.0	3.9	150	790
80	88.9	3.2	1.0	5.3	150	1100
100	114.3	3.6	1.1	9.9	150	2000
125	139.7	3.6	1.3	18.0	150	3700
150	168.3	4	1.4	28.0	150	5800
200	219.1	4.5	1.6	55.0	150	11 000
250	273	5	1.8	98.0	150	20 000
300	323.9	5.6	2.0	154.0	150	31 000
350	355.6	5.6	2.0	186.0	100	38 000
400	406.4	6.3	2.0	244.0	100	50 000
450	457	6.3	2.0	310.0	100	63 000
500	508	6.3	2.0	385.0	100	79 000
600	610	7.1	2.0	557.0	100	110 000
700	711	8	2.0	785.0	50	160 000
800	813	8.8	2.0	993.0	50	200 000

Transmission capacity

Different ΔT , other than 50°C

The transmission capacity in the table above applies for $\Delta T = 50^{\circ}\text{C}$. This is linearly dependent on ΔT as follows:

ΔT	Transmission capacity in % of $\Delta T=50^{\circ}$
20	40
25	50
30	60
35	70
40	80
45	90
50	100
55	110
60	120

Example

For the calculation of $\Delta T=40^{\circ}$ DN200, single pipe, the transmission capacity is: $11.000 \times 0.8 = 8.800 \text{ kW}$

Different flow

Transmission capacity is linearly dependent on flow, as shown below (below for DN200):

Flow [litre/s]	Transmission capacity in %
44	80
55	100
66	120

Example:

For calculation of transmission capacity where the flow deviates from the table, and is 44 litre/s for DN200, the transmission capacity becomes:
 $44/55 * 11,000 = 8,800 \text{ kW}$

Pressure drop

Caused by the friction factor, which in turn is a function of surface roughness. Can vary with the age of the pipe. In normal cases, the pressure drop is lower for larger pipe dimensions.

The pressure drop is proportional to the speed squared.

The pressure drop is presented in the table for Steel Pipes above, assumed friction factor = 0.022 and tabled flows. Note that the friction factor and thus the pressure drop can vary significantly.

Heat losses

Calculation assumptions for single and double pipes

Laying conditions

Fill height	0.80 m	
Free distance between pipes	0.20 m	$\emptyset 110 \leq D_y \leq \emptyset 180$
	0.25 m	$\emptyset 200 \leq D_y \leq \emptyset 500$
	0.30 m	$\emptyset 630 \leq D_y \leq \emptyset 900$

Ground

Thermal conductivity: $\lambda_m = 1.5 \text{ W/m}^\circ\text{K}$

PUR foam insulation

Thermal conductivity: $\lambda_i = 0.026 \text{ W/m}^\circ\text{K}$

Temperature, annual average value (primary system)

Supply line temperature: $T_f = 85^\circ\text{C}$

Return pipe temperature: $T_r = 55^\circ\text{C}$

Ambient temperature: $T_o = 5^\circ\text{C}$

$\Delta T = 65^\circ\text{C}$

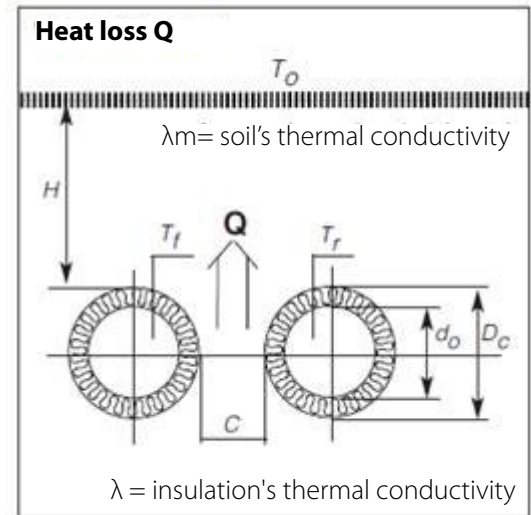
$$\Delta T = \frac{T_f + T_r}{2} - T_o$$

if ΔT changes by 10° , the loss is affected by $\frac{10}{65} = 15\%$

Heat losses for district heating pipes in ground depend on:

- 1- Thermal resistance of the soil: $R_m = \frac{1}{2\pi\lambda_m} \ln\left(\frac{4Z_c}{D_c}\right)$
- 2- Thermal resistance of the pipe insulation: $R_r = \frac{1}{2\pi\lambda_i} \ln\left(\frac{D_{pur}}{d_o}\right)$
- 3- Interaction between supply and return pipe: $R_2 = \frac{1}{4\pi\lambda_s} \ln\left(1 + \left(\frac{2Z_c}{C}\right)^2\right)$

For calculation see EN 13941



Different series, different heat losses

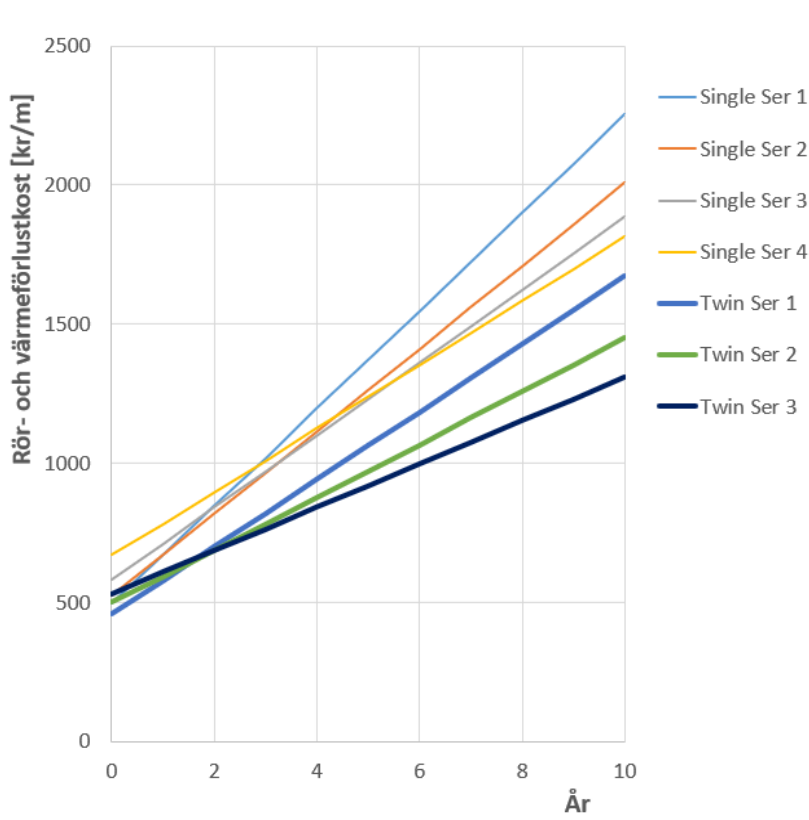
The table below summarises the differences, in this case DN 80. Data from p. 9:305 and 9:308

DN 80/160	Series 1	33 W/m	+ 18 %	comparison starting point	(All calculated losses supply + return)
DN 80/180	Series 2	28 W/m	0 %		
DN 80/200	Series 3	24 W/m	- 14 %		
DN 80/225	Series 4	22 W/m	- 22 %		
DN2*80/250	Double Std	23 W/m	- 18 %		
DN2*80/280	Double+	18 W/m	- 36 %		
DN2*80/315	Double++	15 W/m	- 46 %		
DN2*80/315	Panel pipe	11 W/m	- 60 %	(only supply pipe, in addition lower losses, -71%)	

Assumed: Supply 85°C, return 55°C, surrounding 5°C, 0.8 m.

Life cycle cost

To achieve optimal overall economy, a life cycle cost analysis should be carried out. A number of parameters are relevant. Consult with Powerpipe. The result of the analysis can be presented graphically, for example:



Heat losses

Single pipe - Heat losses at $\Delta T = 65^\circ\text{C}$ (refers to supply + return pipe together)

DN	Series 1		Series 2		Series 3		Series 4	
	W/m	kWh/m.year	W/m	kWh/m.year	W/m	kWh/m.year	W/m	kWh/m.year
20			14.6	128	13.4	117	12.5	109
25	20.8	182	17.3	151	15.6	137	14.4	126
32	21.3	186	18.8	164	17.0	149	15.3	134
40	24.5	214	21.2	186	19.0	167	17.0	148
50	27.3	239	23.7	208	20.6	180	18.5	162
65	32.1	281	26.6	233	23.1	203	20.7	182
80	33.0	289	27.8	244	24.4	214	21.5	188
100	34.5	302	29.0	254	25.3	221	22.3	195
125	39.9	350	33.4	292	28.2	247	24.4	214
150	47.1	413	37.8	331	31.1	272	26.5	232
200	51.1	448	39.8	349	32.4	284	27.5	241
250	49.2	431	38.8	340	32.4	284	27.8	243
300	56.4	494	44.2	387	35.7	312	29.9	262
350	54.8	480	42.6	373	34.3	301	28.8	253
400	58.1	509	44.1	387	35.2	308	29.5	258
450	58.4	511	43.7	383	35.2	309	29.5	258
500	56.5	495	42.7	374	34.6	303	29.6	259
600	68.4	599	49.3	432	39.8	349		
700	77.7	681	55.8	488				
800	87.3	765						

Double pipe - Heat losses at $\Delta T = 65^\circ\text{C}$

DN	STANDARD		DOUBLE+		DOUBLE++	
	W/m	kWh/m.year	W/m	kWh/m.year	W/m	kWh/m.year
2 x 20	12.1	106	10.1	88	8.9	78
2 x 25	13.2	116	11.2	97	9.9	87
2 x 32	14.6	128	12.2	107	10.8	95
2 x 40	16.6	145	14.3	125	12.4	109
2 x 50	16.4	144	13.8	121	12.2	107
2 x 65	20.2	177	16.3	143	13.7	120
2 x 80	22.8	200	17.8	156	14.6	128
2 x 100	22.9	201	17.4	152	14.4	126
2 x 125	20.8	182	16.7	146	13.6	119
2 x 150	25.6	224	19.7	173	16.1	141
2 x 200	30.5	267	20.8	182	16.4	144

EN 13941 and the insulation value $\lambda=0.026$ W/mK have been used during calculation of heat consumption, together with the fact that the casing pipe expanded 1%.

Heat losses, flexible pipe

Laying conditions

Fill height 0.6 m
Free distance between pipes 0.1 m

Ground

Thermal conductivity: $\lambda_m=1.5 \text{ W/m}^\circ\text{K}$

Insulation PUR foam

Thermal conductivity: $\lambda_i=0.024 \text{ W/m}^\circ\text{K}$

Temperatures, annual average values

	Primary system	Secondary system
Supply line temperature	85°C	70°C
Return pipe temperature	55°C	40°C
Ambient temperature	5°C	5°C
AT	65°C	50°C

Heat losses, copper flex, single

Dimension	Primary system W/m	kWh/m, year	Secondary system W/m	kWh/m, year
22/ 91	13.7	120	10.5	92
28/ 91	16.5	145	12.7	111
35/ 91	20.4	179	15.7	137

Heat losses, 3E-copper flex, single

18/ 90	11.5	101	8.8	77
22/ 90	13.2	116	10.1	89
22/110	11.7	103	9.0	79
28/110	13.9	122	10.7	94
28/125	10.8	111	9.8	86

Heat losses, copper flex, double

2x15/ 91	8.7	76	6.7	59
2x18/ 91	10.2	89	7.8	68
2x22/ 91	12.5	110	9.7	84
2x28/ 91	18.2	159	14.0	123
2x18/113	7.9	69	6.1	53
2x22/113	9.2	80	7.1	62
2x28/113	11.6	102	8.9	78

Heat losses, 3E-copper flex, double

2x 18/ 90	9.5	83	7.3	64
2x 18/110	8.3	72	6.4	56
2x 22/110	9.9	87	7.6	67
2x 18/125	7.6	66	5.8	51
2x 22/125	8.3	78	6.8	60
2x 28/125	11.3	99	6.7	58
2x 18/160	6.1	54	4.7	41
2x 22/160	7.2	63	5.6	49
2x 28/160	8.7	76	6.7	58

Heat losses, steel flex, single

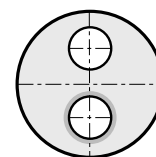
20/91	12.90	113.0	9.9	87.0
28/91	16.50	145.0	12.7	111.0

Heat losses, 3E steel flex, single

Dimension	Primary system W/m	kWh/m, year	Secondary system W/m	kWh/m, year
20/110	11.1	97	8.5	75
28/110	13.9	122	10.7	94
20/125	10.3	90	7.9	69
28/125	12.7	111	9.8	73

The heat losses above refer to both supply and return pipe. If ΔT changes, the heat losses are affected linearly.
NB! The heat losses increase with time for all district heating pipes. Consult Powerpipe regarding optimisation.

Heat losses and savings when using super insulated pipes



Super insulated Double Standard

Dimension	Losses		Saving	
	W/m	kWh/m, year	Total %	Supply pipe %
DN2x 20/125				
DN2x 25/140	9.8	86	26	48
DN2x 32/160	10.7	93	27	49
DN2x 40/160	12.1	106	27	49
DN2x 50/200	11.9	104	27	49
DN2x 65/225	14.6	128	27	49
DN2x 80/250	16.2	142	29	49
DN2x100/315	16.7	146	27	46
DN2x125/400	15.6	137	25	43
DN2x150/450	19.5	170	24	40

Super insulated Double+

Dimension	Losses		Saving	
	W/m	kWh/m, year	Total %	Supply pipe %
DN2x 20/140	7.9	69	22	46
DN2x 25/160	8.5	75	24	45
DN2x 32/180	9.2	80	25	46
DN2x 40/180	10.7	93	25	46
DN2x 50/225	10.4	91	24	45
DN2x 65/250	12.3	108	24	45
DN2x 80/280	13.4	117	25	45
DN2x100/355	13.2	116	24	43
DN2x125/450	13.0	114	22	39
DN2x150/500	15.6	136	21	36

Super insulated Double++

Dimension	Losses		Saving	
	W/m	kWh/m, year	Total %	Supply pipe %
DN2x 20/160	7.1	62	20	44
DN2x 25/180	7.7	68	22	44
DN2x 32/200	8.4	73	23	45
DN2x 40/200	9.5	83	23	45
DN2x 50/250	9.5	83	22	44
DN2x 65/280	10.8	94	21	43
DN2x 80/315	11.4	100	22	46
DN2x100/400	11.4	100	21	44
DN2x125/500	11.0	97	19	40
DN2x150/560	13.2	116	18	37

Savings are based on the same pipe but without vacuum panels
Calculation assumptions, see p. 9:301

Design guidelines

Foam pillows

Function:

Foam pillows should be used to protect bends, T-pieces etc. during large axial movements and when backfill material other than natural sand is used. Foam pillows often need to be used during cold laying. The material can withstand 70% compression. See part no. and dimensions p. 8:303.

Positioning

Cutting with

Height = casing pipe diameter.

Width and length calculation/description.

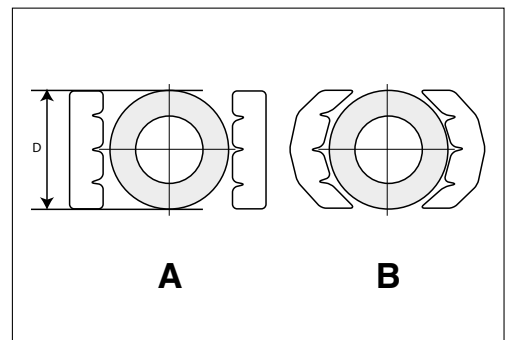
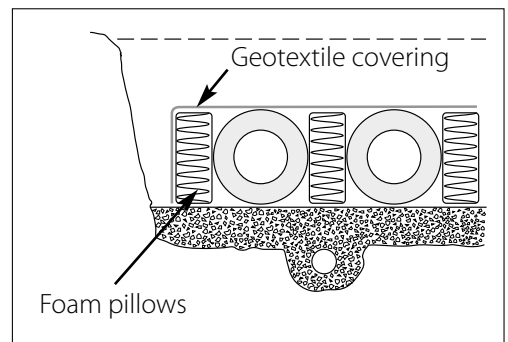
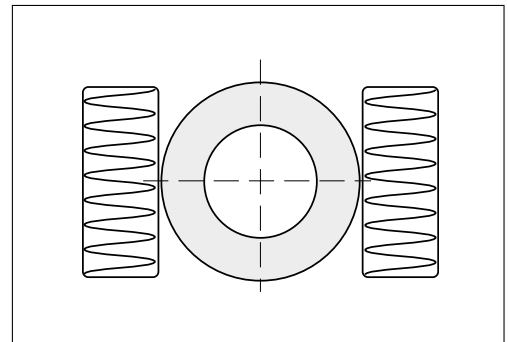
Installation

The foam pillows are placed on both sides of the pipe. It is recommended that the expansion cushions and pipes are covered with geotextile to prevent material falling in from above.

In the case of cold laying with large initial movements, the thickness of the pillows in the elbow of the bend can be reduced by 50%.

The pillows can be installed vertically (version A) or around the pipe (version B) as the figure shows.

Version B should be avoided around double sealing shrinkable sleeves.



Installation of transition unit in angle, Part no. 1580, 1680 and 1780

Background

Transition unit in angle, Part no. 1580, 1680 and 1780 has a limited ability to absorb forces and expansion movements from the single pipe.

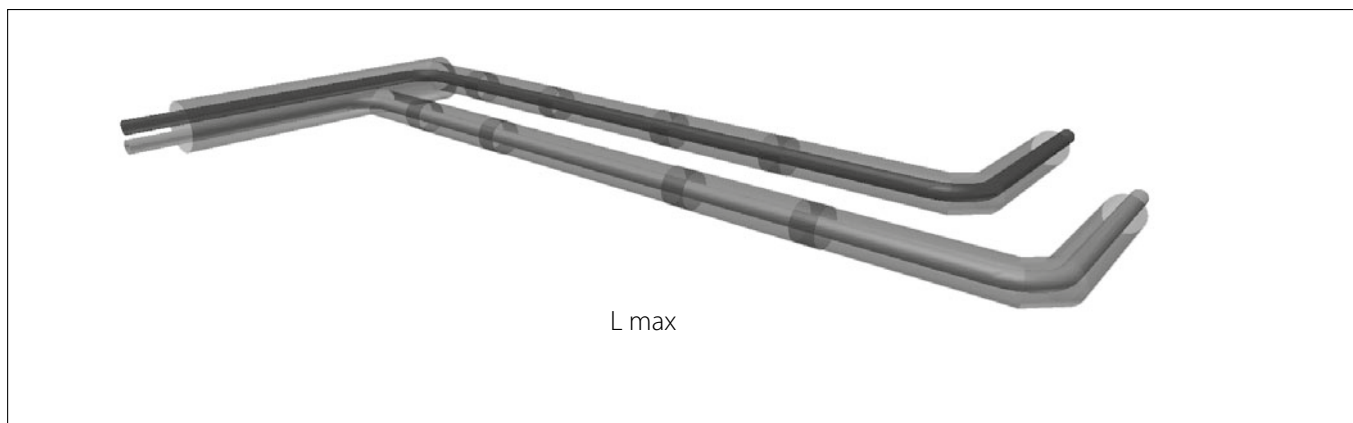
Max. temperature 120°C

Min. laying temperature 0°C

Max. length

The maximum lengths for single pipe from the transition unit bend to the next 90° bend for thermally pre-stressed and cold-laid systems are:

DN 25-80	14 m.
DN 100	12 m.
DN 125	8 m.
DN 150	4 m.
DN 200	2 m.



NOTE: Calculate the supply pipe!

These regulations should be seen as a complement to the instructions issued by the Swedish District Heating Association

Transportation and storage

Pipes and pipe fittings are usually delivered to the construction site by truck, with the recipient being responsible for unloading.

Broad straps must be used during unloading and further transport.

Chains or round lifting equipment such as wires may not be used.

Flat forks must be used during unloading and lifting. Pipes and pipe fittings may never be tipped or thrown off as the casing and insulation can be damaged.

NB! T-pieces may not be lifted by the branch pipe! Great care should be taken to ensure that the casing pipe or protruding parts are not scratched or damaged by being subject to loads.

Pipes and pipe fittings should be stored on a flat and dry surface.

Pipes and pipe fittings should be stored so that the insulation cannot come into contact with water. The storage site should be organised so that steel pipes do not corrode.

Pipes of larger dimensions (\geq DN 125) should be stored with spacers. Stack height may not exceed 2 m. The width and distance between spacers should be dimensioned so that the maximum pressure on the outer casing does not exceed 200 kPa.

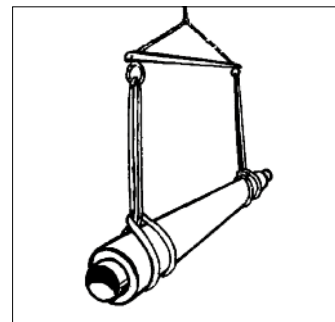
It is recommended that the spacers supplied with the delivery are used.

These make stacking safer and prevent accidents due to collapse.

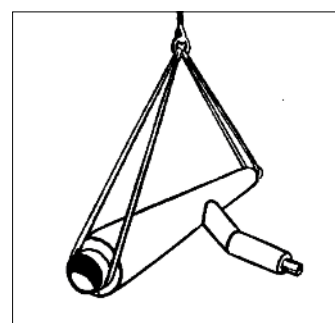
Upon receipt of the delivery, the products should be inspected for visible damage and obvious faults (can be carried out with alarm wire measurement).

Pipe fittings should be stored so that steel pipe ends face downwards.

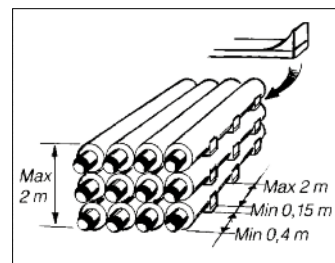
Pipes with casing diameters of \geq 560 mm should be handled with particular care at temperatures of between 0 and -20°C . Below -20°C , Powerpipe should be consulted before handling.



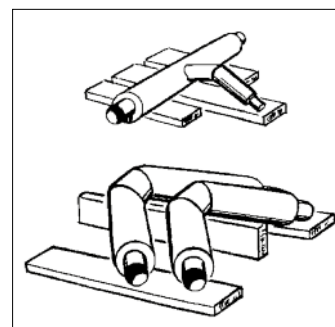
Broad straps must be used during unloading and further transport. Chains or round lifting equipment such as wires may not be used.



NB! T-pieces may not be lifted by the branch pipe!



It is recommended that the spacers supplied with the delivery are used. These make stacking safer and prevent accidents due to collapse.



Pipe fittings should be stored so that steel pipe ends face downwards or are protected in some other way.

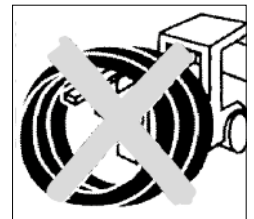
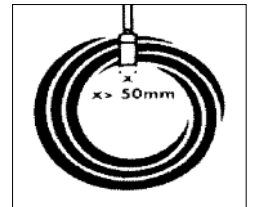
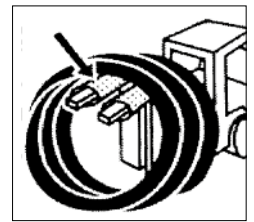
Loading, unloading

Flexible pipes are delivered on large reels.

The pipes must not be lifted with narrow straps or unprotected forks.

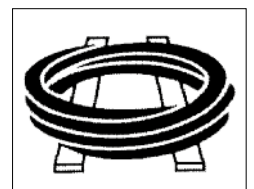
The minimum strap width should be 50 mm.

Fork protection can consist of steel pipe or pressurised water pipe.



Storage, unrolling

- The reels should be stored horizontally on spacers to avoid ground-borne moisture/ sharp edged objects.
- The reels may be stored upright on completely smooth surfaces. The storage area must be completely free of foreign/sharp-edged material.



Unrolling can be done from:

1. Vertical reels which are unrolled.
Check that the reel is not unrolling over sharp-edged material.
2. Horizontal rotating reels, for example on a spool holder.
3. When unrolling the pipe, it may not be compressed by drive rollers.
4. Horizontal fixed reel. In this situation, the pipe may be unwound from the reel.



Laying

- Pipe should not be laid at temperatures below 0°C without consulting Powerpipe.



Dimensions

Powerpipe's district heating pipes are laid directly on the prepared pipe bed (2). The recommended trench type section is shown in the figure on the right. Alternatively, the pipes can be laid on pallets during the installation phase. A drainage layer and drainage pipe (1) facilitate the installation work and reduce heat losses because dry soil insulates better than wet soil.

The coverage over the crown of the pipe should be at least:
 - 500 mm for heavily trafficked areas. - 300 mm for park land.

Pipe trenches

The bed is executed with a thickness of 150 mm. The pipe bed should be designed with stone-free material with a largest grain size of 20 mm according to Construction AMA 2013 CEC. 2131. If sharp-edged material with a grain size above 8 mm is used, the pipe bed should be equipped with a 50 mm thick levelling layer of stone-free material.

	Dimensions according to drawing	Svensk Fjärrvärme D:211	Standard EN13941
A	$Dy \leq 180$	Min 350	Min 150
	$200 \leq Dy \leq 500$	Min 350	Min 250
	$Dy > 560$	Min 350	Min 300
C	$Dy \leq 180$	Min 350	Min 150
	$200 \leq Dy \leq 500$	Min 350	Min 250
	$Dy > 560$	Min 400	Min 300

Excavation at sleeves, or laying of pipes on pallets, shall be carried out so that there is a free installation space around the joint site over a length of 2 m – see figure.

The space should be min. 200 mm for $dim \leq 500$ and 300 mm for $dim \geq 560$ mm.

At joints where the pipes cannot be rolled, the free installation space should be increased to 400 mm over a width of 2 x 600 mm (counted from the welding point) so that welding work can be carried out.

Drainage

Trenches for district heating pipes should be drained. Dry trenches during the construction period reduce the risk of construction moisture in the insulation. Dry trenches during the operating period lead to reduced heat losses and a reduced risk of moisture entering the insulation from outside. Stiff drainage pipes of approved type, such as DV, should be used. The drainage pipes may not be connected to crossing drain water pipes but should instead connect at a low point to an existing pipe. Filling around drainage pipes is carried out according to Construction AMA 2013 CEC. 3112.

Installation conditions

It must be possible for the installation to be carried out according to the supplier's document instructions if the warranty is to be valid. To execute an approved joint, the following general installation conditions must be fulfilled:

The pipe trenches must have functioning drainage so that the joint site is dry.

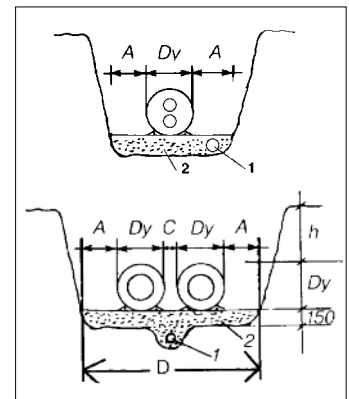
It must also be free of snow and ice.

Before jointing and insulation takes place, the remainder of the facility must be installed and have undergone final testing.

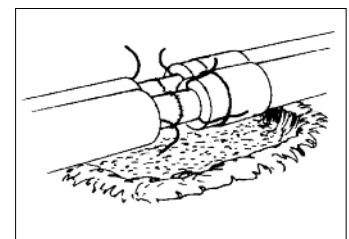
Alarm and signal wires should be connected according to the established alarm diagram.

At joint sites, splicing joint, casing pipe ends, free steel pipe ends and free foam surfaces should be dry and clean.

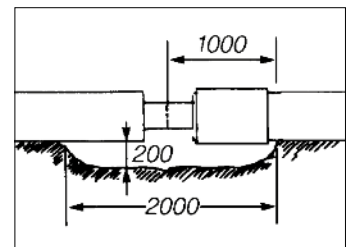
Surfaces against which PUR foam will be cast should normally have a temperature of 15-40°C. In cold weather, this can be achieved by circulating hot water through the pipe.



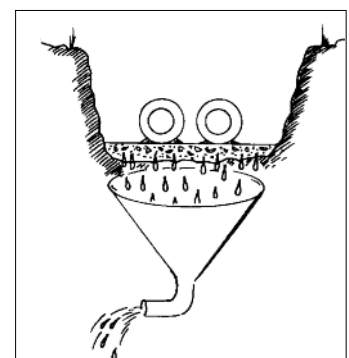
1: Drainage pipe
2: Pipe trenches



Excavation at sleeves, or laying of pipes on pallets, shall be carried out so that there is a free installation space



Space for installation



Trenches for district heating pipes should always be drained

Joint sites should be protected against precipitation between work stages and during foaming and jointing.

Laying

Before laying begins, check that the pipe bed is carried out according to the instructions on the previous page, is free of foreign objects and is so even that the pipe is level along its entire length. District heating pipes should be laid on special pallets or rollers. Pallets or rollers should be positioned before the pipe is laid.

Check that the alarm wires in each pipe and fitting are turned upwards. However, for technical reasons the alarm wires in curved pipes and profile bends are positioned differently.

Ensure during the entire installation period that water does not collect in the bottom of the pipe trench at any time. Insulation must be kept dry. Wet insulation at pipe ends causes problems during joint insulation and leads to alarm errors.

Welding, testing and inspection of welds

Where stipulated, welding of steel pipes should be carried out by a company with a welding licence. Welders should have certification. Each weld should be marked so the welder can be identified. When welding straight sections, the pipes should be rotated by hand on rollers/supports. This minimises problematic welding. Window welds should be avoided.

Testing is carried out according to EN 13941 (or AFS 2005:3). Seal testing is carried out with cold water and 1.43 times the highest permitted operating pressure. The pressure must be maintained for one hour before inspection. All joints should be visible. NB! Test pressurisation against close valves may only take place with 1.1 X PN (valve pressure class).

Seal testing may also be carried out with air, in which case leak indication is carried out by brushing on soapy water or similar. Maximum pressure 3 kPa (0.03 kp/cm²). See AFS 2006:8, the Swedish Work Environment Authority's regulations for testing with over or underpressure.

Radiography is carried out to the extent stipulated by the programme documents. Before commissioning, the pipe is cleaned with a pig or pressure cleaning tool.

Cut-to-length pipes, cutting

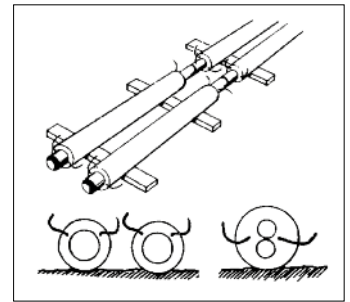
Where fitting pieces are required, cut-to-length pipes should be used. The construction of the cut-to-length pipes means that it is easy to remove the insulation from the service pipe and provide an absolutely clean surface in the steel pipe. This simplifies the installation work and prevents the risk of gases hazardous to health developing during welding or brazing.

The part of the pipe which is a cut-to-length pipe is marked "kaprör".

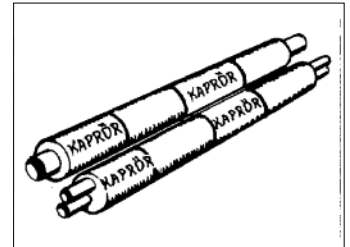
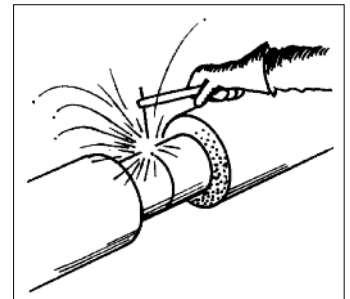
The cut-to-length pieces should be placed where friction movement is as small as possible, i.e. as far as possible from a deflection.

Cut-to-length pieces may not be cast into walls etc. on straight sections.

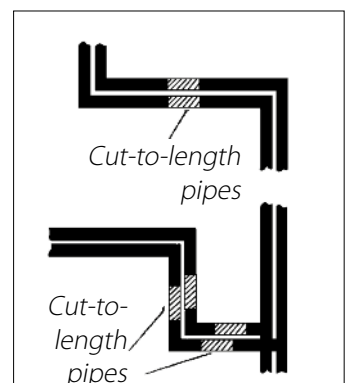
When cutting the casing pipe, it is important not to create an axial direction which can cause the pipe to split. This is particularly important in cold conditions. The pipe should first be cut tangentially.



District heating pipes should be laid on special pallets or rollers. Pallets or rollers should be positioned before the pipe is laid. Check that the alarm wires in each pipe and fitting are turned upwards.



The part of the pipe which is a cut-to-length pipe is marked "kaprör"



The cut-to-length pieces should be placed where friction movement is as small as possible, i.e. as far as possible from a deflection.

Deflections (for thermally pre-stressed systems)

Where deflection is required, standard bends should be used as far as possible. For narrower dimensions, alternatives with bend sleeves should be used. To guarantee pipe strength, bends with angles between 25° and 60° may only be used if at least one leg is short.

To guarantee pipe strength, it is important that small deflections greater than 10°–25° are not permitted to move laterally if deflections have straight sections on either side. For this reason particularly careful packing is required around these deflections.

Deflections smaller than 3° can be executed by mitring the steel pipe. Several mitres following each other can be accepted. Mitring can be replaced by the complete joined culvert pipe being held in a broad curve.

The deflection can also be created using special curved pipes. These are manufactured in 12 or 16 m lengths in the form of a curve with a deflection of a maximum of 35°. See also Chapters 3 and 4, Curved pipes.

Branches

Single pipes

Powerpipe's T-pieces are normally dimensioned to be equally strong as the pipe. Despite the fact that the T-piece is reinforced, it will not withstand excessive forces from the branched pipe. If the branch is longer than 12–15 m, it must be supported with a bend or fixation. When designing bends and distance between the main pipe and the fixation, any axial movement in the main pipe must be taken into account.

For parallel T-pieces, the length of the branch parallel with the main pipe should be at least the leg length for the branch. The maximum length of same is very long if the main pipe has minimal movement, or otherwise approx. 5 m. Naturally, expansion-absorbing material should be used if required.

Double pipes

T-pieces for double culvert pipes dimensioned to withstand full force from branched pipe. No expansion bends or fixings are required for straight T-pieces.

Flexible pipes

For instructions for flexible pipes, see Chapter 5.

Tapping

Tapping is permitted on non pressurised pipes without specific authorization.

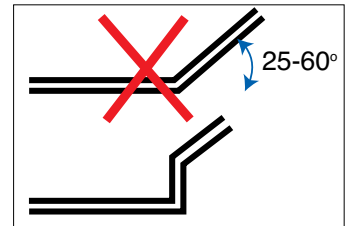
In a pressurised system, however, the description in Swedenergy D:217 (2021), Tapping, should be followed.

Wall penetrations

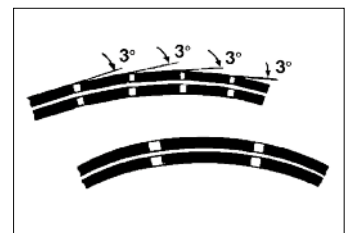
Wall penetrations must be carried out carefully to prevent locking of district heating pipes or ingress of groundwater.

Where the pipe does not move axially and where the groundwater pressure is normally low, embedding ring 6520 is used – see Chapter 8. The embedding ring is positioned in the centre of the wall and the hose clamp is tightened before concrete casting.

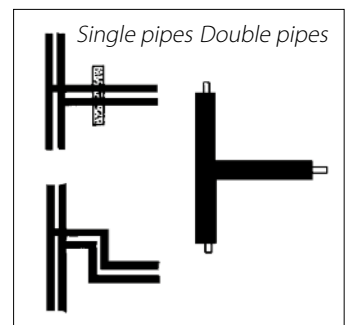
Where movement can be expected and where the probability of groundwater pressure is high, wall penetration 6510 is used – see Chapter 8.



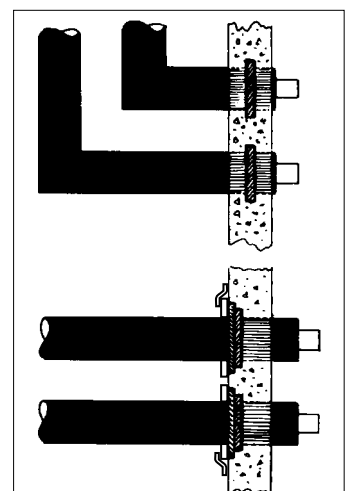
To guarantee pipe strength, it is important that deflections greater than 25° are not permitted to move laterally if the bend has straight sections on either side.



To guarantee pipe strength, bends with angles between 30° and 60° may only be used if at least one leg is short.



If the branch is longer than 12–15 m, it must be supported with a bend or fixation.



Valves, drain and vent devices

Valves

Valves should be positioned so they are not exposed to bending torque or lateral movements.

Axial movements should be as small as possible. During installation, valves should always be in fully open position.

The stem should be protected, for example by concrete pipe \varnothing 600 mm, resting on a concrete slab or equivalent. These should be placed so that the concrete pipe does not damage the district heating pipe.

The concrete pipe ends at ground level with a district heating cover.

In streets or in ground with traffic loads, a telescopic cover should be used so that the traffic loads are not transferred to the concrete pipe.

The concrete pipe should be positioned so that the valve can move longitudinally without the stem extension being subject to load.

Drain and vent devices

Low and high point with relevant drain/vent devices are best positioned where the main pipe does not move, i.e. at least a friction length from a 90° bend.

Vent can be carried out to advantage at a branch.

Prefabricated parts

T-piece is connected to valve assembly or Vent/Drain. See Chapter 3 (single pipes) or Chapter 4 (double pipes).

For single pipes, a joint can be avoided if an Extended T-piece, see Chapter 3, is used. By using a Combination valve, see Chapter 3, Stop and Vent/Drain are coordinated.

Site-built devices

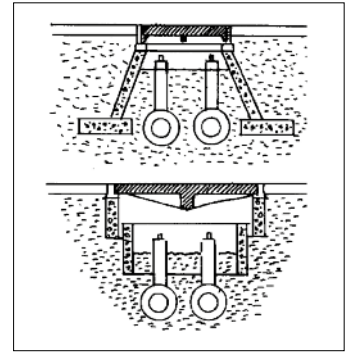
Site-built vent/drain devices are used in concrete access manholes and in buildings.

After welding, ironwork, valves and pipes should be rustproofed. Valves should be covered with insulation up to the connecting district heating pipe.

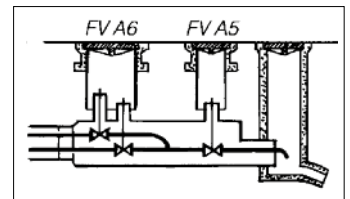
To prevent a risk of freezing, a bypass device with a choke valve should be installed. The valve is adjusted to ensure a low flow rate. If possible, the valve should be equipped with a thermostat.

Anchor points

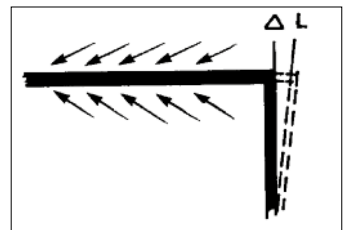
The thermal forces occurring in the service pipe are normally transferred to the soil via friction during movement in the district heating pipes. In the majority of cases these movements can be absorbed in naturally occurring deflections. In some cases however, the district heating pipe needs to be attached to prevent, limit or direct the expansion movement.



The stem should be protected by a concrete pipe resting on a concrete slab or equivalent. In streets or in ground with traffic loads, a telescopic cover should be used so that the traffic loads are not transferred to the concrete pipe.



Pre-fabricated drain and vent units



In the majority of cases movements from thermal forces can be absorbed in naturally occurring deflections.

Ground anchoring

During pre-heating can be desirable to guide the expansion movement into a particular direction. This can be achieved by backfilling one or two pipe lengths (ground anchoring).

Anchor units

Anchor units are used when you wish to limit the pipe section's axial movements, to ensure that a section does not slide from one expansion point to another, for example where there is a steep gradient, or where compensators are used.

The anchor unit is installed so that the offset between each anchor flange is 100-200 mm. The flange package is cast into a reinforced concrete block. This should be dimensioned to take into account the anchor force and the design compression strength of the soil.

Anchor units

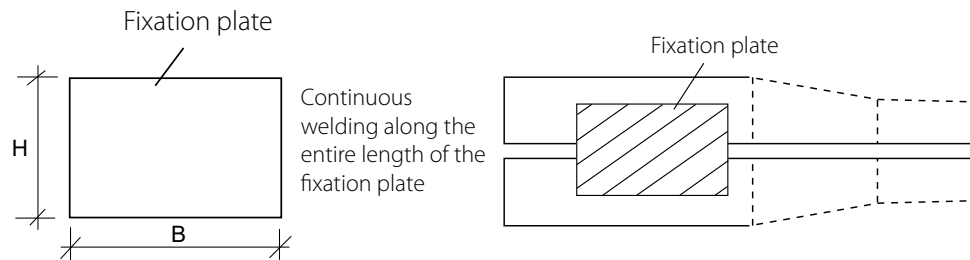
The steel pipes in double pipes are attached to each other in bends, anchor points, T-pieces, valves and reduction units.

Where a straight section does not end with one of these parts, e.g. after passing a foundation wall or on a straight section, anchor points must be used. This is to prevent the insulation from being torn off the steel pipe where there are different temperatures in the supply and return pipes.

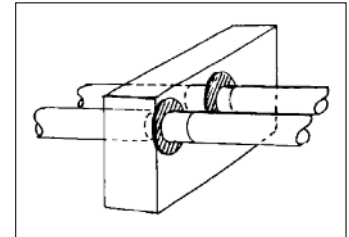
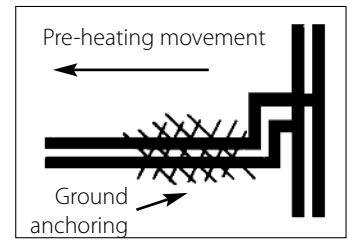
When commissioning double pipes, it is important not to immediately increase to high temperature in the supply pipe if the return pipe is cold, but instead to do this gradually, as initial stresses caused by the temperature difference occur in the fixation plates.

Alternative to anchor points

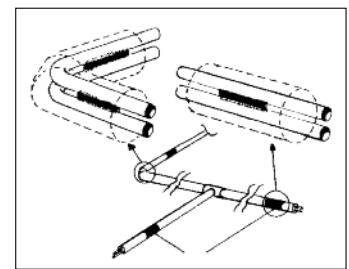
Steel plates with the dimensions below and installed according to the figure can replace anchor points or interconnected branches from double pipes.



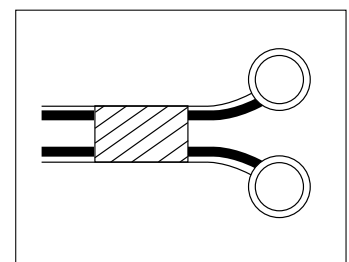
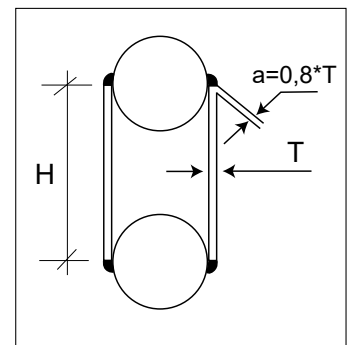
DN	Dy x t	B	H	T
20	26.9 x 2	45	42	4
25	33.7 x 2.3	65	49	4
32	42.4 x 2.6	80	57	4
40	48.3 x 2.6	85	63	4
50	60.3 x 2.9	110	76	4
65	76.1 x 2.9	135	90	4
80	88.9 x 3.2	120	108	6
100	114.3 x 3.6	165	131	6
125	139.7 x 3.6	200	162	6
150	168.3 x 4	260	200	6
200	219.1 x 4.5	300	255	8



The anchor unit is installed so that the offset between each anchor flange is 100-200 mm. The flange package is cast into a reinforced concrete block.



The steel pipes in double pipes are attached to each other in bends, anchor points, T-pieces, valves and reduction units.



Pre-heating and expansion absorption

Thermal forces occur in the steel pipe during temperature changes in operation. At natural deflections and expansion devices, these forces are transformed into movement either wholly or partially. The size of the movement primarily depends on the pipe dimension, temperature differential and laying depth.

Pre-heating

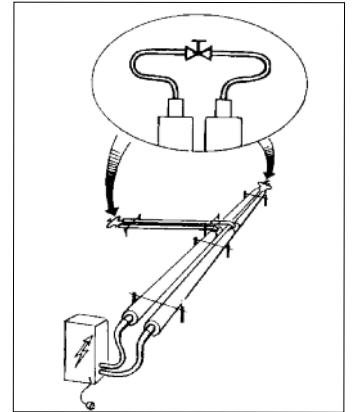
To minimise movement, the pipe can be thermally pre-stressed to a temperature between the lowest surrounding and highest operating temperatures. The pre-heating temperature is stated in the design documents. Pre-heating should be carried out with a slow increase of temperature. Pre-heating is normally carried out with water and often with the water used for pressure testing. The water is either heated with an electric boiler or is taken from the existing district heating network. When the district heating network is used as the heat source, the water should be shunted in to avoid rapid temperature changes.

Large dimensions and long sections can be pre-heated with electricity – consult with Powerpipe.

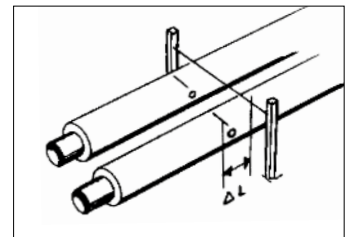
Before pre-heating, the expansion movement must be calculated and inspection points drawn up so that the calculated expansion movement can be inspected in practice. During pre-heating, the pipes must be free to move.

When the fixing temperature is achieved, the expansion movement should agree with the calculated figure. If this has not been reached, the pre-heating temperature can be increased a few degrees so that the right expansion is obtained.

The pipes can also be helped to achieve the right expansion mechanically, through lifting and stretching at certain points. The pre-heating temperature should be kept constant during packing and backfilling work.



To minimise movement, the pipe can be thermally pre-stressed to a temperature between the lowest surrounding and highest operating temperatures. The pre-heating temperature is stated in the design documents.



Before pre-heating, the expansion movement must be calculated and inspection points drawn up so that the calculated expansion movement can be inspected in practice.

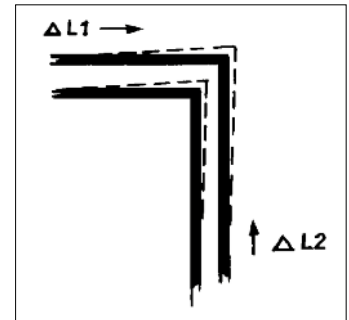
Expansion absorption

As the temperature changes during operation, movements occur in expansion devices, bends etc. These movements can often be absorbed by the surrounding sand. If the temperature difference between laying temperature (pre-heating temperature) and maximum/minimum occurring temperature is greater than approx. 50°C and/or the surrounding soil is very firm, bends etc. must be protected against ground pressure.

The movement is facilitated if the pipe in the expansion zone is surrounded by foam pillows/ground slabs, for example of foam pillows – see Figure 2, right, and Chapter 8 and 9.

In the case of very large movements, the protection can consist of concrete ducting or special steel elements. These should be ventilated to avoid excessive temperatures. For concrete ducting and steel elements, special installation instructions should be followed.

In the case of large movements (cold laying), expansion devices (90° bends) can be protected by backfilling these parts first after commissioning.



As the temperature changes during operation, movements occur in expansion devices, bends etc. These movements can be absorbed by the surrounding sand.

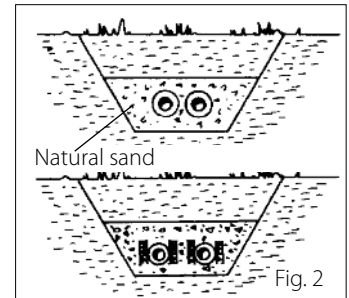
Surveillance system

Powerpipe's pipes and pipe fittings are supplied with two separate embedded alarm wires. At joint sites these should be connected to a monitoring system.

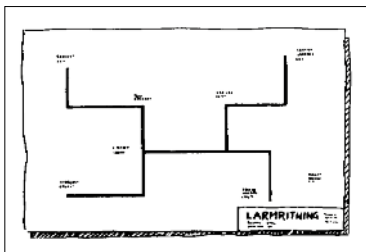
The alarm wires consist of soft annealed naked copper wires, Ø 1.5 mm².

The pipe network is divided into sections of up to 5000 m of pipe each (1000 m supply and 1000 m return pipe). For further information, see the text in Chapter 7.

Each section creates an alarm circuit and is connected to the alarm control centre designated by Powerpipe. The alarm control centre can either be used as an individual alarm unit or as part of a larger monitoring system.



Pipes in the expansion zone can be surrounded with ground slabs, for example made from mineral wool.

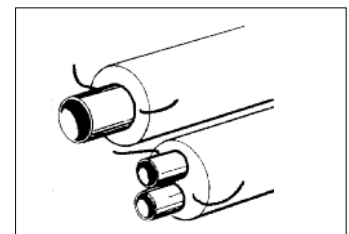


Alarm diagrams and installation instructions

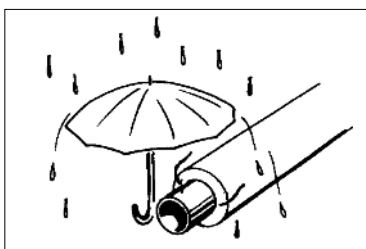
Alarm connection should be carried out according to the alarm diagram. This shows the alarm route, how the alarm wires are connected and the section divisions to be made. It also shows the alarm path and which pipe sections are connected to the different alarm units. The position of alarm wires in Powerpipe's pipe fittings is described in Chapter 7.

To guarantee alarm function – i.e. that it functions and does not give incorrect alarm indications, ensure that:

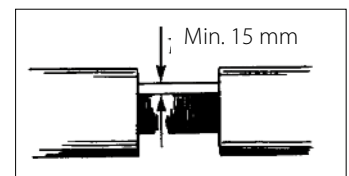
- The service pipe, steel pipe is welded/brazed in such a way that the alarm wires are oriented at 10 and 2 o'clock.
- Water has not penetrated the district heating pipe insulation during transport and assembly.
- The alarm wires are laid straight from pipe end to pipe end and do not cross each other.
- The alarm wires are laid parallel to the steel pipe.



Powerpipe's pipes and pipe fittings are supplied with two separate embedded alarm wires.



To guarantee alarm function – i.e. that it functions and does not give incorrect alarm indications, ensure that water has not penetrated the pipe insulation during transport and assembly.



The position of alarm wires in Powerpipe's pipe fittings is described in Chapter 7.

Connection of alarm wires

Alarm spacers

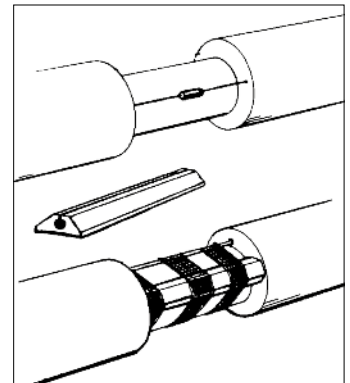
1. Carefully straighten out the alarm wires. Gently pull on the wires and check that they are undamaged and whole.
2. Clean the alarm wires with emery cloth.
3. Cut off the excess length from the stretched alarm wires.
4. Compress the wires in stretched condition in an approved splicing joint (Part no. 6890-100-000-000) using an approved special tool (Part no. 6890-100-100-000).
5. Slide the alarm spacers beneath the stretched wires and press the wires into the alarm spacers.
6. Tape the alarm spacers into place.
7. Insulation should be carried out immediately after alarm wire installation.

Hygroscopic felt

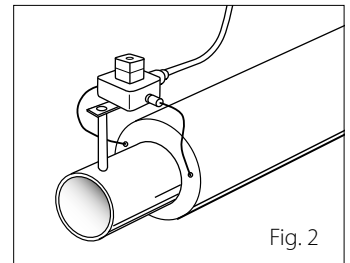
As an alternative to alarm spacers, hygroscopic felt can be used with single pipes but are recommended for use with double pipes.

Looping of alarm wire

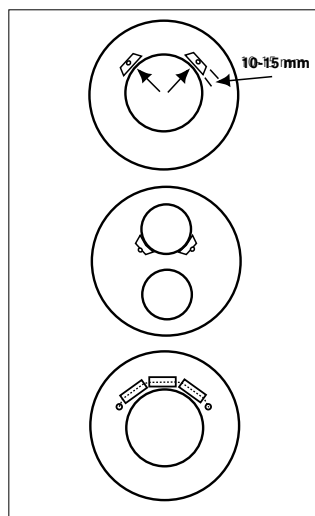
Unless otherwise stated on the alarm diagram, the wire must always be connected in a loop at the terminations of a pipe section. For looping, the alarm wire is spliced and laid according to the figure. The uninsulated wire should be insulated with an insulating joint or alarm spacer. The alarm spacer is cut and laid in segments around the steel pipe. The distance between alarm wire and pipe may not be less than 15 mm. Unless otherwise stated on the alarm diagram, for penetrations into manholes or similar, insulated wire EK 1.5 mm² should be used.



Slide the alarm spacers beneath the stretched wires and press the wires into the alarm spacers. Tape the alarm spacers into place.



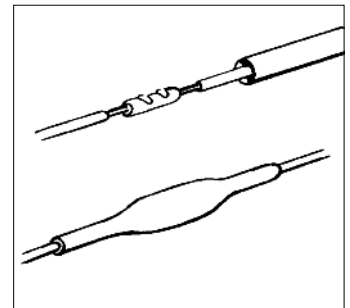
A mounting eye should be permanently welded to the steel pipe for earth connection at the endpoints.



At the endpoints to be connected to Powerpipe's section unit, a mounting eye should be permanently welded to the steel pipe for earth connection – see Figure 2, right.

The uninsulated wire should be insulated with an insulating sleeve or alarm spacer. The alarm spacer is cut and laid in segments around the steel pipe.

The distance between alarm wire and pipe may not be less than 15 mm.



The stripped part of the wire and the splicing joint should be insulated with a shrinkable insulating sleeve.

Signal wire

Powerpipe's district heating pipe can be supplied with an insulated signal wire cast into the insulation, by special order. This is spliced according to what is stated above. However, the stripped part of the wire and the splicing joint should be insulated with a shrinkable insulating sleeve. Where the pipe ends without being connected further, the wire end should be insulated with a shrinkable insulating sleeve.

Inspection of alarm connection

Control measurement of loop and insulation resistances should be carried out after each connection of wires and after foaming work and before backfilling begins.



Megger control appliance for alarm wires. See Chapter 8.

Assembly instructions – joint insulation

General information

Insulation in a pipe system may not have any weak points. Each joint must therefore be carefully insulated in the field. The insulation material should consist of Powerpipe's installation foam. **Joint installation shall be carried out by specialist, licensed companies, using trained personnel** (for Powerpipe's guarantee to apply). They are equipped with mobile foaming machines that have automatic pressure, volume and temperature control. In certain cases manual foaming can be carried out with bottles or foam pack. The current regulation AFS 2014:32 "Hard plastics" must be followed during all foaming work.

As seal testing of joints is stipulated, joint insulation must be carried out after seal testing. Casing pipes should be cut so that axial fractures do not occur. The sleeve/casing pipe overlap should be approx. 100 mm.

Assembly instruction for weld assembly, T-pieces

- 1 Required material**

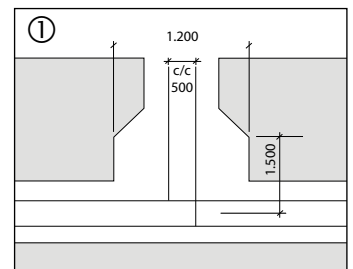
 - T-sleeve double/double Part no. 6530
 - T-sleeve flexible Part no. 6540
 - Bend with long radius 5D bend or greater for branch
 - Check that the sleeve and accessories are undamaged and of the right dimension
- 2 Excavation** The trench dimensions need to be expanded. See figure ①
- 3 Cleaning** Clean the outer casing on the branch and main pipe that will be in contact with the sleeve.
- 4 Peeling** Peel off the requisite amount of outer casing and insulation for branch installation. NB Avoid axial damage or cuts to the casing during peeling. Slice the bottom sleeve with a straight cut in the top side of the sleeve (90° from the branch) See figure ③ and ④
- 5 Sliding on the casing pipe** Slide the flex sleeve or reduction sleeve with tightening tubes onto the branch pipe. See figure ② NB The shrinkable end should be positioned furthest from the main pipe. Push the bottom sleeve onto the branch.
- 6A Welding of flexible T-piece**

Weld in the branch with bend. See figure ③ NB the bend should be 5D or greater. Weld the branch to the welded-on socket. Fitting pieces and flat reinforcement may be required. "L" fitting pieces should be:

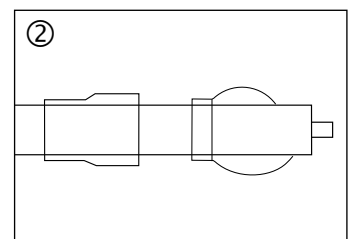
DN	L [mm]
32-80	200
100-150	250
200-500	300

c/c measured between branches should be \approx 500 mm.
- 7 Installation of bottom pipe** The bottom sleeve should be pushed back over the main pipe. NB The longitudinal joint should be at the top.
- 6A Welding of straight T-piece**

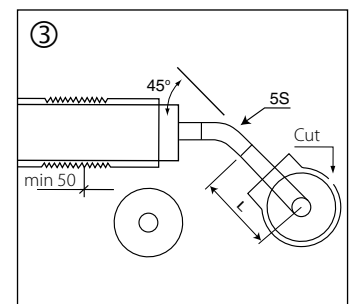
Spread the free steel ends of the branch so they can be welded to the main pipe. Weld the branch pipes (Part no. 8205. See Chapter 8) to the main pipe. Any reinforcements according to the designer's instructions.



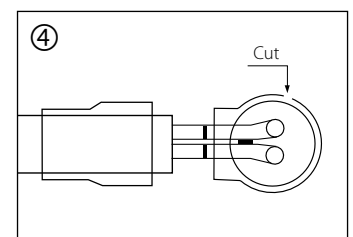
Dimensions, excavation and welding.



Slide the sleeve and tubing onto the branch.



Installation of flexible T-piece.



Installation of straight T-piece.

Welding sleeve, Mittel

General information

Mittel welding sleeves should be executed by authorised companies and by personnel with specific training. The overall procedure is described below.

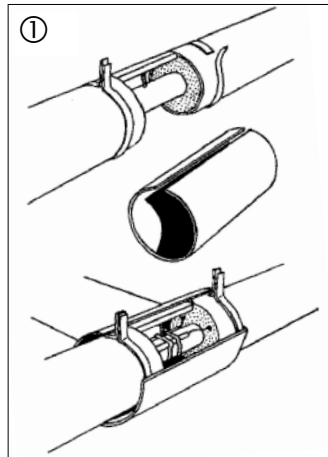
Material

The requisite material, Part no. 6110 Chapter 6 is delivered in batches for each dimension of outer casing. Alarm spacers, mastic, plugs and FOPS are supplied by the sleeving contractor.

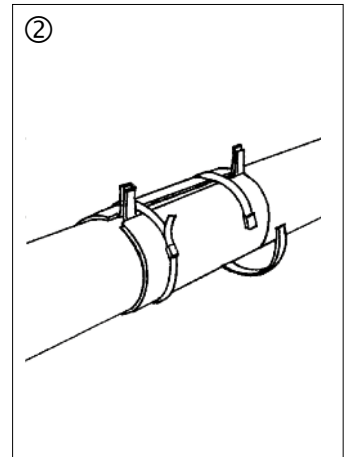
Special electrical equipment is used to weld the Mittel joint.

Execution

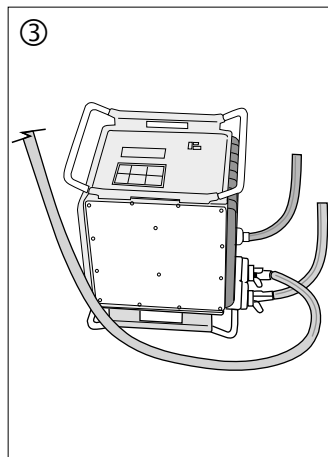
- Clean dirt, grease, moisture etc. from sleeve and casing.
- Connect the alarm wires (see Chapter 10, connection alarm wires)
- Sand the areas of the pipe and sleeve that will be covered by the Mittel joint and the inside of the Mittel joint.
Wash with ethanol.
- Apply guide and welding net. ①
- Cut and fit the sleeve on the pipe. ②
- Assemble and connect the welding equipment to the electrodes. ③
- Weld the radial weld. ③
- Cut and weld the axial weld. ④
- Drill holes for pressure testing/foaming/venting. The holes should be positioned at the edge of the casing pipe.
- Pressure test. ⑤
- Foam the sleeve. ⑥
- Foam and air holes should be welded closed.



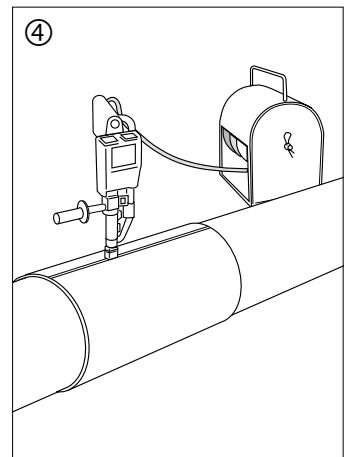
① Install welding net around the casing pipe.



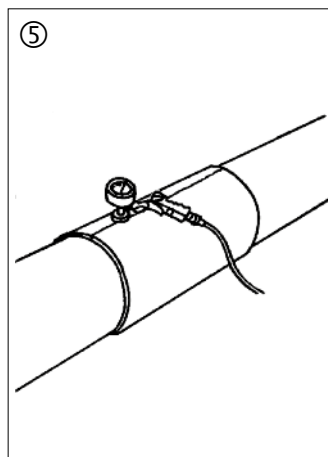
② The sleeve is cut and installed on the casing pipe.



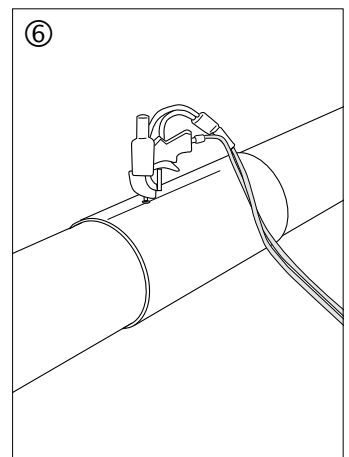
③ The computer-controlled welding procedure takes 3-4 minutes.



④ The longitudinal joint is carried out using an extrusion welder.



⑤ Pressure testing.



⑥ Foam the sleeve.

Shrink welding sleeve

General information

Shrink welding sleeves should be executed by authorised companies and by personnel with specific training. The overall procedure is described below

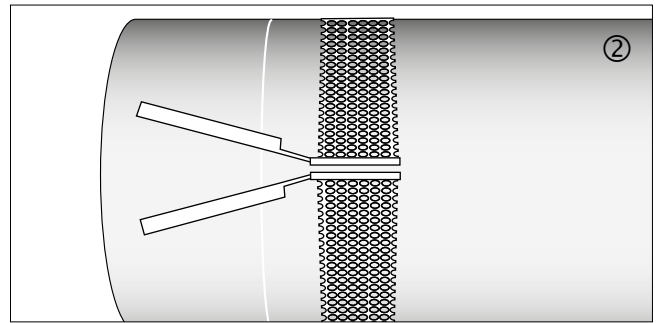
Material

The requisite material, Part no. 6112 or 6111 (Chapter 6) delivered in batches for each dimension of outer casing. The sleeve should be installed on the district heating pipe before welding steel pipes. Alarm spacers, plugs and FOPS are supplied by the sleeving contractor.

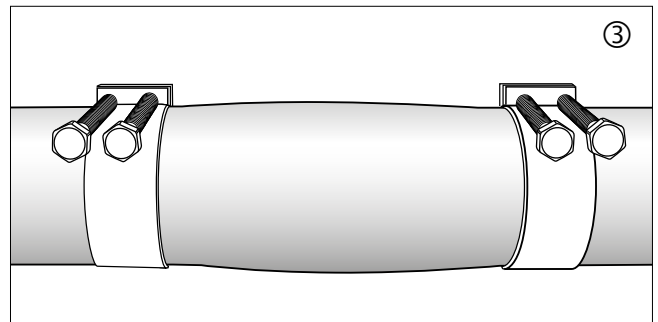
Special electrical equipment is used to weld the shrink welding sleeve.

Execution

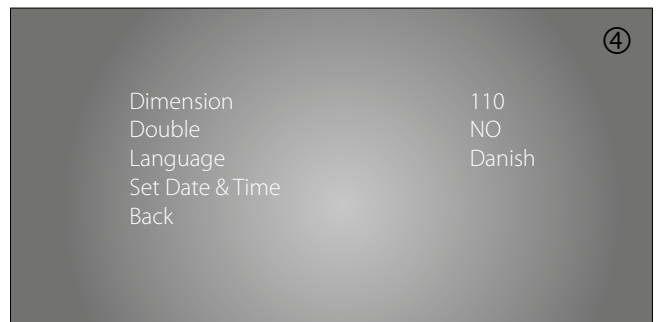
- Clean dirt, grease, moisture etc. from sleeve and casing.
- Connect the alarm wires (See Chapter 10, "Connect the alarm wires")
- Sand the areas of the pipe and sleeve that will be covered by the shrink welding sleeve and the inside of the sleeve. Wash with ethanol.
- Measure out and mark where welding net and sleeve should be applied. ①
- Apply welding net. ②
- Shrink the sleeve with a gas torch.
- Install the clamping tools. ③
- Assemble and connect the welding equipment to the electrodes.
- Weld the radial weld. ④
- Drill holes for pressure testing/foaming/venting. The holes should be positioned at the edge of the casing pipe.
- Pressure test. ⑤
- Foam the sleeve. ⑥
- Weld the foam and vent holes closed. See image 10 on the next page.



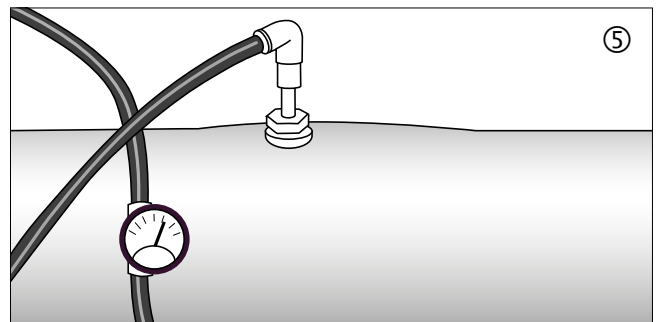
Install welding net around the casing pipe.



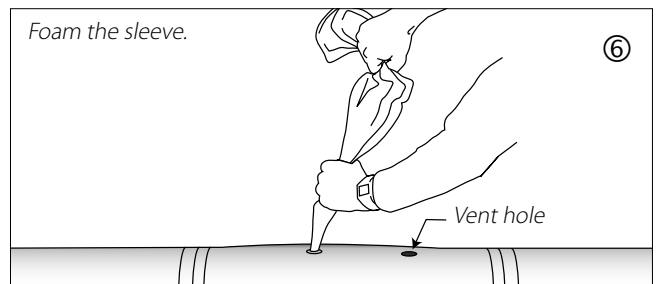
Install the clamping tools.



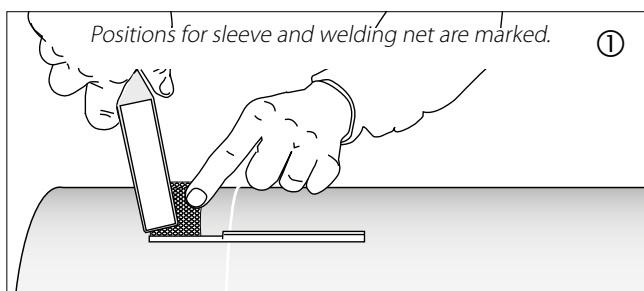
The computer control welding procedure begins.



Pressure testing.



Foam the sleeve.



Positions for sleeve and welding net are marked.

Double expanded sleeve

General information

Double expanded sleeve (PEHD) should be executed by authorised companies and by personnel with specific training. The overall procedure is described below.

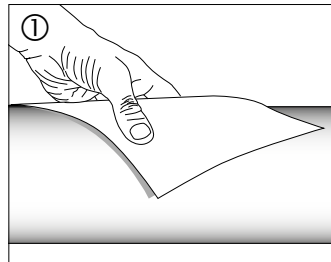
Material

The requisite material, Part no. 6361 (Chapter 6) delivered in batches for each dimension of outer casing. The sleeve should be installed on the district heating pipe before welding steel pipes. Alarm spacers, mastic, plugs and FOPS are supplied by the sleeving contractor.

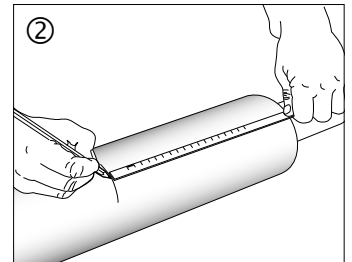
Execution

- Clean dirt, grease, moisture etc. from sleeves and casing pipes with ethanol. ①
- Connect the alarm wires (see Chapter 10, "Connecting alarm wires")
- Sand the areas of the pipe that will be covered by the PEHD sleeve and the inside of the sleeve. ①
- Mark out the position for sleeve and mastic. ②
Positioning of mastic must be approx. 1 cm inside the sleeve edge.
- Pre-heat the sanded areas. ③
- Remove the plastic protection around the sleeve and tightening band. ④
- Wrap broad (approx. 50-100 mm) woven mastic around the casing pipe. ⑤
- Centre the sleeve and remove the outer protection from the mastic strip. ⑥
- Use a soft gas flame and start to shrink one end of the sleeve. Move the flame carefully around the sleeve. Ensure that the underside of the sleeve receives sufficient heat. Use silicone cloth to protect the casing pipe from overheating. ⑦
- Check the shrinkage all around the pipe. The mastic should be visible at the edge of the sleeve. ⑦
- Pressure test. Allow the sleeve to cool to a max. of 40°C before pressure testing and foaming.
- Drill 20 mm holes for foaming and venting. ⑧
- Foam the sleeve. ⑨
- Foam and air holes should be welded closed. Sand the weld plug and surface; pre-heat the surface to 40°C. Pre-heat the FOPS and press it over the weld plug with your hand or a roller. ⑩

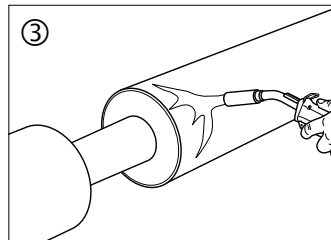
See plug instruction Chapter 10, "Plug instructions".



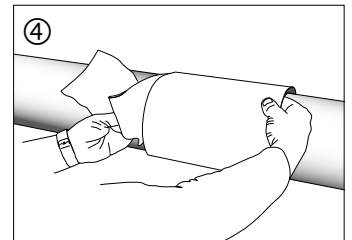
① Clean and sand the casing and the inside of the sleeve.



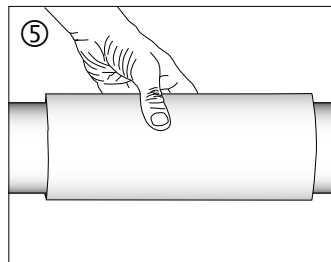
② Mark out the position for sleeve and mastic.



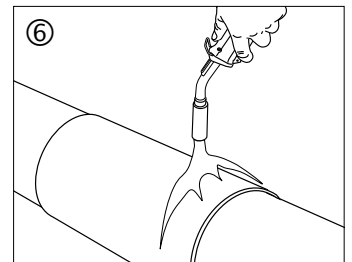
③ Pre-heat to 40-50°C



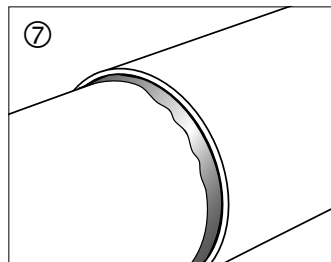
④ Remove the plastic protection from the sleeve.



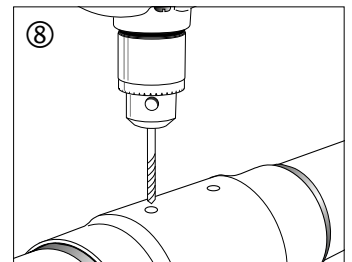
⑤ Remove the protective paper from the mastic and wrap it around the casing pipe.



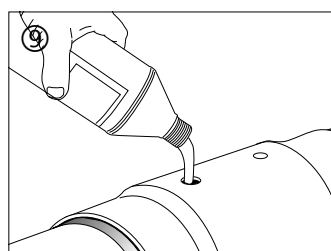
⑥ Shrink the sleeve with a soft gas flame with even movements.



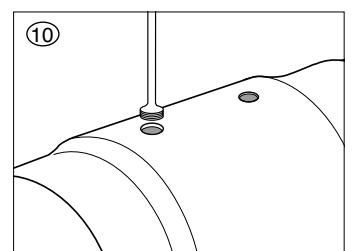
⑦ After shrinking, the mastic is visible at the end of the sleeve.



⑧ Pressure testing. The temperature of the sleeve may be a maximum of 40°C during pressure testing. Drill holes for foaming.



⑨ Foam the sleeve.



⑩ Weld the vent and top-up holes with weld plugs.

NB! Ensure that water (snow and rain) cannot enter the sleeve during the installation process.

Double sealing sleeve (PEHD)

General information

Double sealing sleeve (PEHD) should be executed by authorised companies and by personnel with specific training. The overall procedure is described below.

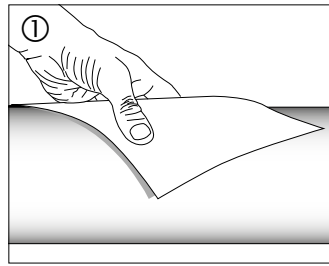
Material

The requisite material, Part no. 6364 (Chapter 6) delivered in batches for each dimension of outer casing. The sleeve should be installed on the district heating pipe before welding steel pipes. Alarm spacers, mastic, plugs and FOPS are supplied by the sleeving contractor.

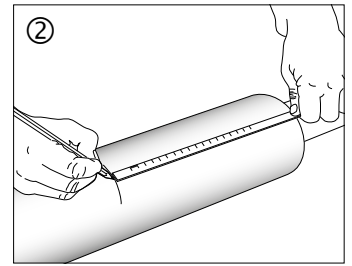
Execution

- Clean dirt, grease, moisture etc. from sleeves and casing pipes with ethanol. ①
- Connect the alarm wires (see Chapter 10, "Connecting alarm wires")
- Sand the areas of the pipe that will be covered by the PEHD sleeve and the inside of the sleeve. ①
- Mark out the position for sleeve and mastic. ②
Positioning of mastic must be approx. 1 cm inside the sleeve edge.
- Pre-heat the sanded areas. ③
- Remove the plastic protection around the sleeve and tightening band. ④
- Wrap mastic around the casing pipe.
- Centre the sleeve and remove the outer protection from the mastic strip. ⑤
- Use a soft gas flame and start to shrink one end of the sleeve. Move the flame carefully around the sleeve. Ensure that the underside of the sleeve receives sufficient heat. Use silicone cloth to protect the casing pipe from overheating. ⑥
See Accessories.

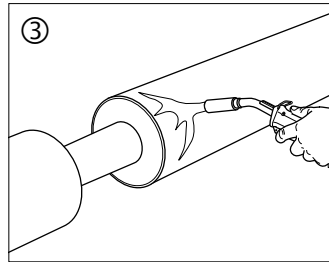
See next page.



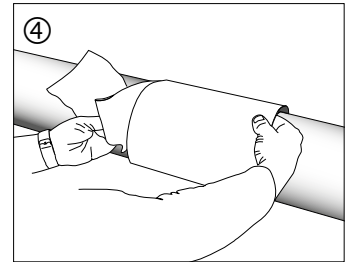
① Clean and sand the casing and the inside of the sleeve.



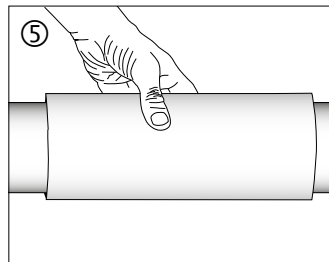
② Mark out the position for sleeve and mastic.



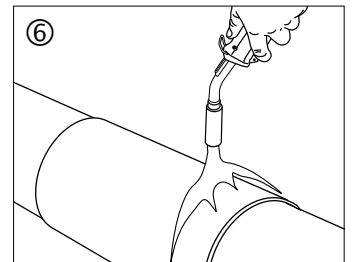
③ Pre-heat to 40-50°C



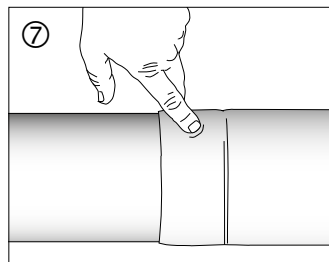
④ Remove the plastic protection from the sleeve.



⑤ Remove the protective paper from the mastic and wrap it around the casing pipe.



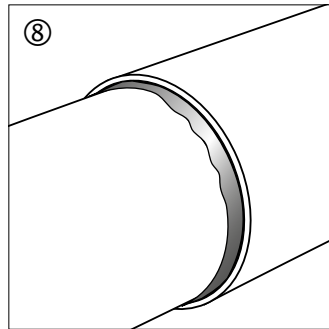
⑥ Shrink the sleeve with a soft gas flame with even movements.



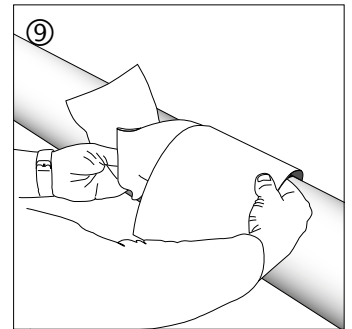
⑦ After shrinking, the mastic is visible at the end of the sleeve.

- Check the shrinkage all around the pipe. The mastic should be visible at the edge of the sleeve. ⑦ ⑧
- Remove the plastic protection from around the tightening tube/tightening band. ⑨
- Shrink the tightening tube/tightening band with a soft gas flame using even movements from the middle outwards. ⑩
- Check the result. ⑪
- Drill 20 mm holes for pressure testing/foaming/venting. The holes should be positioned at the edge of the casing pipe. ⑫
- Pressure test. Allow the sleeve to cool to a max. of 40°C before pressure testing and foaming.
- Foam the sleeve. ⑬
- Foam and vent holes are closed. Sand the weld plug and surface; pre-heat the surface to 40°C. Pre-heat the FOPS and press it over the weld plug with your hand or a roller. ⑭
See plug instruction Chapter 10, "Powerpipe Plug instructions".

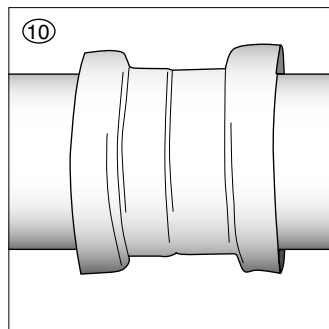
NB! Ensure that water (snow and rain) cannot enter the sleeve during the installation process.



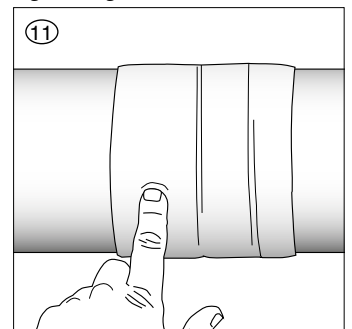
After shrinking, the mastic is visible at the end of the sleeve.



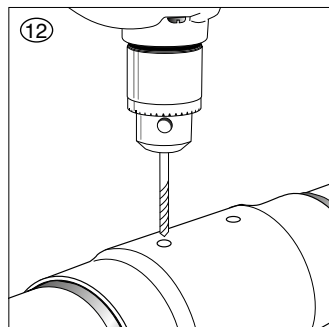
8 Remove the plastic protection from the tightening tube/tightening band.



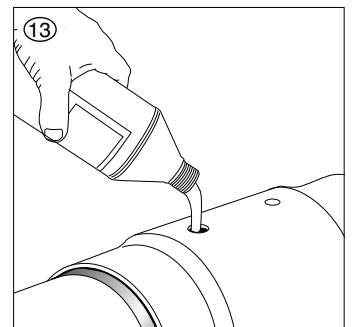
Shrink from the middle outwards.



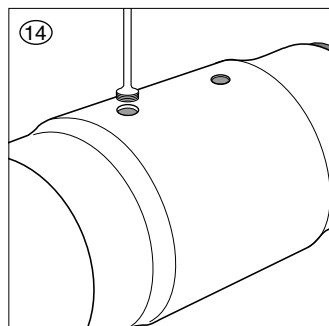
Check the result.



Pressure testing. The temperature of the sleeve may be a maximum of 40°C during pressure testing. Drill holes for foaming.



Foam the sleeve.



Weld the vent and top-up holes with weld plugs.

Shrinkable sleeves (PEX)

General information

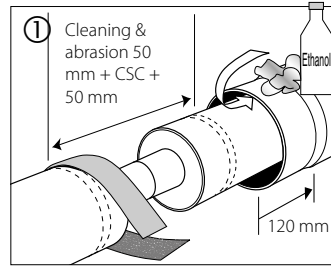
Shrinkable sleeves (PEX) should be executed by authorised companies and by personnel with specific training. The overall procedure is described below.

Material

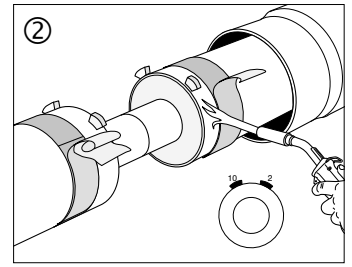
The requisite material, part no. 6362 including mastic (Chapter 6) delivered in batches for each dimension of outer casing. The sleeve should be installed on the district heating pipe before welding steel pipes. Alarm spacers, plugs and FOPS are supplied by the sleeving contractor.

Execution

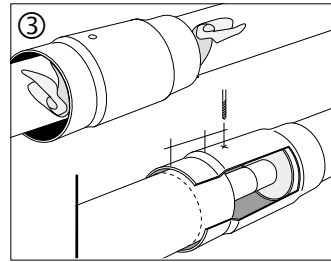
- Clean dirt, grease, moisture etc. from sleeve and casing.
- Connect the alarm wires (see Chapter 10, "Connecting alarm wires")
- Mark out the position for sleeve and mastic. ① Positioning of mastic must be approx. 1 cm inside the sleeve edge.
- Sand the areas of the pipe that will be covered by the PEX sleeve and the inside of the sleeve. Wash with ethanol (methylated spirits). ①
- Pre-heat the sanded areas to 40-50°C. Place spacers (for dimensions larger than 200 mm) at 10 and 2 o'clock. ②
- Remove the protective paper from the mastic and wrap the mastic around the casing pipe. ②
- Centre the sleeve and remove the outer protection from the mastic strip. ③
- Drill 1 hole, diameter 20 mm, for pressure testing/foaming/venting. The holes should be positioned at the edge of the casing pipe. ③
- Use a soft gas flame and start to shrink one end of the sleeve. Move the flame carefully around the sleeve. Ensure that the underside of the sleeve receives sufficient heat. ④
- Check the shrinkage all around the pipe.
- Pressure test. Allow the sleeve to cool to a max. of 40°C before pressure testing and foaming. ⑤
- Drill an additional hole for venting.
- Foam the sleeve. ⑤
- Drill a conical hole and weld the vent and top-up holes with weld plugs. The sleeve has areas inlaid with PEHD, and it is here the holes should be drilled for easy plugging. See plug instruction Chapter 10, "Powerpipe Plug instructions".
- Sand the weld plug and surface; pre-heat the surface to 40°C. Pre-heat the FOPS and press it over the weld plug with your hand or a roller. ⑥⑦



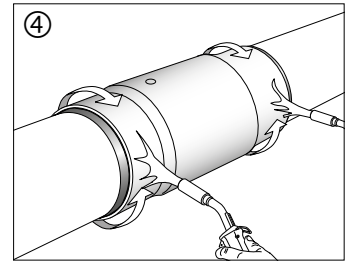
Clean, mark out and sand.



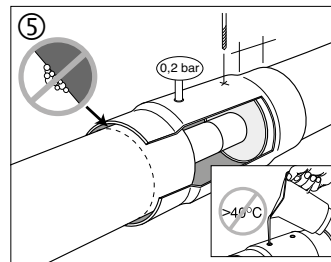
Pre-heat to 40-50°C. Place spacers.



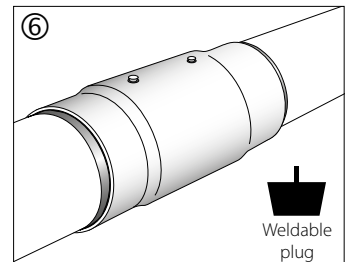
Centre the sleeve. Drill holes for pressure testing/foaming/venting.



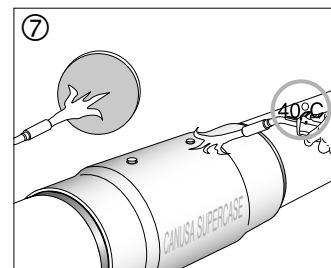
Shrink the sleeve with a soft gas flame.



Pressure testing. Foam the joint



Drill with conical drill.



Close the foaming and vent holes.

Flexible sleeve/Bend sleeve

General information

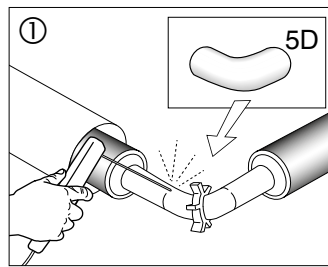
Flexible sleeves are used instead of prefabricated bends, but primarily for odd degree angles (not recommended for larger than 60°). Compared with prefabricated bends, it is important to carefully dry off the sleeve/bend before sleeving begins. The area must be 100% dry to prevent moisture from being enclosed in the bend.

Material

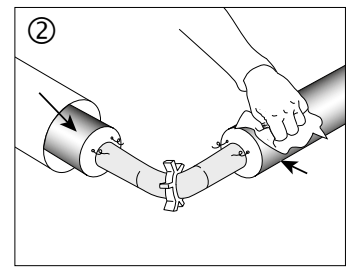
The requisite material, part number 6200 (See Chapter 6), together with a short 5D bend (by welder) is used during assembly and other ordinary sleeving components inc. a "spacer" (by the sleeve fitter).

Execution

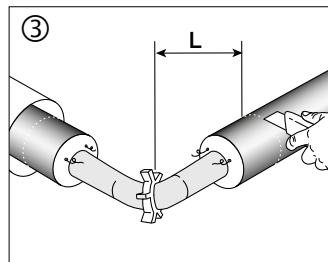
- Cut the 5D steel bend to the required angle and weld in place. Insert a spacer if required. ①
- Clean dirt, grease, moisture etc. from sleeve and casing with ethanol or similar. ②
- Measure L on the flexible sleeve and mark out where the sleeve should end on the casing pipe. L should correspond to half the sleeve length from the middle of the steel bend. Peel so that the foaming hole is inside the edge of the casing pipe. ③
- Drill 1 hole, diameter 20 mm, for pressure testing/foaming/venting. The holes should be positioned at the edge of the casing pipe. ④
- Connect the alarm wires with alarm guides and spacers. ⑤
- Sand the casing pipe where it will be covered by the sleeve. ⑥
- Pre-heat the sanded areas to 40-50°C. ⑦
- Heat the "grooved" part of the sleeve (not the smooth part). Continue until the bellows feels flexible enough to bend. NOTE! Do not overheat, as the sleeve can split if not handled carefully. ⑧
- Pull the sleeve over the steel bend and place it so that it overlaps the edge of the casing pipe equally at both ends. Slide wedges into both ends so the sleeve is centred. Allow to cool until it is stiff again. Remove the wedges and use a soft gas flame as if for a normal sleeve until the sleeve has completely shrunk down. After this, shrink the included tightening band. ⑨
- After this, pressure testing, foaming and plugging should be carried out in the same way as for other sleeves according to previous pages. ⑩
- For foaming and plugging, see the following pages.



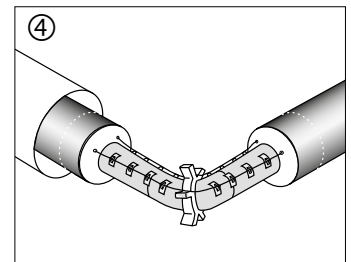
① Cut and weld in 5D steel pipe



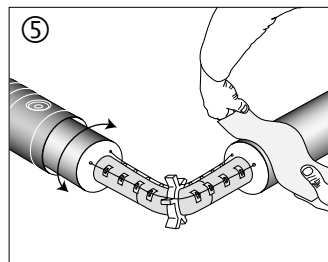
② Clean surfaces where the sleeve is to be shrunk.



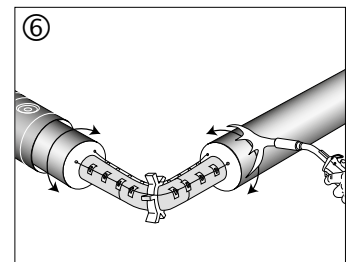
③ Measure the length of the flexible sleeve and mark out where the sleeve should end on the casing pipe.



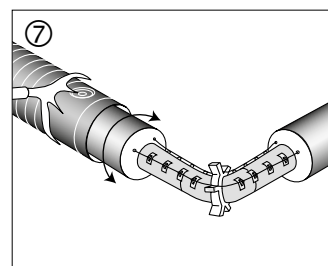
④ Connect the alarm wires with alarm guides and spacers.



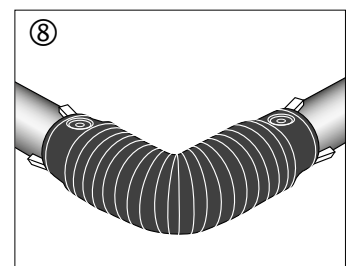
⑤ Sand the areas that will be covered by the sleeve.



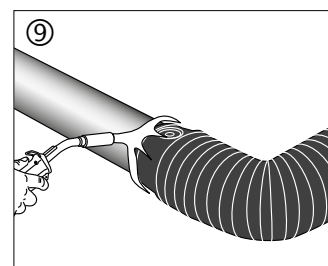
⑥ Pre-heat the sanded areas to 40-50°C



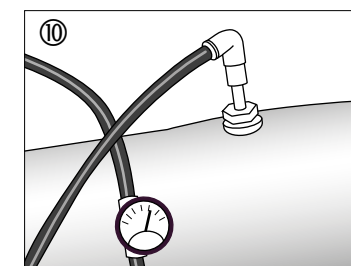
⑦ Heat the "grooved" part of the sleeve.



⑧ Slide wedges into both ends so the sleeve is centred.



⑨ Shrink the accompanying tightening band.



⑩ Pressure testing before foaming and plugging.

End caps

General information

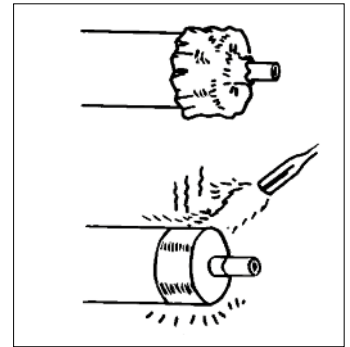
The end cap, mounted on the pipe fitting, is intended to be used inside foundation walls, in manholes and should not lie continuously under the water.

Material

End caps, see Chapter 8

Execution

- The outer casing, foam and steel pipe should be cleaned of dirt, grease, moisture etc. at least 150 mm from the pipe ends.
- Sand the pipe surface to be covered by the end cap.
- Carry out alarm installation according to specific instructions. See Chapter 10:307.
- Sliding on the right dimension of end cap.
- Heat and shrink the part of the protection that lies over the outer casing until mastic escapes.
- Heat and shrink the remainder of the protection until mastic escapes and forms a tight seal.



End cap: Heat and shrink the part of the protection that lies over the outer casing until mastic escapes.

End sleeve

General information

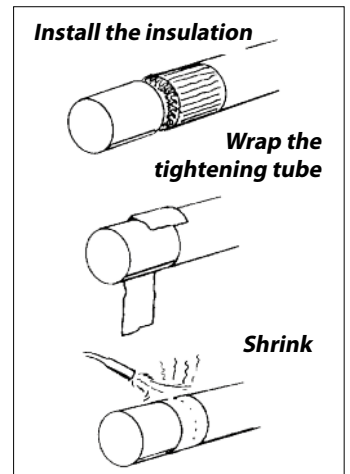
The end sleeve is intended as mechanical protection and insulation for a pipe end in a manhole, inside foundation walls or buried in the ground.

Material

End sleeve, see Chapter 6

Execution

- The outer casing, foam and steel pipe should be cleaned of dirt, grease, moisture etc. at least 150 mm from the pipe ends.
- Sand the part of the sleeve and pipe surface that will be covered by the tightening tube.
- Install the alarm. To create a loop, the alarm wires should be accessible.
- Install the insulation on the pipe:
 - a) Pipe insulation with a length of 300 mm and insulating plugs at the end of the pipe insulation or
 - b) Pre-fabricated insulating joints.
- Install the end sleeve.
- Seal with tightening tube using a suitable method.



End sleeve and tightening tube

Insulation of joints

Mechanical foaming

- Check that the affected surfaces are dry and clean.
- To achieve the best results, the temperature of the surfaces onto which the insulation will be cast should be between +15°C and +40°C. The ideal temperature is 22°C. To achieve the right temperature, the steel pipe can be heated with circulating hot water, or from outside with air or a gas torch. The sleeve can be heated carefully with a soft gas torch.
- The sleeve should be centred over the joint.
- If necessary, centre the sleeve with wedge strip.
- Drill top up hole and vent hole if insulation is to be carried out after installation of the joint material.
- Fill with the requisite quantity of foam. Knock in sealing plugs.
- Allow the sleeve to cool for at least 1 hour before completing sleeve installation.

If the temperature is lower than +15°C or higher than +40°C in the sleeve/steel pipe, foaming can still take place under certain circumstances. Consult with Powerpipe.

Hand foaming

This can be done in two ways. By using foam packs, see Chapter 8, or with manual mixing in a container. Foam packs are recommended from a safety viewpoint.

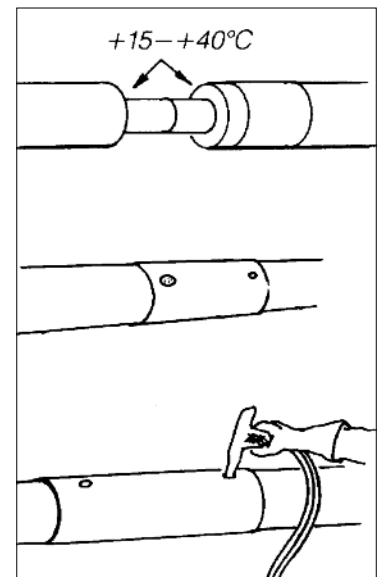
Both methods are difficult to execute when insulating larger dimensions. Mechanical foaming is recommended.

- The same preparations as for mechanical foaming.
- Ensure that the temperature in the foam liquids is at least 20°C.
- Measure out the quantity of polyol and isocyanate in separate containers according to the table below, or choose the right dimension of foam pack.
- Mix and stir vigorously until the mixture has a uniform colour (approx. 15-20 sec).
- Pour the mixture into the filling hole.
- After this, the procedure is the same as for mechanical foaming.

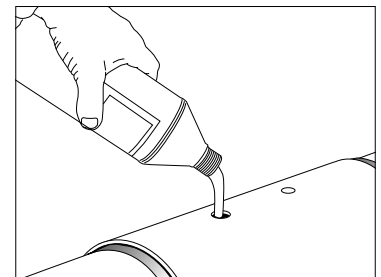
Sealing of top up and vent holes

A non-welded plug should be sealed an extra time using a special cover patch (FOPS) with a seal surface of hot melt adhesive. For sleeves with tightening band, the top up/vent holes are placed at the edge of the sleeve so they are covered by the shrink material.

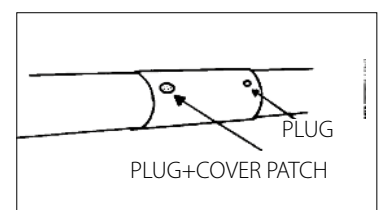
- Sand.
- Use a soft gas flame.
- Pre-heat the surface around the plug to approx. 60°C.
- Check the temperature with a temperature indicator.
- Pre-heat the hot melt adhesive surface on the cover patch for 2-3 sec. so it has a shiny, semi-liquid character.
- Press the cover patch firmly over the plug, ensuring it is centred.
- Heat the upper side until the structure of the upper side disappears and the hot melt adhesive flows out around the edges.
- Press the cover patch in place from the centre and outwards.
- Check that the cover patch is in complete contact with the surface without air bubbles.



The ideal temperature is 22°C. Drill top up hole and vent hole if insulation is to be carried out after installation. Fill with the requisite quantity of foam. Knock in sealing plugs.



Hand foaming

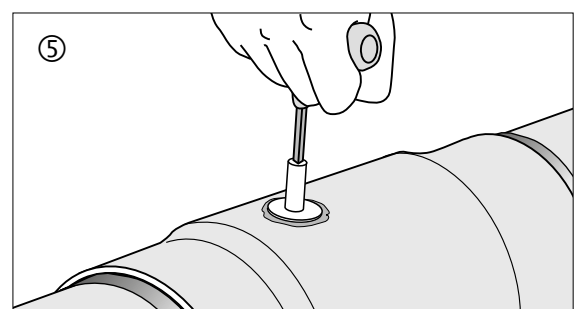
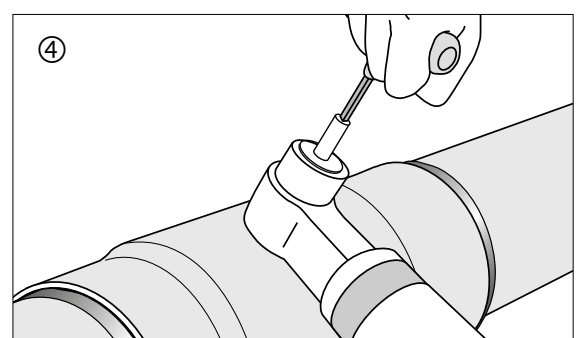
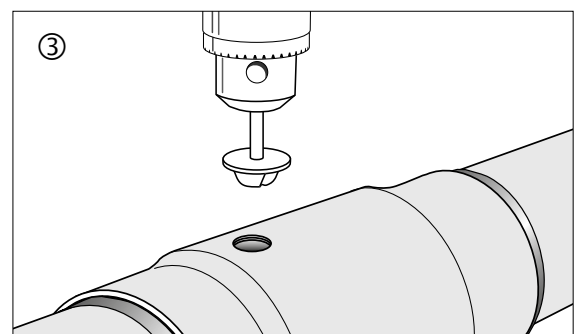
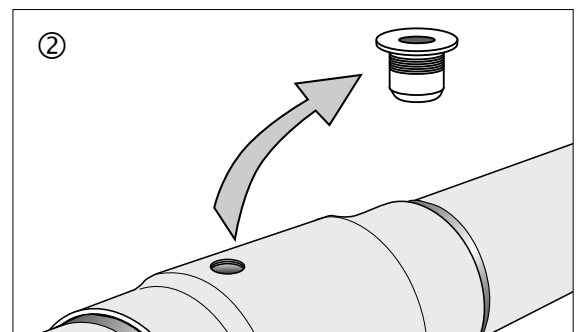
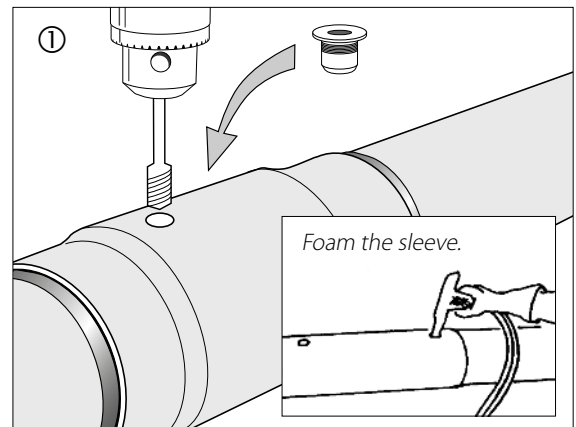


The plugs should be sealed and extra time using a special cover patch with a seal surface of hot melt adhesive.

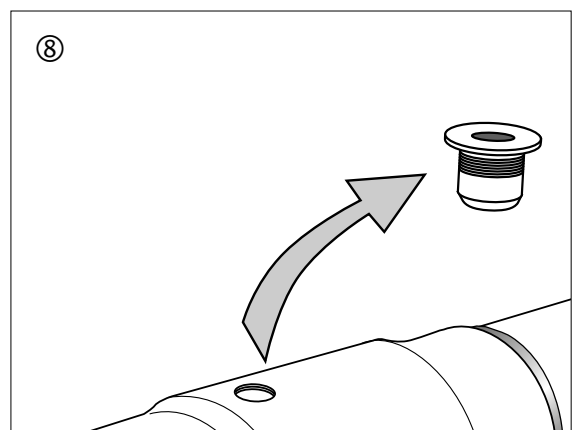
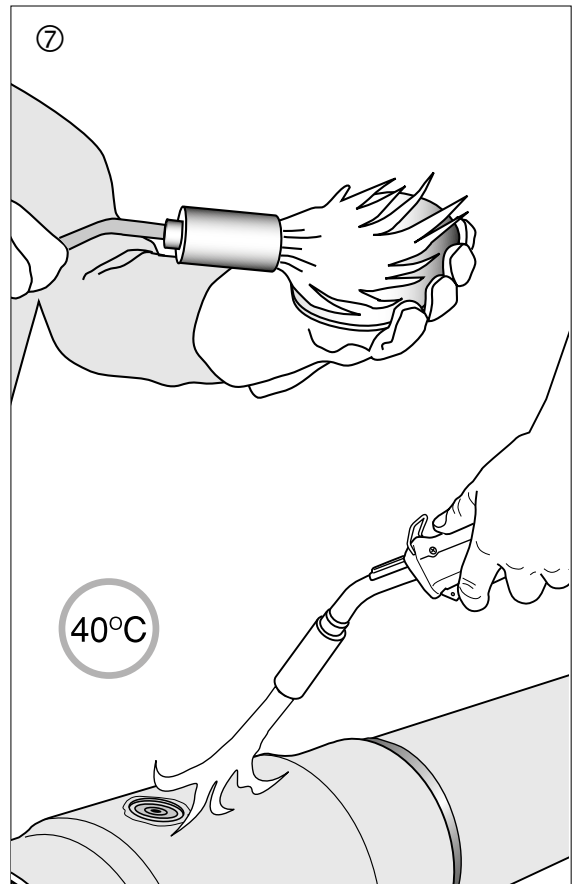
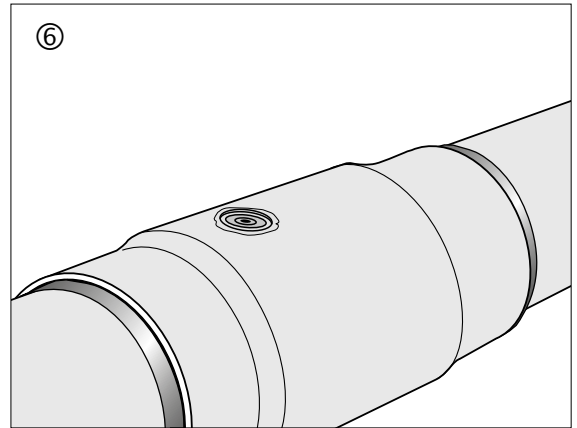
Plug instruction Powerpipe

- 1 Connect the plug welder to a 230 volt supply.
- 2 Check that the tool is clean and that the heating element has heated up. This is indicated by a steady LED light. The thermostat should be set at 260°C. +/- 10°C.
- 3 Check the temperature with a temperature sensor. If required, the temperature should be adjusted to the right conditions.
- 4 Drill out the foaming hole with a 20 mm drill. Foam the sleeve, knock in vent plug. Harden for at least 20 min. See image 1.
- 5 The vent plug is dismantled and the hole is drilled out with a conical drill. Clean the hole and surrounding casing pipe of any foam residues. See images 2 and 3.

See next page.



- 6 Place the plug welder in the hole and the weld plug into the holder to pre-heat until a weld bead of approx. 1-2 mm has formed. Remove the tool and press the melted plug into the hole under pressure for approx. 1 min until the plastic has cooled. See images 4 and 5.
- 7 If a FOPS (cover patch) is to be installed, the weld plug must be ground down to an even surface. See Image 6.
- 8 Pre-heat the FOPS and the surface around the plug. Place the FOPS over the plug, heat with a gas torch and press with a FOPS press. See images 7 and 8.



Foaming of joint sleeves with bottles or foam pack

If foaming of joint sleeves during installation is carried out with bottles (art. no. 6480-) or foam pack (art. no. 6481-), there are certain differences in the numbering, and also during transportation and storage:

Transport:

- Bottle foam: no restrictions
- Foam pack foam: hazard class 3

Storage:

- Bottle foam has no temperature requirement for storage. Well-ventilated space, protected against moisture
- Foam pack foam must be stored in cold, frost-free conditions in a well-ventilated space

Both are classified as hazardous waste or special waste. The packaging can be reused after cleaning.

For bottle foam, the content of one bottle is mixed with the other (the content of the bottle marked B is poured into the bottle marked A). For foam pack, each foam pack is divided in two separate parts which are mixed by removing the barrier between them, which is done by pulling on the foam pack. In both cases, the mixture is shaken for around 20 seconds.

Single pipes

DN	Series 1			Series 2		
	PEHD Dy	PUR kg/sleeve	Foam bottles	PEHD Dy	PUR kg/sleeve	Foam bottles
20				110	0.50	3
25	90	0.32	2	110	0.46	3
32	110	0.45	3	125	0.58	4
40	110	0.43	3	125	0.55	4
50	125	0.51	4	140	0.65	5.1
65	140	0.60	5	160	0.81	6.1
80	160	0.75	6	180	0.98	7
100	200	1.04	7	225	1.47	8.1
125	225	1.21	8	250	1.68	9
150	250	1.34	8.1	280	1.97	10
200	315	1.98	10	355	2.99	11.1
250	400	3.21	11.1	450	4.84	12
300	450	3.09	12	500	5.52	13
350	500	4.63	13	560	7.08	13.1
400	560	5.60	13	630	8.77	13.1+9
450	630	7.42	13.1+5	710	9.7	12+13
500	710	9.56	13.1+11.1	800	14.75	13.1+13.1+8.1
600	800	11.49	13+13.1	900	17.36	13.1+13.1+12
700	900	13.55	13.1+13.1+3	1000	20.12	3x13.1
800	1000	15.68	13.1+13.1+11			

For Series 3 and 4, see next page.

Tables for bottle foam

DN	Series 3			Series 4		
	PEHD Dy	PUR kg/sleeve	Foam bottles	PEHD Dy	PUR kg/sleeve	Foam bottles
20	125	0.57	4	140	0.71	6
25	125	0.56	4	140	0.70	6
32	140	0.73	5	160	0.89	6.1
40	140	0.70	5	160	0.92	6.1
50	160	0.88	6.1	180	1.12	7
65	180	1.04	7	200	1.35	8
80	200	1.25	8	225	1.65	9
100	250	1.88	9.1	280	2.50	11
125	280	2.24	10.1	315	3.0	11.1
150	315	2.69	11	355	3.65	12
200	400	3.93	12	450	5.70	13
250	500	6.05	13.1	560	8.10	12+12
300	560	7.26	13.1+6.1	630	10.0	12+13
350	630	9.34	13.1+11	710	12.2	13.1+13.1
400	710	11.65	13.1+13	800	17.41	13.1+13.1+12
450	800	14	13.1+13.1+11.1	900	22.03	3x13.1+10.1
500	900	20.62	3x13.1	1000	27.19	4x13.1
600	1000	23.93	4x13			

Double pipes

DN	STANDARD			DOUBLE+			DOUBLE++		
	PEHD Dy	PUR kg/sleeve	Foam bottles	PEHD Dy	PUR kg/sleeve	Foam bottles	PEHD Dy	PUR kg/sleeve	Foam bottles
2x20	125	0,50	3	140	0,72	5	160	0,94	6,1
2x25	140	0,70	5	160	0,92	6,1	180	1,12	8
2x32	160	0,89	6,1	180	1,14	7	200	1,36	8,1
2x40	160	0,84	6,1	180	1,09	7	200	1,32	8,1
2x50	200	1,27	8	225	1,68	9	250	1,90	10,1
2x65	225	1,52	8,1	250	1,94	10	280	2,40	11
2x80	250	1,80	9,1	280	2,37	10,1	315	2,90	11,1
2x100	315	2,75	11	355	3,45	12	400	4,60	13
2x125	400	4,47	12	450	5,20	13	500	7,10	11,1+12
2x150	450	5,34	13	500	6,25	13,1	560	8,60	12+12
2x200	560	8,03	12+12	630	10,2	13+12			

Quantities in all tables for bottle foam are based on:

- Free sleeve length 2x225 = 450 mm
- Dimensions for shrinkable casing
- Temperature +15°C – +40°C in sleeve and steel pipe.
- In the table above, a supplement (≈10%) is included for liquids that remain in the mixing vessel.

The foam liquids should have a temperature of approx. 20°C. If a welding sleeve is used, the quantity should be reduced by approx. 15% for double pipes and approx. 20% for single pipes due to the reduced sleeve diameter.

Bottle foam for tapping/connection, single pipe

The quantity of foam liquids required can be calculated using the tables below for guidance



Bottle set for foaming

Requirements for branch:

Dimension	Series 1 kg	Series 2 kg	Series 3 kg	Series 4 kg	Quantity kg	Bottle no.
DN 25	0.40	0.55	0.70	0.80	0.2-0.25	1
DN 32	0.56	0.65	0.85	1.0	0.25-0.35	1
DN 40	0.52	0.62	0.80	1.0	0.35-0.45	2
DN 50	0.60	0.80	1.0	1.2	0.45-0.55	3
DN 65	0.71	1.0	1.1	1.4	0.55-0.70	4
DN 80	1.09	1.2	1.4	1.7	0.70-0.75	5
					0.75-0.85	5.1
					0.85-1.00	6
					1.00-1.15	6.1

Requirements for main pipe:

Dimension	Series 1 kg	Series 2 kg	Series 3 kg	Series 4 kg	Quantity kg	Bottle no.
					1.15-1.30	7
					1.30-1.60	8
					1.60-1.75	8.1
DN 40	0.43	0.55	0.70	0.92	1.75-1.90	9
DN 50	0.51	0.65	0.88	1.12	1.90-2.30	10
DN 65	0.60	0.81	1.04	1.35	2.30-2.60	10.1
					2.60-3.0	11
DN 80	0.75	0.98	1.25	1.65	3.0-3.5	11.1
DN 100	1.04	1.47	1.88	2.50	3.5-4.8	12
DN 125	1.21	1.68	2.24	3.00	4.8-6.0	13
					6.0-7.0	13.1
DN 150	1.34	2.97	2.69	3.65		
DN 200	1.98	2.99	3.93	5.70		
DN 250	3.21	4.84	6.05	8.10		
DN 300	3.09	5.52	7.26	10.0		
DN 350	4.63	7.08	9.34	12.2		
DN 400	5.60	8.77	11.65	15.6		
DN 450	7.42	9.7	14.4	18.2		
DN 500	9.56	12.44	18.3	22.6		

Calculate and add the requirements for main pipe and branches. In the table above, a supplement ($\approx 10\%$) is included for liquids that remain in the mixing vessel.

Bottle foam for tapping/connection, double pipe

The quantity of foam liquids required can be calculated using the tables below for guidance



Bottle set for foaming

Requirements for branch (double pipe)

Dimension	STANDARD Kg	DOUBLE+ Kg	DOUBLE++ Kg	Quantity kg	Bottle no.
DN 25	0.44	0.55	0.7	0.2-0.25	1
DN 32	0.70	0.90	1.10	0.25-0.35	1
DN 40	0.67	0.87	1.10	0.35-0.45	2
DN 50	1.11	1.45	1.60	0.45-0.55	3
DN 65	1.60	2.05	2.50	0.55-0.70	4

				0.70-0.75	5
				0.75-0.85	5.1
				0.85-1.00	6

Requirements for main pipe (double pipe)

Dimension	STANDARD Kg	DOUBLE+ Kg	DOUBLE++ Kg	Quantity kg	Bottle no.
				1.00-1.15	6.1
				1.15-1.30	7
				1.30-1.60	8
				1.60-1.75	8.1
DN 32	0.89	1.14	1.36	1.75-1.90	9
DN 40	0.84	1.09	1.32	1.90-2.30	10
DN 50	1.27	1.68	1.90	2.30-2.60	10.1
DN 65	1.52	1.94	2.40	2.60-3.0	11
				3.0-3.5	11.1
DN 80	1.80	2.37	2.90	3.5-4.8	12
DN 100	2.75	3.45	4.60	4.8-6.0	13
DN 125	4.47	5.20	7.10	6.0-7.0	13.1
DN 150	5.34	6.55	8.60		
DN 200	8.03	10.2			

Calculate and add the requirements for main pipe and branches. In the table above, a supplement ($\approx 10\%$) is included for liquids that remain in the mixing vessel.

Replacement table for bottle foam

If the right bottle size is not available, the table below may be useful.

Bottle	Can be replaced with bottle		
4	1+1		
5	1+2	2+2	
5.1	2+2	3+1	
6	2+3	3+3	1+4
6.1	3+4	5+2	5.1+1
7	4+4	3+4	6+1
8	5+5.1	6+4	6.1+2
8.1	5.1+5.1	6+5	6.1+3
9	6+6	6.1+5.1	7+5
9.1	6+6.1	7+5.1	7+6
10	6.1+6.1	7+6	8+5.1
10.1	7+7	8+6	8.1+5.1
11	8.1+7	9+6.1	9.1+5.1
11.1	8.1+8.1	9+8	9.1+7
12	10+10	10.1+9.1	11+8.1
13	11+11	11.1+8	12+8.1
13.1	11.1+11.1	12+10	13+6

Table for foam pack

Quantities in all tables for foam pack are based on:

Single pipes

DN	Serie 1			Serie 2		
	PEHD Dy	PUR kg/sleeve	Foam pack no.	PEHD Dy	PUR kg/sleeve	Foam pack no.
20				110	0,50	3
25	90	0,32	2	110	0,46	3
32	110	0,45	3	125	0,58	1+1
40	110	0,43	3	125	0,55	1+1
50	125	0,51	1+1	140	0,65	2+2
65	140	0,60	5	160	0,81	7
80	160	0,75	6	180	0,98	4+4
100	200	1,04	4+4	225	1,47	9
125	225	1,21	5+5	250	1,68	6+6
150	250	1,34	9	280	1,97	7+7
200	315	1,98	7+7	355	2,99	9+9
250	400	3,21	9+9	450	4,84	12+2
300	450	3,09	12+2	500	5,52	12+9
350	500	4,63	12+9	560	7,08	12+11
400	560	5,60	12+9	630	8,77	12+11+6+6
450	630	7,42	12+11+5	710	9,7	12+12+9+2
500	710	9,56	12+11+9+9	800	12,44	12+12+11+11

Double pipes

DN	STANDARD			DUBBEL+			DUBBEL++		
	PEHD Dy	PUR kg/sleeve	Foam pack no.	PEHD Dy	PUR kg/sleeve	Foam pack no.	PEHD Dy	PUR kg/sleeve	Foam pack no.
2x20	125	0,50	3	140	0,72	5	160	0,94	7
2x25	140	0,70	5	160	0,92	7	180	1,12	5+5
2x32	160	0,89	7	180	1,14	4+4	200	1,36	9
2x40	160	0,84	7	180	1,09	4+4	200	1,32	9
2x50	200	1,27	5+5	225	1,68	6+6	250	1,90	10+2
2x65	225	1,52	9	250	1,94	7+7	280	2,40	10+5
2x80	250	1,80	10	280	2,37	10+2	315	2,90	9+9
2x100	315	2,75	10+5	355	3,45	12+2	400	4,60	12+9
2x125	400	4,47	12+2	450	5,20	12+9	500	7,10	12+9+9+2
2x150	450	5,34	12+9	500	6,25	12+11	560	8,60	12+12+2+2
2x200	560	8,03	12+12+2+2	630	10,2	12+12+9+2			

Quantities are based on:

- Free sleeve length 2x225 = 450 mm
- Dimensions of shrinkable casing
- Temperature +15°C – +40°C in sleeve and steel pipe.
- In the table above, a supplement (≈10%) is included for liquids that remain in the mixing vessel.

The foam liquids should have a temperature of approx. 20°C. If a welding sleeve is used, the quantity should be reduced by approx. 15% for double pipes and approx. 20% for single pipes due to the reduced sleeve diameter.

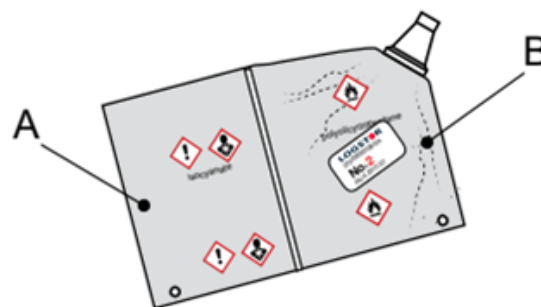
Table for foam pack

Quantities in all tables for foam pack are based on:

DN	Series 3			Series 4		
	PEHD Dy	PUR kg/sleeve	Foam pack no.	PEHD Dy	PUR kg/sleeve	Foam pack no.
20	125	0.57	1+1	140	0.71	6
25	125	0.56	1+1	140	0.70	6
32	140	0.73	5	160	0.89	7
40	140	0.70	5	160	0.92	7
50	160	0.88	7	180	1.12	4+4
65	180	1.04	4+4	200	1.35	5+5
80	200	1.25	5+5	225	1.65	6+6
100	250	1.88	10	280	2.50	10+5
125	280	2.24	10+2	315	3.0	9+9
150	315	2.69	10+5	355	3.65	12+2
200	400	3.93	12+2	450	5.70	12+9
250	500	6.05	12+11	560	8.10	12+12+2+2
300	560	7.26	12+11+7	630	10.0	12+12+9+2
350	630	9.34	12+11+10+5	710	12.2	12+12+11+11
400	710	11.65	12+12+11+9			
450	800	14	12+12+11+11			

Foam pack for tapping/connection, single pipe

The quantity of foam liquids required can be calculated using the tables below for guidance

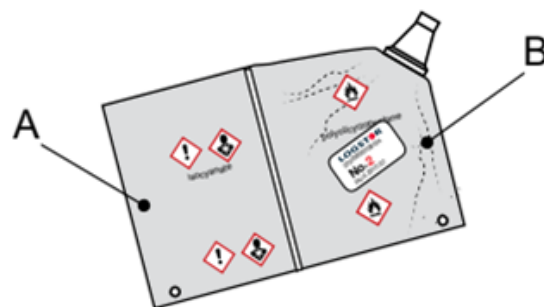


Foam pack for foaming

Requirements for branch:					Quantity kg	Foam pack no.
DN	Series 1 kg	Series 2 kg	Series 3 kg	Series 4 kg		
25	0.40	0.55	0.70	0.80	0.12	0
32	0.56	0.65	0.85	1.0	0.22	0.5
40	0.52	0.62	0.80	1.0	0.32	1
50	0.60	0.80	1.0	1.2	0.39	2
65	0.71	1.0	1.1	1.4	0.49	3
80	1.09	1.2	1.4	1.7	0.59	4
Requirements for main pipe:					0.73	5
DN	Series 1 kg	Series 2 kg	Series 3 kg	Series 4 kg	0.91	6
40	0.43	0.55	0.70	0.92	1.10	7
50	0.51	0.65	0.88	1.12	1.36	8
65	0.60	0.81	1.04	1.35	1.66	9
80	0.75	0.98	1.25	1.65	2.07	10
100	1.04	1.47	1.88	2.50	2.62	11
125	1.21	1.68	2.24	3.00	3.97	12
150	1.34	2.97	2.69	3.65	5.32	13
200	1.98	2.99	3.93	5.70		
250	3.21	4.84	6.05	8.10		
300	3.09	5.52	7.26	10.0		
350	4.63	7.08	9.34	12.2		
400	5.60	8.77	11.6	15.6		
450	7.42	9.70	14.4	18.2		
500	9.56	12.4	18.3	22.6		

Foam pack for tapping/connection, double pipe

The quantity of foam liquids required can be calculated using the tables below for guidance



Foam pack for foaming

Requirements for branch (double pipe):				Quantity kg	Foam pack no.
DN	STANDARD kg	DOUBLE+ kg	DOUBLE+ kg		
25	0.44	0.55	0.70	0.12	0
32	0.70	0.90	1.10	0.22	0.5
40	0.67	0.87	1.10	0.32	1
50	1.11	1.45	1.60	0.39	2
65	1.60	2.05	2.50	0.49	3
				0.59	4
				0.73	5
Requirements for main pipe (double pipe)				Quantity kg	Foam pack no.
DN	STANDARD kg	DOUBLE+ kg	DOUBLE+ kg		
32	0.89	1.14	1.36	0.91	6
40	0.84	1.09	1.32	1.10	7
50	1.27	1.68	1.90	1.36	8
65	1.52	1.94	2.40	1.66	9
80	1.80	2.37	2.90	2.07	10
100	2.75	3.45	4.60	2.62	11
125	4.47	5.20	7.10	3.97	12
150	5.34	6.55	8.60	5.32	13
200	8.03	10.2			

Replacement table for foam pack

Foam pack	Can be replaced with		
4	2x1		
5	1+2	2x2	
6	2+3	2x3	1+4
7	3+4	1+5	2+5
8	4+5	2+6	3+6
9	5+6	3+7	4+7
10	6+7	5+8	2+9
11	6+9	3+10	4+10
12	8+11		
13	2x11	8+12	

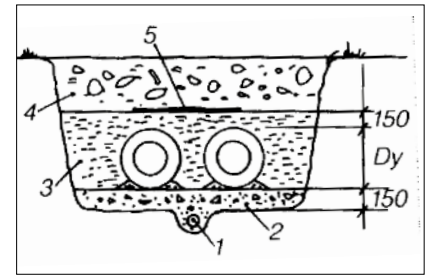
Backfilling

Backfilling should be carried out with 0-16 mm stone-free gravel material according to Construction AMA 2013 CEC. 3131. Backfilling should be packed according to Class 2, Table CE/4. See below.

Individual particles with a largest grain size of 50 mm may occur, but not adjacent to casing pipe joints without approval from Powerpipe.

Support filling should be carried out with the same material as for pipe trenches and packed evenly. Particular care should be taken when filling and packing beneath the pipes. At branches, backfilling must be done with care. Care should be taken when filling and packing material at deflection between 10°-30°.

If support pallets have been used, this must be removed before backfilling. Marking strip or net should be laid over the filling material.



1. Drainage pipe
2. Pipe trenches
3. Backfilling
4. Backfill soils
Excavation material
5. Marking strip/mesh

Backfilling with alternative material

See exhaustive information on page 10:402

Marking strip

The use of marking strip to facilitate location of pipes is recommended. Execution in accordance with Construction AMA 02013. Marking strip and mesh should be violet in colour. See Chapter 8.

Residual filling

Execution in accordance with Construction AMA 2013 CEC. 4131. Maximum stone size 100 mm may occur evenly distributed in the filling.

Terracing, pile-driving, ground reinforcement, soil layers etc.

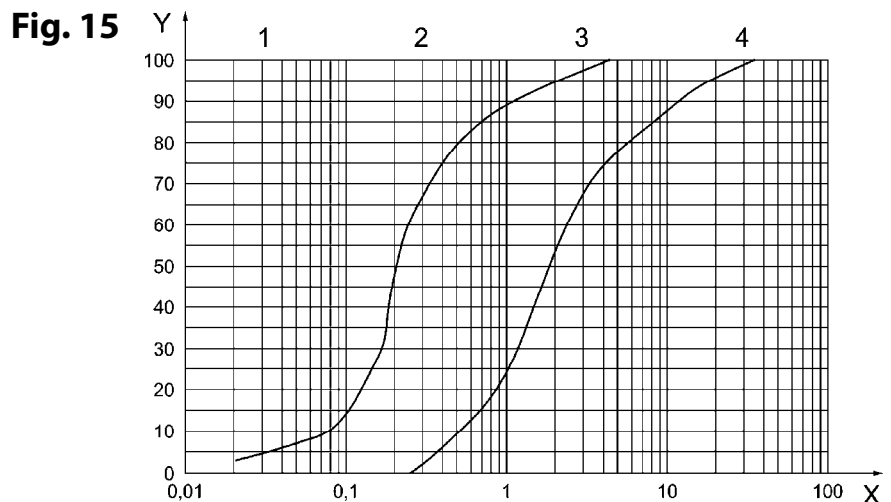
Table CE/4. Filling and packing around pipes. Largest layer thickness in metres after packing and minimum number of passes per layer during packing.

Backfill material should have a bearing capacity fulfilling the mechanical and hydraulic characteristics required for the construction.

The material shall have such properties that it can be compressed with a reasonable effort from the packing equipment.

Backfill material should lie within the limits shown in Figure 15.

Packing tool	Material type 2	Min. number of passes
Hand tamper, min. 15 kg.	0.15	4
Vibrator, min. 70 kg.	0.30	4
Vibrator plate		
min 50 kg.	0.10	6
min 100 kg.	0.15	6
min 200 kg.	0.20	6



Backfilling with alternative material

Limitations and guidelines for use of alternative backfill material are provided below.

If coarse material is to be used as material to fill around insulated district heating pipes, thorough inspection of the execution is required, together with great care when handling soils to avoid damaging pipes and joints.

Conditions	Non-trafficked surface	Trafficked paved surface	Trafficked unpaved surface
	No external load on pipe	The pipe is assumed to lie beneath the superstructure of the paved surface – i.e. in previously hard packed soil. The fill material distributes the traffic loads so that point loads do not occur on the pipe. It must be possible to pack fill material.	There is a risk of point loads on the pipe where there is insufficient fill material. It must be possible to pack fill material
Friction attached section	Existing natural and/or crushed aggregate with a largest grain size of 50 mm	Existing natural and/or crushed aggregate with a largest grain size of 50 mm	Existing non-sharp edged natural material with a largest grain size of 50 mm or crushed aggregate 4-32 mm
Expansion section (axial movement)	Existing non-sharp edged natural material with a largest grain size of 50 mm or crushed aggregate 4-32 mm. Double sealing shrinkable sleeve (with tightening tube) is surrounded by sand.	Existing non-sharp edged natural material with a largest grain size of 50 mm or crushed aggregate 4-32 mm Double sealing shrinkable sleeve (with tightening tube) is surrounded by sand.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm. Double sealing shrinkable sleeve (with tightening tube) is surrounded by sand.
Expansion device (radial movement). For limited movement in pre-heated systems.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm + foam cushions that absorb the expansion exceeding 20 mm.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm.
Expansion device (radial movement). For limited movement in cold laid systems.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm and foam pillows with a thickness at least equal to the calculated movement or natural and/or crushed aggregate with largest grain size 50 mm. Foam pillows with a thickness of approx. 1.6 times the calculated movement.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm and foam pillows with a thickness at least equal to the calculated movement or natural and/or crushed aggregate with largest grain size 50 mm. Foam pillows with a thickness of approx. 1.6 times the calculated movement.	Non-sharp edged trench gravel according to AMA table CEC/1 with largest stone size 32 mm and foam pillows with a thickness at least equal to the calculated movement or natural and/or crushed aggregate with largest grain size 50 mm. Foam pillows with a thickness of approx. 1.6 times the calculated movement.

Regarding backfilling material and packing, see Chapter 10.

Safety regulations and protective devices

Powerpipe pipes are insulated with a high quality rigid polyurethane cellular plastic. This is produced through a reaction and fermentation process following the combination of polyol and isocyanate.

Work environment risks

Three procedures can involve special risks during work with insulated district heating pipes if safety measures are not taken.

For:

- Welding/brazing of service pipes producing a high temperature (in excess of 150°C) in any part of the insulation, whereupon harmful gases may be produced.
- Mixing of the polyol and isocyanate components for supplementary insulation at joints.
- Carrying out jointing of the outer casing which produces a high temperature (in excess of 150°C) in any part of the insulation, whereupon harmful gases may be produced.

Instructions and protection

Working with polyurethane cellular plastic insulation entails risks for the affected personnel. These risks can be eliminated if the right methods and protective equipment are used.

In general, smoking is prohibited during work with polyurethane. Personnel working with polyurethane products must have specific training in aspects such as work protection, legislation and materials handling. The personnel should also have undergone a medical examination.

Work environment matters are regulated by the Swedish National Board of Occupational Safety and Health's statute AFS 2005:18, "Hard plastics".

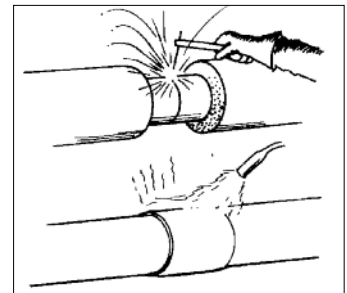
Welding

Welding/brazing of factory-manufactured pipes and pipe fittings

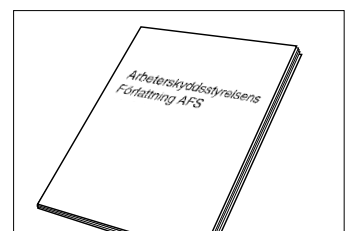
1. Check that the uninsulated service pipe (min. 150 mm) is entirely free of polyurethane residues.
2. When welding/brazing: do not aim the gas torch at the insulation. Do not heat the pipe more than necessary to achieve a good joint.

Welding/brazing of pipes and pipe fittings cut on the construction site

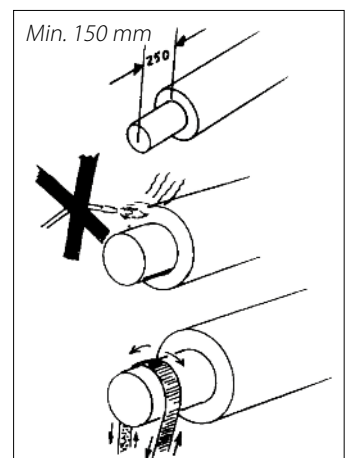
1. Cut and remove the outer casing and insulation so that the uninsulated pipe end is min. 150 mm. Breathing protection should be worn when using cutting wheels to remove insulation.
2. Service pipe (min. 150 mm) should be scraped/sanded with emery to remove all residues of insulation.
3. If smaller insulation residues remain, breathing protection of carbon filter type should be used when welding/brazing. In restricted spaces, a fresh air breathing mask is recommended. Alternatively, minor foam residues can be burned away – provided breathing protection/fresh air breathing mask is worn – before welding/brazing work.
4. When welding/brazing: do not aim the gas torch at the insulation. Do not heat the pipe more than necessary to achieve a good joint.



Use protective equipment: When welding/brazing service pipes, a high temperature (in excess of 150°C) is produced in part of the insulation, whereupon harmful gases may be produced.



Follow instructions in the Swedish National Board of Occupational Safety and Health's statute AFS 2005:18



Do not aim the gas torch at the insulation. Service pipe (min. 150 mm) should be sanded with emery to remove all residues of insulation.

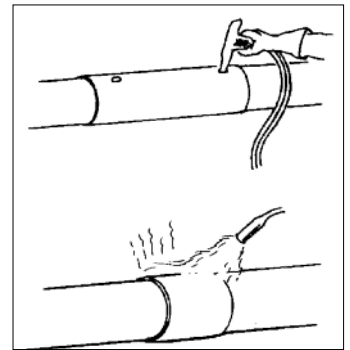
Joint insulation

Close handling of foaming liquids minimises the risk of leakage of harmful gases. However, a certain quantity leaks out from the sleeve during the foam fermentation process. Good ventilation is required. In narrow and poorly ventilated spaces, breathing protection with gas and dust filter Class II should be used against organic vapours.

Containers which have contained isocyanate must not be filled with water and later closed. Significant production of carbon dioxide can result.

Joining of outer casing

The outside and edges of PEHD pipes should be cleaned thoroughly so that any residues of insulation material are completely removed before joining the outer casing. The gas flame must not be aimed at free polyurethane cellular plastic.



A certain quantity of isocyanate vapour leaks out from the sleeve during the foam fermentation process. Good ventilation is required.

In case of accident

Isocyanate on the skin must be rinsed off immediately with clean water. Isocyanate in the eyes must be rinsed off immediately with plenty of clean water. Rinse the eyes until a doctor arrives.

If isocyanate has been swallowed, large quantities of lukewarm, clean water or milk should be drunk immediately. A doctor should then be consulted.

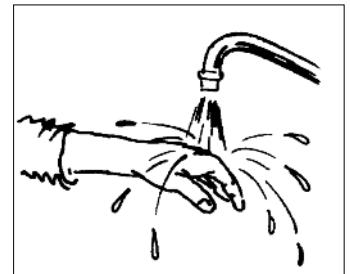
Polyurethane cellular plastic on bare skin can be scraped off and the area washed with soap and water.

Decontamination solution for isocyanate:

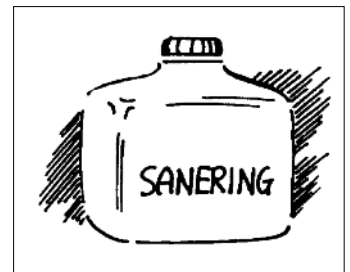
5% ammonia
50% methylated spirit
45% water

Decontamination powder for absorbing isocyanate:

25% sawdust	4% triethanolamine
37% kieselgur	4% ammonia
20% methylated spirit	10% water



Isocyanate on the skin must be rinsed off immediately with clean water.



Use protective equipment: When welding/brazing the service pipe, a high temperature is produced

Instructions for installation, operation and maintenance of ball valves

Installation

Check that the product with ball valve(s) is of the right dimensions and that there is no dirt or foreign particles in the valve/pipe. The valve is installed in a position that means it is not exposed to uncontrolled thermal forces or high bending stresses. The valve should be open when welded in place and may not be operated before the pipe fitting has cooled. Ensure that the network pressure/temperature does not exceed the valve performance.

NB

On valves with bypass pipes, one valve must always be open to permit expansion during heating or freezing.

Pressure testing.

When the valve is installed in the network, you can pressure test it with $1.1 \times P_N$ against the closed valve and $1.5 \times P_N$ against the open valve. After pressure testing, the valve can be seal tested.

Use

To avoid pressure shocks, close the valve slowly. For dimensions $\geq DN 200$ a gear is recommended.

If the valve is the final flow limiter in a pipeline, the pipe must end with a sealing flange or plug.

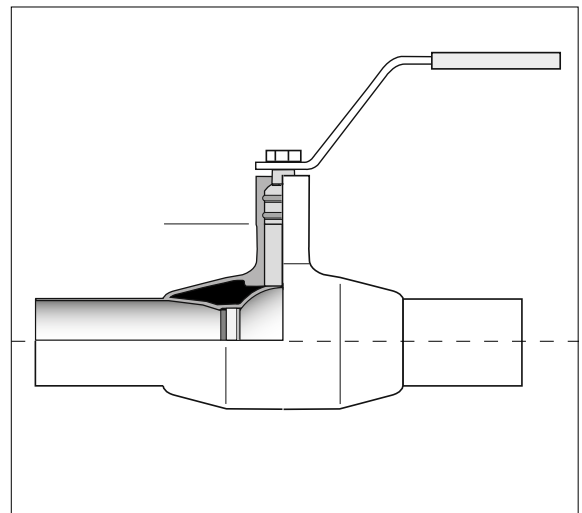
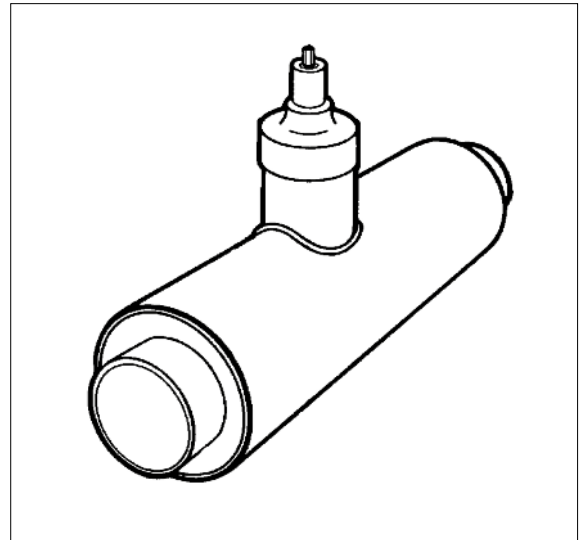
When such a flange or plug is installed, the valve should be left in the open position.

Maintenance

Valves should be exercised at least twice a year. At this time, check that the top of the stem is not soaked or contaminated with dirt.

Stem leakage

If necessary, the O-ring of the stem can be replaced according to specific instructions. During such an O-ring replacement, the valve must be de-pressurised and the enclosed position.



ORDER FORMS

RETUR 

Customer		Customer no.	Date			
Client (name)		Telephone				
Delivery address						
Post code	Town/city			Crane truck <input type="checkbox"/>		
Notification to		Telephone				
Marking		Desired delivery date				
Your order no.		Last delivery date				
PART NO.	NAME	DN	LÄNGD	ANTAL	PRIS	
1						
2						
3						
4						
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17						
18						
19						
20						
Miscellaneous						

ORDER FORMS UNIQUE PRODUCTS

Check list

1. Enter dimensions already known and specific requirements in the box below, such as any specific requirements for alarm wire position.

- Lengths/dimensions
- Stem heights
- Dimensions
- Alarm wire position
- Position in section
- Which type of valve. Full flow or choke
- Gear/actuator. Fixed, portable or model requirement

Sketches