



## RAUVITHERM

PRE-INSULATED DISTRICT HEATING PIPE

TECHNICAL AND INSTALLATION MANUAL 463600 EN

IT'S MADE  
IN THE U.K. 

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# 1 RAUVITHERM

## INTRODUCTION

In view of the increasing need to minimise CO<sub>2</sub> emissions as much as possible, local and district heating supply technology is becoming ever more important. With the number of new supply stations being set up, the requirements for a flexible and efficient local and district heating pipe system are also increasing. Pioneering technologies, combining optimum functionality with low energy losses, form the basis for the insulated pipe system RAUVITHERM from REHAU.

### 1.1 System Advantages

- Flexible pipe system ensures cost-effective heat distribution
- High operating safety because the RAUVITHERM pipes are made of corrosion-resistant material
- Full range of system components for all applications
- Longitudinal water tightness

### 1.2 Scope

This Technical Information applies to the planning/design, installation and use of the flexible RAUVITHERM pre-insulated heating pipe system, the REHAU compression sleeve joints and the REHAU insulating sleeve systems, T-couplings and jointing sleeves.

### 1.3 Applications

RAUVITHERM is a pre-insulated pipe system used predominantly for below ground.

- District Heating
- Swimming Pool Technology
- Cooling Technology
- Biogas and Biomass Applications
- Connection of External Surface Heating
- Heat Pump Applications
- Remote boiler/CHP units



*Biogas plant*



*Connection to wood chip burner*



*Biomass plant*



Pay attention when you see this symbol!  
Important information for the safe and correct handling of this product

Abbreviations used in this RAUVITHERM Technical Manual:

PE-Xa = high pressure cross linked polyethylene

PE-LD = Polyethylene - low density

PE-HD = Polyethylene - high density

EVOH = Ethylen-Vinyl-Alcohol-Copolymer

PU = Polyurethane

## 2 RAUVITHERM MAIN COMPONENTS



Fig. 1 RAUVITHERM pipe



Fig. 2 RAUVITHERM compression sleeve joint



Fig. 3 RAUVITHERM shroud system

### 2.1 RAUVITHERM Pipe (Fig. 1)

RAUVITHERM district heating pipes consist of carrier pipes (PE-Xa) with a primer and oxygen diffusion barrier (EVOH), insulation made from cross-linked, closed-cell PE foam sheet ( $\lambda = 0.043 \text{ W/mK}$ ) and a PE foamed corrugated outer jacket to increase the ring stiffness and flexibility. In the case of DUO pipes, the location of the two carrier pipes in relation to each other is determined by extruded foam made of PE.

#### Advantages

- High flexibility
- Quick installation
- Small bending radius
- Very good thermal insulation properties

### 2.2 REHAU Jointing Technique

#### 2.2.1 REHAU Compression Sleeve Joint (Fig. 2)

The jointing technique for a compression sleeve is a method developed and patented by REHAU for quick, safe and permanently leakproof connections between PE-Xa pipes. It comprises simply a fitting and the compression sleeve.

Additional sealing elements are not required, as the pipe itself acts as a seal. Four sealing ribs guarantee a completely secure connection, which also withstands the tough application conditions on construction sites. Specially designed ribs on the compression sleeves prevent the connection coming loose during operation.

#### Advantages

- Secure, permanently leakproof connection
- Practically no bore reduction, as carrier pipes are expanded to make the connection. The resulting pressure loss is negligible and there is no cavitation
- Quick installation
- Can be pressurised immediately
- Works under any weather conditions

#### 2.2.2 REHAU T- shrouds and I-shrouds, (Fig. 3)

Connecting points in the ground, for example sockets or T-couplings, are to be insulated and sealed to an insulation quality equivalent to that of RAUVITHERM pipes. The insulating sleeve system Generation I, which was specially developed for this application, comprises a plastic component with stepped ends for adjustment to the relevant outer jacket diameter. For sealing, two heat-shrink sleeves are used for the I-Shroud or three heat-shrink sleeves for the T-shroud. For insulation, high-quality dual-component PU foam (RAUVITHERM coupler foam) is supplied in bottles.

#### Advantages

- Quick and easy assembly
- Reliable sealing
- Extremely good thermal insulation properties
- Universal sleeve: only 4 products for branches and joints in all dimensions

# 3 RAUVITHERM PROPERTIES

## 3.1 RAUVITHERM Pipe

The RAUVITHERM pipes are made of the following main components

- carrier pipe (1)
- pipe insulation (2)
- pipe jacket (3)

These sub-areas are explained in detail below.

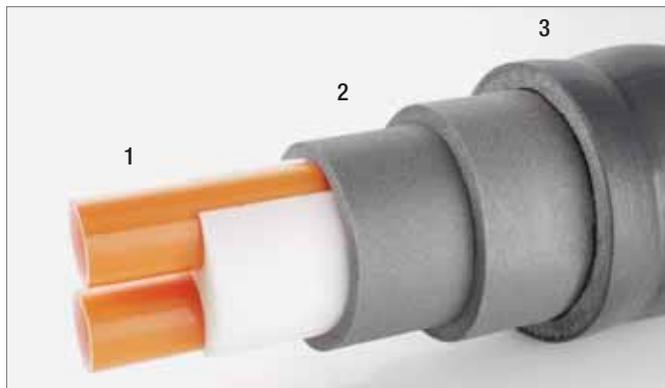


Fig. 4 RAUVITHERM pipe with main components

### 3.1.1 Carrier Pipes

The carrier pipe is made of high-pressure cross linked polyethylene PE-Xa (produced in accordance with DIN 16892 and DIN 16893). The carrier pipes are cross linked via the addition of peroxide under high pressure and at a high temperature. This process bonds the macromolecules so that they form a network.



Fig. 5 Carrier pipes SDR 11

### RAUVITHERM Carrier Pipes SDR 11

The RAUVITHERM SDR 11 pipes are predominantly used in heating and cooling circulation systems. For this reason, they have an additional oxygen diffusion barrier made of EVOH in accordance with DIN 4726. The colour of these pipes is orange.

### Advantages of PE-Xa Carrier Pipes

- Excellent chemical resistance
- Extremely low friction coefficient ( $e = 0.007 \text{ mm}$  at  $60 \text{ }^\circ\text{C}$ )
- No incrustation
- Permanently low pressure loss over entire service life
- SDR 11 pipes with special, orange-coloured EVOH oxygen diffusion barrier
- Corrosion-resistance
- Good aging behaviour

- Creep resistance
- Shape retention
- Temperature resistance
- Poor transmission of sound
- Pressure resistance
- Toxicologically and physiologically harmless
- Excellent notched impact strength

### Properties of PE-Xa Carrier Pipe

Density	0,94 g/cm <sup>3</sup>
Average thermal longitudinal expansion coefficient in temperature range of 0 °C to 70 °C	1,5 · 10 <sup>-4</sup> K <sup>-1</sup>
Thermal conductivity	0,38 W/mK
Modulus of elasticity	600 N/mm <sup>2</sup>
Surface resistance	10 <sup>12</sup> Ω
Construction material class (DIN 4102)	B2 (normal flammability)
Surface friction coefficient	0,007 mm

Table 1 Properties of PE-Xa carrier pipe

### Chemical Resistance

The RAUVITHERM PE-Xa carrier pipe demonstrates excellent resistance to chemicals. The safety factors and temperature resistances are dependent on the medium. The resistances mentioned in DIN 8075, Supplement 1, generally also apply to PE-Xa. Often, because of its cross linking, PE-Xa is more resistant than non-cross linked PE.

### Pressure and Temperature Limits

The following temperature and pressure limits apply in accordance with DIN 16892/93 at continuous operating temperatures for RAUVITHERM pipes. (Application: water; safety factor 1,25)

RAUVITHERM, SDR 11		
40 °C	11,9 bar	50 years
50 °C	10,6 bar	50 years
60 °C	9,5 bar	50 years
70 °C	8,5 bar	50 years
80 °C	7,6 bar	25 years
90 °C	6,9 bar	15 years
95 °C	6,6 bar	10 years

Table 2 Pressure and temperature limits SDR 11

For varying pressures and temperatures, the expected service life can be determined according to DIN 13760 "Miner's rule". The carrier pipes are designed for maximum operating temperatures of 95 °C, but can tolerate excess temperatures of up to 110 °C for short periods.

### Approvals for RAUVITHERM pipe

- WRAS Approved (up to 110mm UNO and DUO)



### 3.1.2 Pipe Insulation

The insulation of the RAUVITHERM pipe SDR 11 consists of crosslinked PE foam sheets and in the case of DUO pipes an additional foamed PE moulding ("bones").



Fig. 6 Exposed pipe layers

#### Advantages

- Very fine pores (closed cell up to 95 %)
- High water resistance, thereby no water infiltration during operation
- Low thermal conductivity

#### Properties of PU Pipe Insulation

Heat conductivity	≤ 0,043 W/mK
Density	≥ 30 kg/m <sup>3</sup> (Knochen bis 45 kg/m <sup>3</sup> )
Compression grade	0,073 N/mm <sup>2</sup>
Water absorption	< 1 % Vol (DIN 53428)
Long-term temperature resistance	+95 °C

Table 3 Properties of PU pipe insulation

### 3.1.3 RAUVITHERM Outer Pipe Jacket

RAUVITHERM pipes feature a corrugated outer pipe jacket. Primarily with the larger pipe jacket diameters > 200 mm the corrugation increases the static properties and the flexibility of the pipe. This makes the outer jacket highly robust thanks to its solid wall pipe design.



Fig. 7 Outer jacket

#### Advantages

- Seamless extruded around the PEX-foam
- Ideal for the connection between pipe (sleeve sealing technique)
- High robustness due to its construction

### 3.2 Jointing Technique

In the case of below ground pipe joints, the system operator must be able to rely on the jointing technique. Permanent watertightness of the pipe joints can only be ensured if the pipe joints are carried out using the REHAU compression sleeve jointing technique. Processing of the compression sleeve joint must be carried out using RAUTOOL tools.



Fig. 8 Compression sleeve joint

#### 3.2.1 Compression Sleeve

The compression sleeve fittings are made of dezincification-resistant special brass in accordance with DIN EN 1254/3 (E) Class A, gunmetal or ST 37.0. Compression sleeves are made of annealed standard brass CuZn39Pb3 / F43 in accordance with DIN 17671 or gunmetal.

#### RAUTOOL Tools

To process the REHAU compression sleeve, there are various manual, hydraulic and electro-hydraulic tools available:

##### RAUTOOL M1

Manual tool with double clamping jaw for 2 dimensions. Area of use is dimensions 16 mm – 40 mm. The M1 clamping jaws must only be used with the RAUTOOL M1. (Fig. 9)



Fig. 9 RAUTOOL M1

##### RAUTOOL A3

Electric hydraulic tool with battery operated and clamping jaws for 2 Dimensions. The operation is carried out through a battery operated hydraulic power unit which is found directly on the tool cylinder. For dimensions 16 – 40. (Fig. 10)



Fig. 10 RAUTOOL A3

## RAUTOOL G2

Tool for the dimensions 50mm – 110mm (optionally also available for dimension 40 mm). It is driven via a hydraulic foot pump or via an electrohydraulic unit. (Fig. 11)



Fig. 11 RAUTOOL G2

### 3.3 RAUVITHERM Insulating Sleeve System

The sleeve is made of extremely robust and impact-resistant PE-HD. In addition, for high-quality insulating sleeve production, there is also abrasive strip, temperature gauges and Forstner bits available to create the foam hole.



Fig. 12 Shroud system

The sleeve system Generation I is available in two different configurations as a T-coupling or as a jointing sleeve.

#### The T-Shroud set comprises of

- 1 T-shroud, large or small
- 3 heat-shrink sleeves
- 11 screws for T-shroud large
- 1 Vent plug
- Installation instructions



Fig. 13 RAUVITHERM T-Shroud

#### RAUVITHERM I-Shroud

The RAUVITHERM jointing sleeve is used to insulate couplings and end caps.

#### The I-shroud set contains:

- 1 jointing sleeve, large or small
- 2 heat-shrink sleeves
- 1 Vent plug

- Installation instructions



Fig. 14 RAUVITHERM I-shroud

#### Properties of Sleeve Set System

High-density polyethylene (PE-HD):

Thermal conductivity	0,43 W/mK
Crystallite melting range	105-110 °C
Density	0,93 N/mm <sup>2</sup>
Modulus of elasticity	600 N/mm <sup>2</sup>
Construction material class (DIN 4102)	B2 (normal flammability)

Table 4 Properties of sleeve system

#### Heat-shrink Sleeves for Shroud Set

The heat-shrink sleeving is coated inside with a hot melt adhesive to seal the sleeve to the RAUVITHERM pipe.

#### Material Properties of Heat-shrink Sleeve

Tensile strength	14 MPa
Max. expansion	300 %
Density	1,1 g/cm <sup>3</sup>
Water absorption	< 0,1 %
Adhesive softening temperature	80-90 °C
Construction material class (DIN 4102)	B2 (normal flammability)

Table 5 Material properties of heat-shrink sleeve

### 3.4 RAUVITHERM Foam

RAUVITHERM sleeve insulation is made of dual-component PU foam.

The foam is supplied with the set and comprises of:

- 2 bottles
- 1 filler attachment
- Installation instructions



Fig. 15 Foam set



Before using the foam products, the safety data sheets and the installation instructions supplied with the products must be read through carefully.

#### Technical Data Component A, Colour: brown

Flashpoint	> 200 °C
Vapour pressure (20 °C)	1 hPa
Density (20 °C)	1,23 g/cm <sup>3</sup>

Table 6 Technical data component A

#### Technical Data Component B, Colour: yellowish

Flashpoint	-5 °C
Vapour pressure (20 °C)	345 hPa
Density (20 °C)	1,06 g/cm <sup>3</sup>

Table 7 Technical data component B

#### Technical Data for Foam [measurement temperature 20 °C]

Mix ratio for weight (A:B)	146:100
Mix ratio for volume (A:B)	130:100
Start time	54 seconds
Thread time	335 seconds
Raw density (unrestricted foaming)	42 kg/m <sup>3</sup>
Raw density (core)	>60 kg/m <sup>3</sup>
Closed-cell factor	>88 %

Table 8 Foam technical data

#### Technical Data Component A, Colour: brown

Temperature	Mixing/shaking time	Processing time
25 °C	20 s	30 s
20 °C	25 s	40 s
15 °C	40 s	50 s

Table 9 Processing of foam components

### 3.5 RAUVITHERM Pipe Sizes

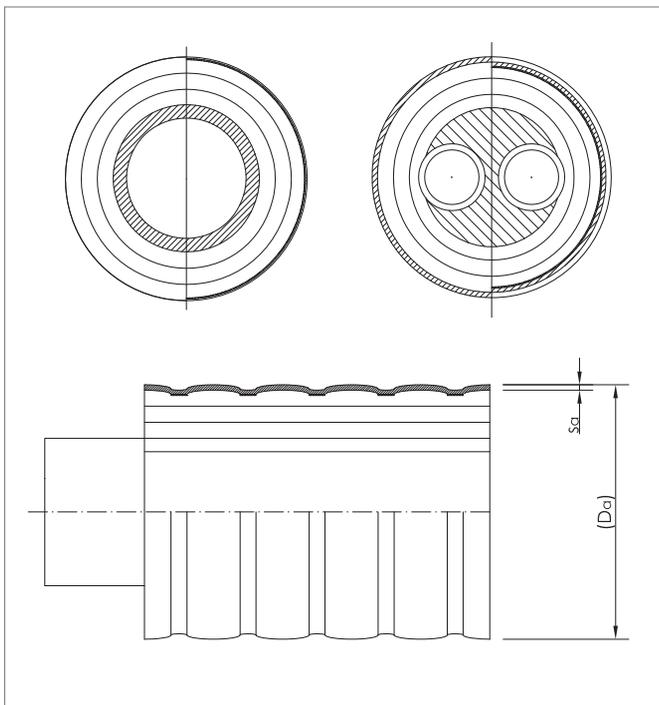


Fig. 16 RAUVITHERM outline diagram

#### RAUVITHERM Dimensions

Dimension	Volume (l/m)	Weight (kg/m)	Max. ring Coil Length (m)	
			2.8 x 0.8m	2.8 x 1.2m
<b>UNO</b>				
25	0.33	0.98	207	300
32	0.54	1.07	207	300
40	0.83	1.22	207	300
50	1.3	1.75	138	240
63	2.07	2.08	138	140
75	2.96	2.99	95	140
90	4.25	3.64	95	110
110	6.36	4.60	87	110
125	8.20	6.10	59	100
<b>DUO</b>				
25	2 x 0.33	1.66	138	240
32	2 x 0.54	1.87	138	240
40	2 x 0.83	2.24	138	240
50	2 x 1.31	3.31	84	140
63	2 x 2.07	4.77	59	100

Table 10 RAUVITHERM Dimensions

# 4 DESIGN

## 4.1 General Information

With the flexible RAUVITHERM pipes, both district heating networks and connecting lines between two buildings can be achieved cost effectively. There are three different laying alternatives. Combinations are possible.

### 4.1.2 Branch Layout

With this method, buildings are connected via branches from a main line.

#### Advantages

- Flexible in design
- Easy installation even before buildings are constructed
- Branches can be connected to the main line at a later stage

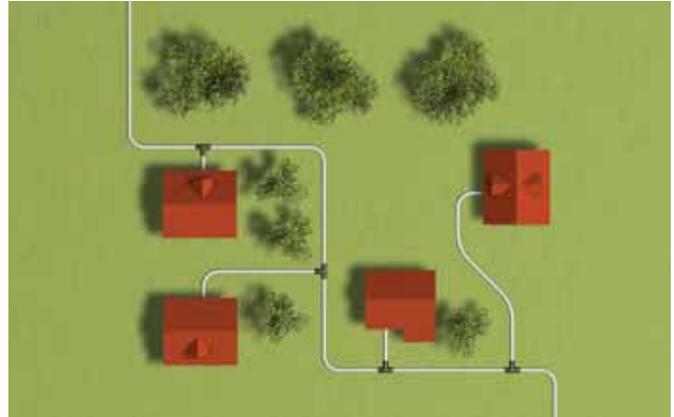


Fig. 17 Branch piping

### 4.1.3 Building-to-building ("Daisy Chain") layout

In many cases, the availability of long delivery lengths of RAUVITHERM pipes allows for the complete elimination of belowground connections or branches by laying the RAUVITHERM pipes from one building to the next and back.

#### Advantages

- No connections below ground

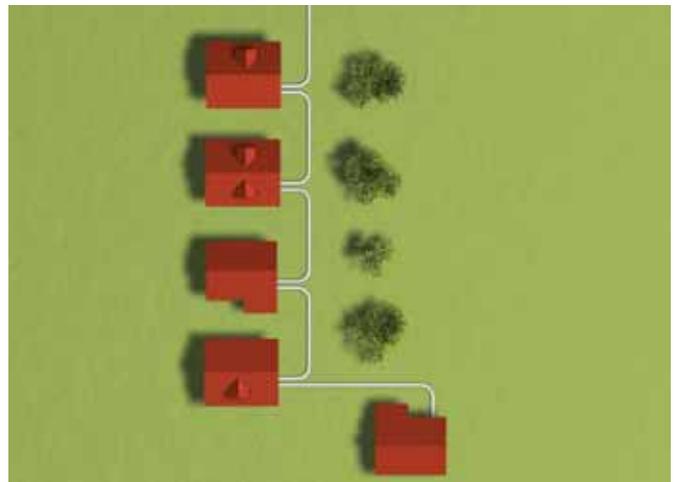


Fig. 18 Building-to-building ("Daisy Chain") piping

### 4.1.4 Branching off a plastic jacketed main line

Existing district heating networks can either be extended or tapped into for connections to future development of properties as long as the network can accommodate the increased load.

#### Advantages

- If the operating temperatures of the main line are too high, a secondary network with RAUVITHERM pipes can be created via a network decoupling

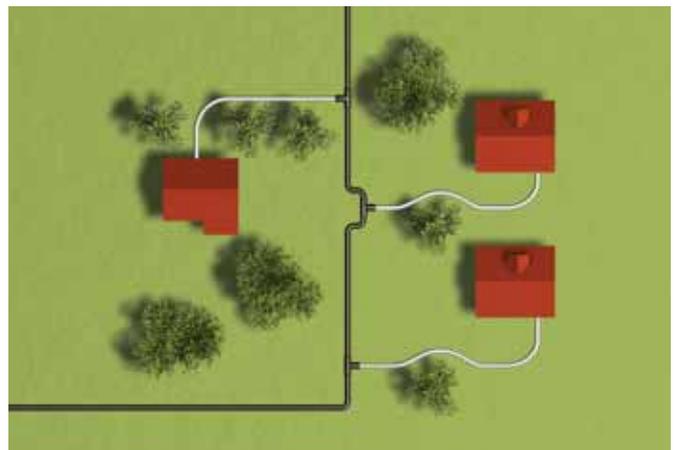


Fig. 19 Branching off a plastic jacketed main line

## 4.2 Design Tips

From the heat demands plotted over one year, it is clear that full heat carrying capacity is only required on a few days a year. Investment and running costs (due to higher energy losses) of district heating networks rise proportionally with the nominal pipe diameter. Therefore, the smallest possible pipe diameters should be designed for the pipe network. The low additional costs required to compensate for the increased pressure loss at full capacity are more than outweighed by the savings mentioned above. It may also be practical to use a second pump, which starts automatically when the primary pump is at full capacity and which otherwise serves as a back-up.

In connecting lines in particular, it may be a good idea to split the lines into three (two flow pipes and one return pipe) or into four pipes (two flow pipes and two return pipes). If the second lines are only switched on when the capacity of the first is exceeded, the network can indeed be operated with minimal energy losses for most of the year.

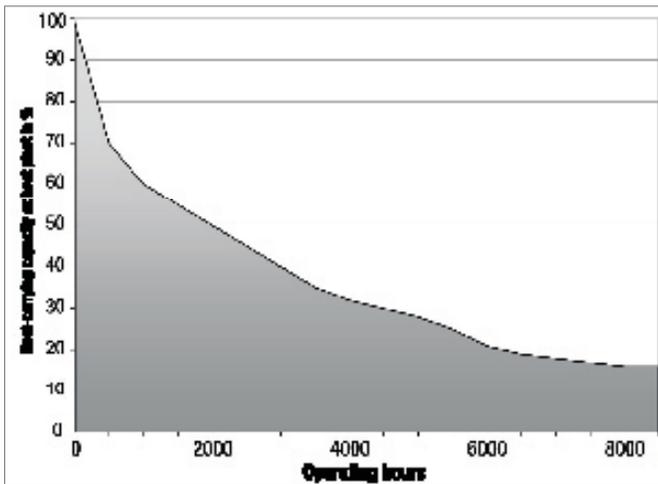


Fig. 20 Annual time curve

## 4.3 Pipe Sizing

The hydraulic performance of RAUVITHERM pipes is considerably greater than that of steel pipes due to the lower pipe friction coefficient with the same inner diameter. For this reason, pressure loss tables for steel pipes cannot be used for the pressure-loss calculation of RAUVITHERM pipes. When sizing RAUVITHERM pipes, we recommend comparing the energy losses and pump capacities.

Since full pump capacity is usually only required on a few days of the year, reducing the pipe dimensions can lead to considerable savings in terms of energy loss and material used.

For sizing, the maximum carrying capacities must be calculated for the heating supply network. The charts on the following pages can be used for estimating pressure loss. Tables, diagrams (Fig. 21) and example calculations (pg 13) are available for the pressure loss calculation.

## 4.4 Pressure Loss

### 4.4.1 Pressure Loss Calculation for SDR 11 Pipes

To estimate pressure loss in a pipe section, the pipe routing must be known in order to determine the necessary section and therefore pipe length. The flow rate [l/s] or the heat-carrying capacity [kW] together with the design temperature drop [K] can be used for system design.

**Calculation method using flow rate [l/s]: taking SDR 11 pipes as an example:**

**Flow Rate:** 0,65 l/s  
**Section Length:** 100 m  
**= Total Pipe Length:** 200 m

#### Selecting a Pipe Size

First, start at 0.65 l/s and draw a straight line vertically upwards (red line). Where the straight line crosses the lines for each pipe size (circles), draw another horizontal straight line to the left axis Pressure loss drop (green line). This shows the relevant pressure loss drop [Pa/m] for the corresponding pipe size.

#### Selecting the Flow Speed

From the intersections (circles), draw a line diagonally upwards and left (blue line) to find the flow speed in the pipe.

#### Calculation using Heat-carrying Capacity [kW]

If the values for design temperature drop in K and heat-carrying capacity in kW are available, the capacity on the axis with the relevant temperature drop is used as a starting point.

#### Example:

**Temperature drop:** 30 K  
**Heat-carrying capacity:** 80 kW  
**Length:** 100 m

#### Selection

Starting at the 80 kW mark on the bottom axis (temperature drop 30 K), draw a line upwards (yellow line). All subsequent steps follow the same sequence as the previous process using the flow rate.

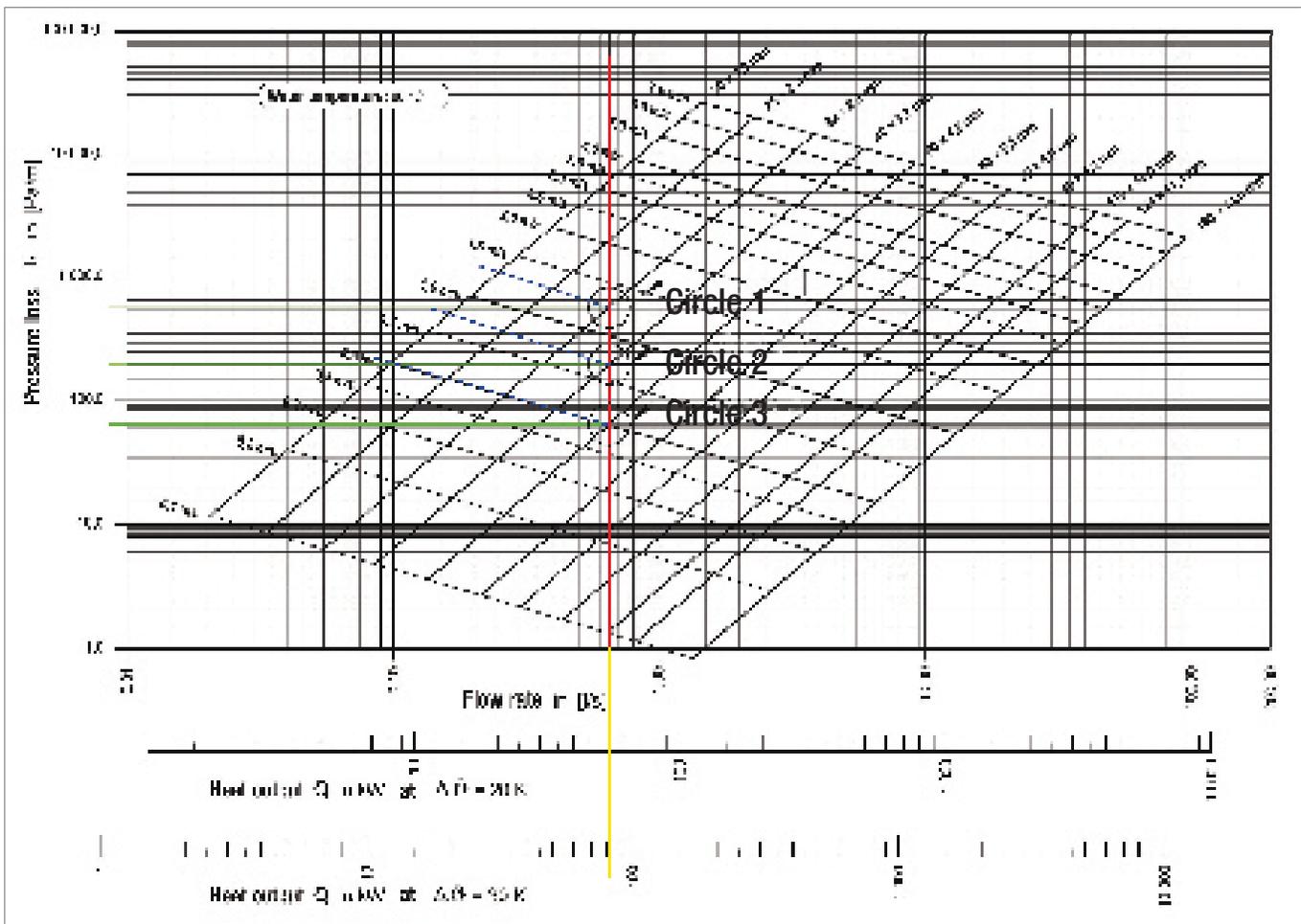


Fig. 21 Pressure loss diagram SDR 11

### Alternatives

<b>Circle 1 pipe size:</b>	32 x 2,9
Green Line	
<b>Pressure loss:</b>	550 Pa/m
<b>Total pressure loss:</b>	550 Pa/m x 200 m
-----	
	= 110.000 Pa
	= 1,1 bar
Blue Line	
<b>Flow speed:</b>	1,3 m/s

<b>Circle 3 pipe size:</b>	50 x 5,7
Green Line	
<b>Pressure loss:</b>	65 Pa/m
<b>Total pressure loss:</b>	65 Pa/m x 200 m
-----	
	= 13.000 Pa
	= 0,13 bar
Blue Line	
<b>Flow speed:</b>	0,5 m/s

<b>Circle 2 pipe size:</b>	40 x 3,7
Green Line	
<b>Pressure loss:</b>	200 Pa/m
<b>Total pressure loss:</b>	200 Pa/m x 200 m
-----	
	= 40.000 Pa
	= 0,4 bar
Blue Line	
<b>Flow speed:</b>	0,8 m/s

Detailed pressure loss table available on request.

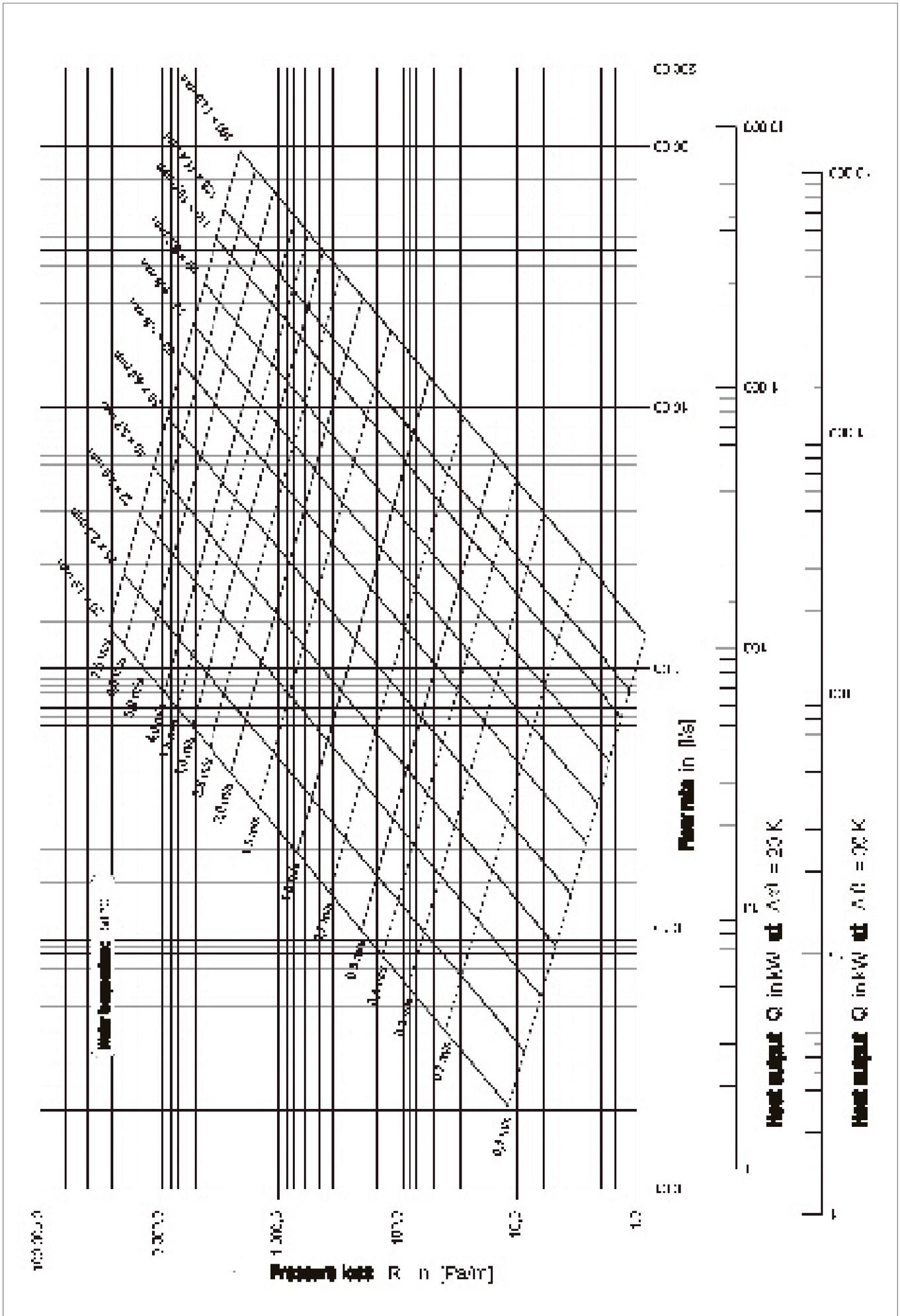


Fig. 22 Pressure loss diagram for SDR 11

## 4.5 Heat Losses

### 4.5.1 Heat Losses in RAUVITHERM Pipes

With a soil temperature of 10 °C, soil conductivity of 1.2 W/mK, depth of 0.6 m from the surface and (when using two UNO pipes) pipe spacing of 0.1 m, the following heat losses per metre of pipe can be expected at the average water supply temperature. The indicated heat losses apply to 1 m of trench considering flow and return pipe (2 Uno or 1 Duo).

#### Assumptions

UNO pipe: 2 pipes in trench below ground

DUO pipe: 1 pipe in trench below ground

For UNO pipes:

$$a = 0,1 \text{ m}$$

Depth from surface:

$$h = 0,6 \text{ m}$$

Ambient soil temperature:

$$\delta_E = 10 \text{ °C}$$

Soil conductivity:

$$\lambda_E = 1,2 \text{ W/mK}$$

Cond. of PE-Xa-foams:

$$\lambda_{PU} = 0,043 \text{ W/mK}$$

Cond. of PE-Xa-pipes:

$$\lambda_{PE-Xa} = 0,38 \text{ W/mK}$$

Cond. of PE-pipe jacket:

$$\lambda_{PE} = 0,09 \text{ W/mK}$$

#### Heat Losses During Operation

$$Q = U (\delta_B - \delta_E) \text{ [W/m]}$$

U = thermal heat transfer coefficient [W/mK]

$\delta_B$  = average water supply temperature [°C]

$\delta_E$  = ambient soil temperature [°C]

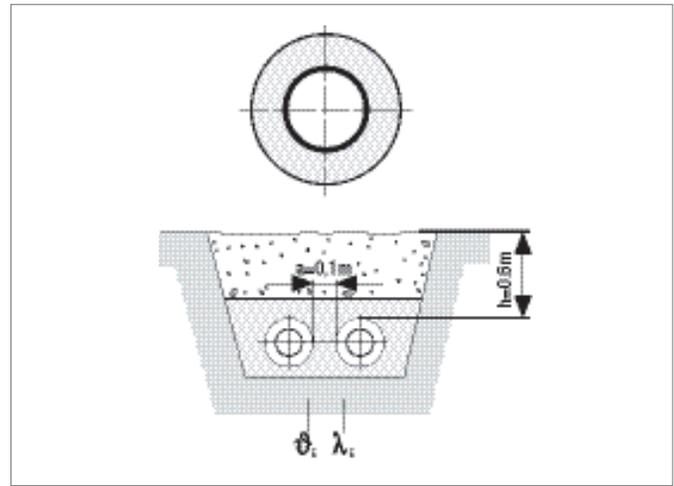


Fig. 23 RAUVITHERM UNO SDR 11

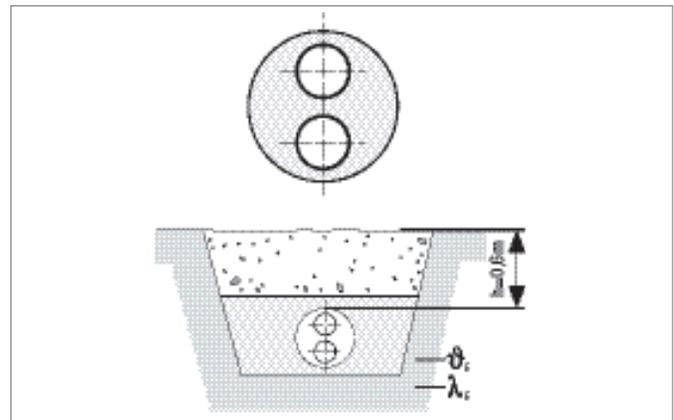


Fig. 24 RAUVITHERM DUO SDR 11

#### Heat losses UNO pipe SDR 11 (Flow and Return)

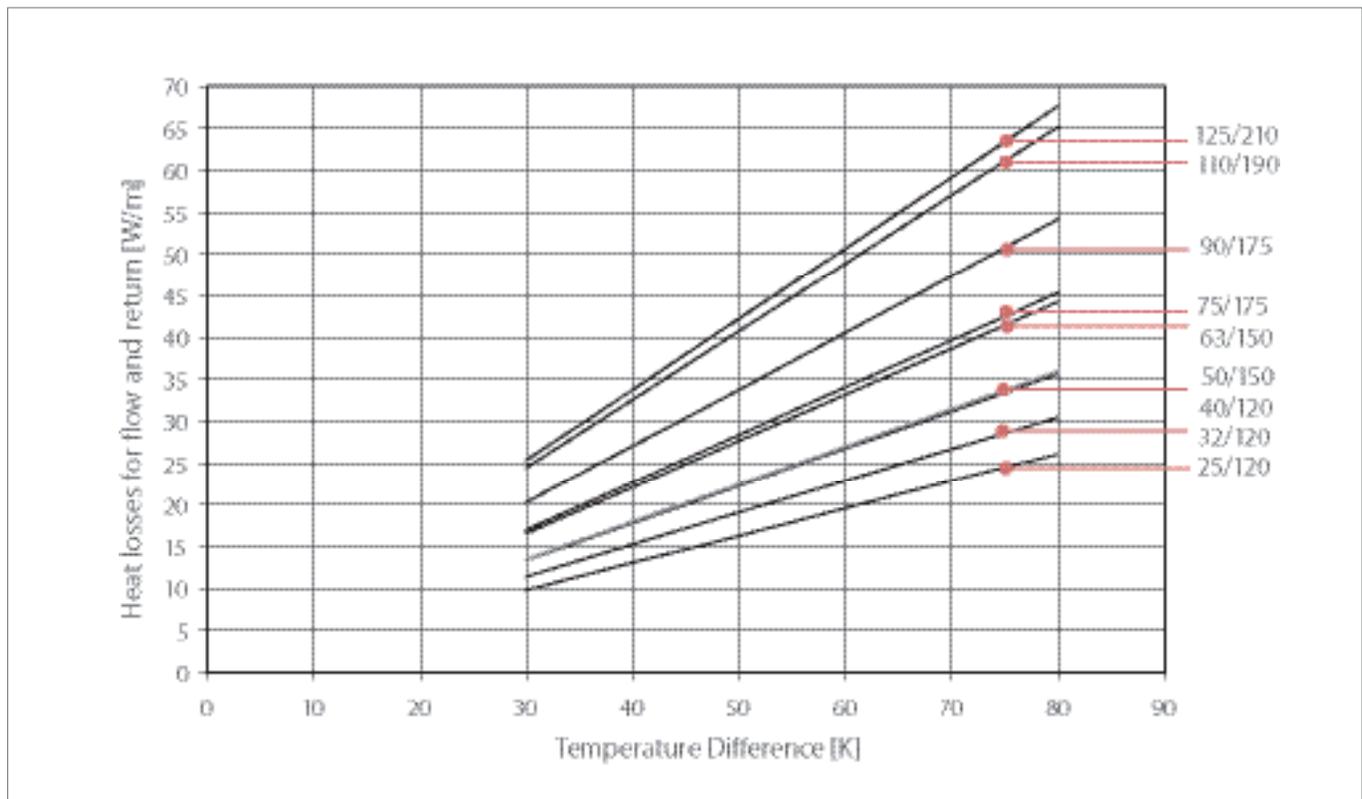


Fig. 25 Heat losses UNO pipe

Heat losses DUO pipe SDR 11 (Flow and Return)

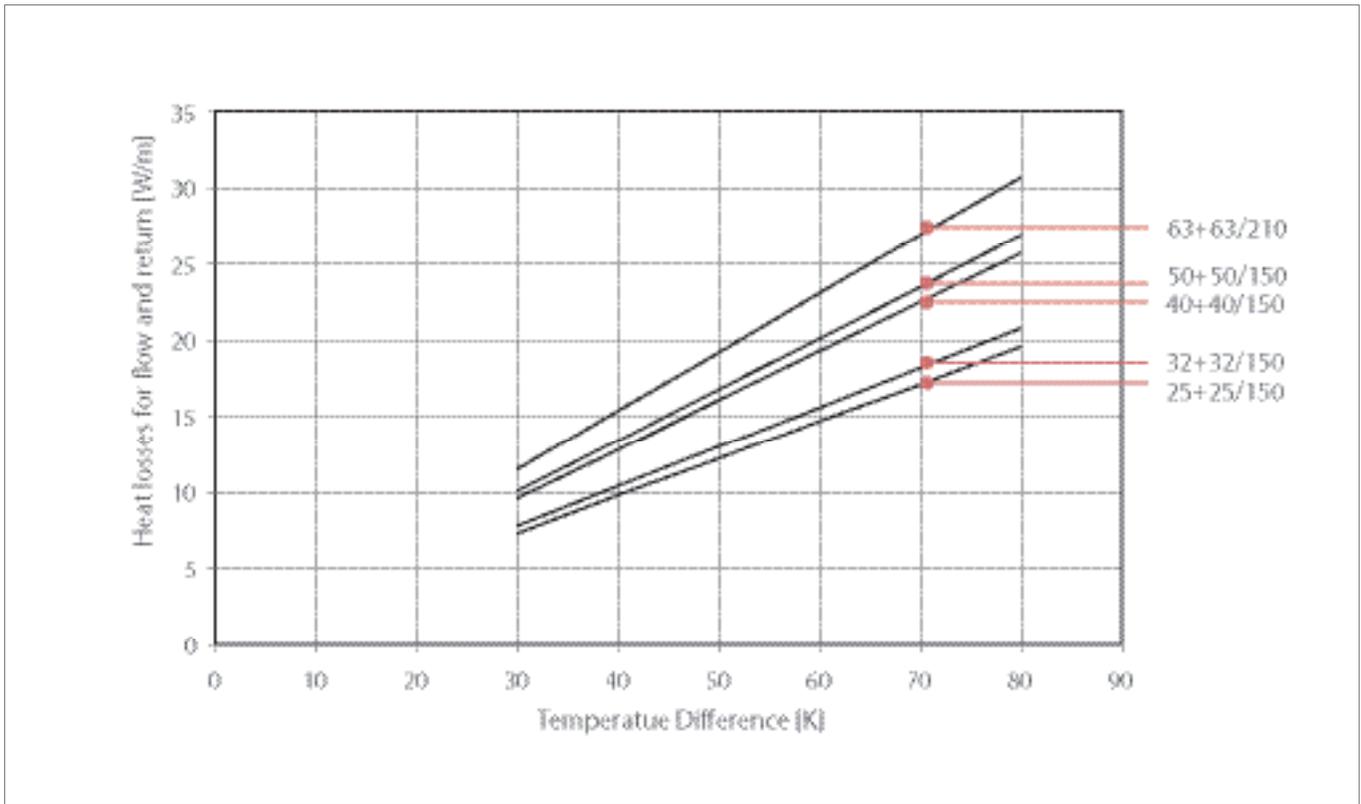


Fig. 26 Heat losses DUO pipe

Heat Load kW	Temperature Drop ( $\Delta T$ )				
	5K	10K	15K	25K	30K
10	0.48	0.24	0.16	0.10	0.08
20	0.96	0.48	0.32	0.19	0.16
30	1.44	0.72	0.48	0.29	0.24
40	1.91	0.96	0.64	0.38	0.32
50	2.39	1.20	0.80	0.48	0.40
60	2.87	1.44	0.96	0.57	0.48
70	3.35	1.67	1.12	0.67	0.56
80	3.83	1.91	1.28	0.77	0.64
90	4.31	2.15	1.44	0.86	0.72
100	4.78	2.39	1.59	0.96	0.80
200	9.57	4.78	3.19	1.91	1.59
300	14.35	7.18	4.78	2.87	2.39
400	19.14	9.57	6.38	3.83	3.19
500	23.92	11.96	7.97	4.78	3.99
600	28.71	14.35	9.57	5.74	4.78
700		16.75	11.16	6.70	5.58
800		19.14	12.76	7.66	6.38
900		21.53	14.35	8.61	7.18
1000		23.92	15.95	9.57	7.97
1100		26.32	17.54	10.53	8.77
1200		28.71	19.14	11.48	9.57
1300			20.73	12.44	10.37
1400			22.33	13.40	11.16
1500			23.92	14.35	11.96

Table 11 Flow rates for various heat loads and varying temperature drop ( $\Delta T$ ), Flow rate in l/sec

## Instructions for Using Pipe Sizing and Energy Loss Tables

### a) Pipe Sizing

- Using the heat load (kW) and temperature drop ( $\Delta T$ ) obtain flow in l/sec from table 10
- Use the flow rate in Table 11 to select a suitable pipe size

### b) Energy Loss and Temperature Drop

- Using the selected pipe size and the mean water temperature, obtain the energy loss and temperature drop over 100m pipe lengths using Table 13 & 14

Pressure losses are based on a mean temperature of 70°C

Flow rate (L/sec)	25 x 2.3		32 x 2.9		40 x 2.9		50 x 2.9		63 x 2.9	
	Pa/m	m/sec								
0.1	64	0.31								
0.2	218	0.61	65	0.37						
0.3			135	0.56						
0.4			227	0.74	79	0.48				
0.5					118	0.60				
0.6					164	0.72				
0.7					216	0.84	73	0.5		
0.8					276	0.96	93	0.6		
0.9							115	0.7		
1.0							139	0.8		
1.5							291	1.1	95	0.72
2.5									241	1.20

Flow rate (L/sec)	75 x 6.8		90 x 8.2		110 x 10		125 x 11.4		160 x 14.6	
	Pa/m	m/sec	Pa/m	m/sec	Pa/m	m/sec	Pa/m	m/sec	Pa/m	m/sec
3	141	1.0								
3.5	187	1.2								
4	240	1.4								
4.5	298	1.5	123	1.06						
5			149	1.18						
5.5			178	1.29						
6			209	1.41						
6.5			242	1.53						
7			277	1.65	104	1.10				
7.5					118	1.18				
8					133	1.26				
8.5					148	1.34				
9					165	1.41				
9.5					182	1.49	98	1.16		
10					200	1.57	107	1.22		
15							228	1.83		
20									116	1.49
25									175	1.86
30									247	2.23

Table 12 Pipe sizing and pressure loss table

Pipe Size (mm)	Mean Water Temperature (°C) and Temperature Drop ( $\Delta T$ )											
	40°C	$\Delta T$	50°C	$\Delta T$	60°C	$\Delta T$	70°C	$\Delta T$	80°C	$\Delta T$	90°C	$\Delta T$
25 x 2.3	0.49 kW	0.6 °C	0.66 kW	0.8 °C	0.82 kW	1.0 °C	0.98 kW	1.2 °C	1.15 kW	1.4 °C	1.31 kW	1.6 °C
32 x 2.9	0.57 kW	0.4 °C	0.77 kW	0.5 °C	0.96 kW	0.6 °C	1.15 kW	0.7 °C	1.34 kW	0.8 °C	1.53 kW	0.9 °C
40 x 3.7	0.67 kW	0.2 °C	0.89 kW	0.3 °C	1.12 kW	0.4 °C	1.34 kW	0.5 °C	1.56 kW	0.5 °C	1.79 kW	0.6 °C
50 x 4.6	0.68 kW	0.1 °C	0.90 kW	0.2 °C	1.13 kW	0.2 °C	1.35 kW	0.2 °C	1.58 kW	0.3 °C	1.80 kW	0.3 °C
63 x 5.8	0.83 kW	0.1 °C	1.11 kW	0.1 °C	1.39 kW	0.1 °C	1.66 kW	0.2 °C	1.94 kW	0.2 °C	2.22 kW	0.2 °C
75 x 6.8	0.85 kW	0.1 °C	1.14 kW	0.1 °C	1.42 kW	0.1 °C	1.71 kW	0.1 °C	1.99 kW	0.1 °C	2.27 kW	0.2 °C
90 x 8.2	1.02 kW	0.0 °C	1.36 kW	0.1 °C	1.69 kW	0.1 °C	2.03 kW	0.1 °C	2.37 kW	0.1 °C	2.71 kW	0.1 °C
110 x 10	1.23 kW	0.0 °C	1.63 kW	0.0 °C	2.04 kW	0.1 °C	2.45 kW	0.1 °C	2.86 kW	0.1 °C	3.26 kW	0.1 °C
125 x 11.4	1.27kW	0.0 °C	1.69kW	0.0 °C	2.12kW	0.0 °C	2.54kW	0.0 °C	2.96kW	0.1 °C	3.39kW	0.1 °C

Table 13 RAUVITHERM UNO Energy Loss and Temperature Drop for 100m pipe length

Pipe Size (mm)	Mean Water Temperature (°C) and Temperature Drop ( $\Delta T$ )											
	40°C	$\Delta T$	50°C	$\Delta T$	60°C	$\Delta T$	70°C	$\Delta T$	80°C	$\Delta T$	90°C	$\Delta T$
25 x 2.3	0.73 kW	0.9 °C	0.98 kW	1.2 °C	1.22 kW	1.5 °C	1.47 kW	1.8 °C	1.71 kW	2.0 °C	1.96 kW	2.3 °C
32 x 2.9	0.78 kW	0.5 °C	1.04 kW	0.6 °C	1.30 kW	0.8 °C	1.56 kW	1.0 °C	1.82 kW	1.1 °C	2.08 kW	1.3 °C
40 x 3.7	0.96 kW	0.3 °C	1.28 kW	0.4 °C	1.61 kW	0.6 °C	1.93 kW	0.7 °C	2.25 kW	0.8 °C	2.57 kW	0.9 °C
50 x 4.6	1.01 kW	0.2 °C	1.34 kW	0.2 °C	1.68 kW	0.3 °C	2.01 kW	0.4 °C	2.35 kW	0.4 °C	2.69 kW	0.5 °C
63 x 5.8	1.15 kW	0.1 °C	1.54 kW	0.2 °C	1.92 kW	0.2 °C	2.31 kW	0.2 °C	2.69 kW	0.3 °C	3.07 kW	0.3 °C

Table 14 RAUVITHERM DUO Energy Loss and Temperature Drop for 100m pipe length

#### 4.6 Pipe Laying Techniques

Thanks to the flexibility of RAUVITHERM pipes, various pipe laying techniques can be used. The pipe laying technique must be adapted to suit the local conditions.

##### 4.6.1 Open-cut Technique

This is the most common laying method.

RAUVITHERM pipe trenches can be very narrow. Sufficient working space only has to be available at joints.

##### Advantages

- Flexible laying without special tools
- Simple and cost-effective
- Additional connections can be made at any time



Fig. 27 Open-cut technique

##### 4.6.2 Pull-through Technique

With the pull-through method, RAUVITHERM pipes can be installed in disused channels, already laid pipes or in plastic pipe jackets requiring renovation.

##### Advantages

- Defective pipelines can be renovated easily
- Cost-effective laying through empty pipes that already exist or have been installed using horizontal directional drilling.



Fig. 28 Pull-through technique

##### 4.6.3 Ploughing-in Technique

In the ploughing-in technique, the pipes are laid quickly and without any great effort. The ploughing-in method can be used for soils that are free of stones or when the ploughing-in method can guarantee that the pipe will be laid in a bed of sand.

##### Advantages

- No need for pipe trenches
- High installation efficiency



Fig. 29 Ploughing-in technique



The REHAU technical department is to be contacted in the case of installing RAUVITHERM using the ploughing in technique and installations in groundwater.

#### 4.7 Pipe Trenches

The dimensions of the pipe trench influence the level and distribution of the soil and traffic loads and therefore the load-bearing capacity of the pipeline. The width at the bottom of the trench depends on the outer diameter of the pipe and also whether or not additional accessible working space is required to lay the pipes. Sections underneath roads must comply with loading classifications SWL 30 or SWL 60 in accordance with DIN 1072. For loads greater than SWL 30 (e.g. SWL 60), a load-distributing surface structure in accordance with RStO 75 is necessary.

For RAUVITHERM pipes, accessible working space is only required in jointing areas, as stipulated in DIN 4124. The minimum pipe cover for RAUVITHERM pipes is 60 cm. The maximum cover is 2.6 m. More or less cover must be confirmed by means of a static load calculation. The trench bottom is to be constructed in such a way that it fulfils the width and depth specifications and the pipeline is in contact with it over its entire length.



Fig. 30 Ground works

The trench bottom should not be aerated. Before the pipes are laid, any aerated, cohesive soil is to be removed down to where the aerated soil begins and this is to be replaced with non-cohesive soil or a special pipe support. Aerated, non-cohesive soil is to be packed again.



Fig. 31 Trench base

#### 4.7.1 Trench Widths

The diagrams below show the required trench widths. Only sand of grade 0/4 is to be used around the pipes and must be be compacted manually in layers.

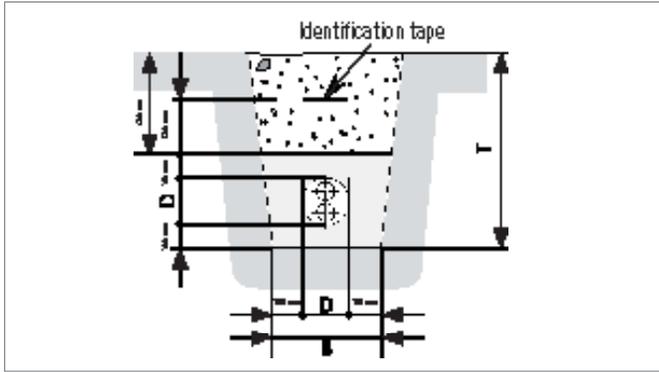


Fig. 32 DUO pipe trenches

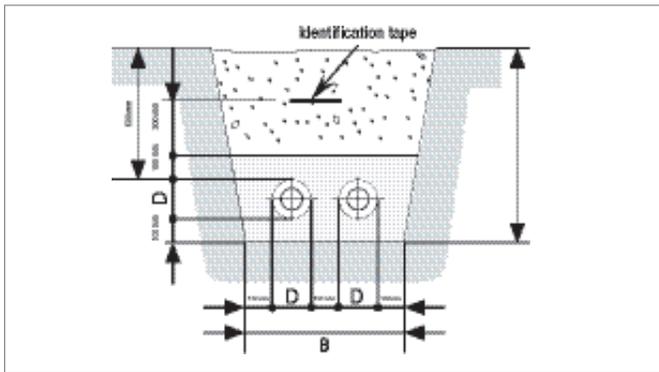


Fig. 33 Pipe system with UNO pipe

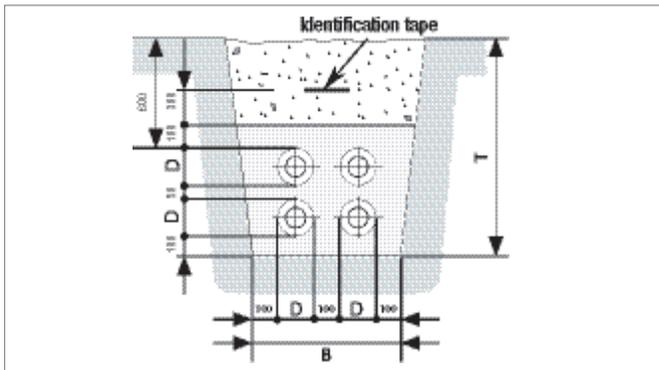


Fig. 34 Pipe system with UNO pipes laid above one another

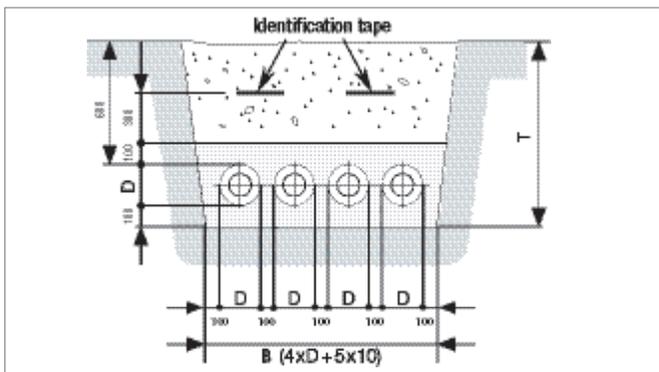


Fig. 35 Pipe system with UNO pipes laid next to one another

#### 4.7.2 Proximity to Other Services

Minimum distances from other services must be observed (see Table 14). Drinking-water services adjacent to district heating pipes are to be separated by the minimum distance to prevent them from warming up above the temperature specified by the applicable standards. If this cannot be guaranteed by the distance, the drinking-water lines are to be insulated.

Other service	Parallel line <5 m or crossover	Parallel line >5 m
1-kV-, signal/measuring cables	0,3 m	0,3 m
10-kV- or 30-kV-cable	0,6 m	0,7 m
more than 1 x 30-kV-cable or cable over 60 kV	1,0 m	1,5 m
Gas and water connections	0,2 m	0,4 m

Table 15 Distances from other services

#### 4.7.3 Protecting the Pipes in Special Installation Situations

##### Boggy Conditions and Marshland

If pipes are laid in boggy soil or marshland with a varying water table or underneath roads, solid obstructions that can affect the pipe support must be removed to a sufficient depth under the pipes. In cases where the bottom of the trench is unstable or the soil is highly saturated, or where there are different soil layers of varying levels of stability, the pipes have to be secured through adequate construction measures, e.g. using non-woven fabric.

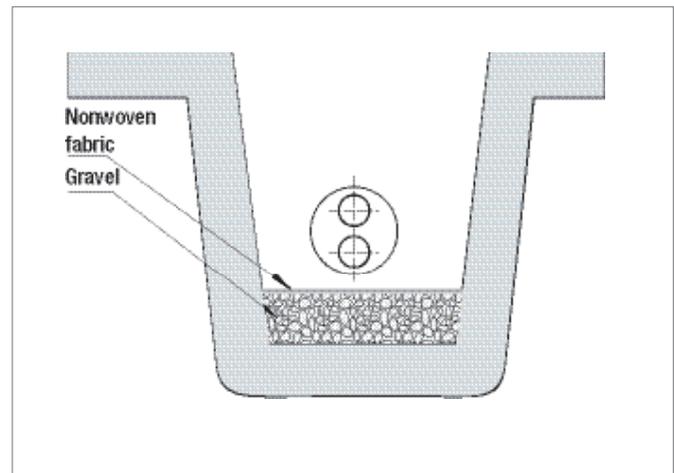


Fig.36 Earthworks

##### Sloped Trenches

On slopes, cross brackets are required to prevent the bedding from being washed away. In some cases, drainage may be needed.

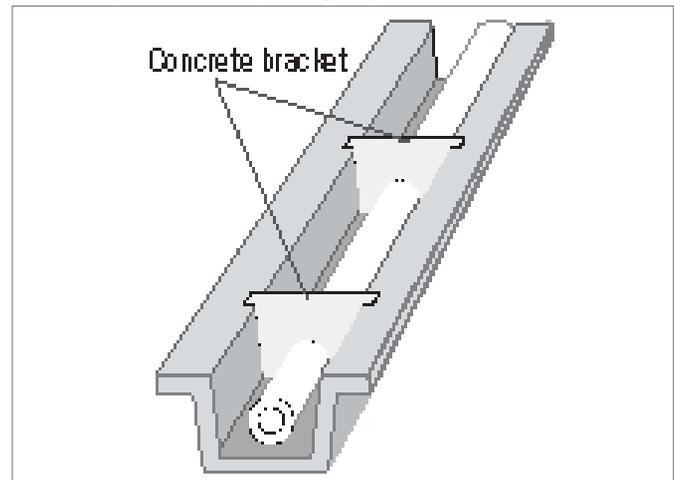


Fig. 37 Ground work

# 5 RAUVITHERM INSTALLATION INSTRUCTIONS



Fig. 38 RAUVITHERM pipe

## 5.1 Transport and Storage

Incorrect transportation or storage can result in damage to RAUVITHERM pipes, accessories and fittings, which could affect the operational safety, particularly the excellent thermal insulation properties. Pipes and pipework components should be checked for any transportation and/or storage damage before being placed in the trench. Damaged pipes and pipework components must not be installed.

### 5.1.1 Storage Time

To protect the pipes from dirt and the carrier pipe from UV radiation, the ends of the RAUVITHERM pipes must be kept clean. Contact with potentially damaging substances (see Supplement 1 to DIN 8075) should be avoided. RAUVITHERM pipes with a pipe jacket made of PE-HD can only be stored in direct sunlight for a limited time. Experience has shown that, in Central Europe, pipes can be stored outside for up to 2 years after manufacture without this affecting the strength of the pipes. For prolonged periods of external storage or in areas with intense solar radiation, e.g. sea, in southern countries, or at altitudes over 1500 m, the pipes must be protected from direct sunlight. When covering with tarps, the UV resistance of the pipes must be taken into account and good ventilation of the pipes must be ensured to prevent any build-up of heat. Unlimited storage is possible if the pipes are protected from any light.

### 5.1.2 Transport

Pipe coils are to be transported horizontally, lying completely flat on a load area, and must be secured to prevent shifting. The load area must be cleaned before loading up the pipe coils.



Fig. 39 Transportation

### 5.1.3 Lifting with a Digger

When lifting a pipe coil, ensure that the lower part of the coil, which is still touching the ground and carrying part of the total weight, is not dragged across the ground or load area. Take extra care when putting down the pipe coils: do not use ropes for lifting, only transport straps at least 50 mm wide.



Fig. 40 Lifting with a digger

### 5.1.4 Lifting with a Forklift

When using a forklift, ensure that the forks are covered with a soft material (cardboard or plastic pipes). Note: When using plastic pipes, make sure they are secured properly to prevent them from slipping off.



Fig. 41 Lifting with a forklift

### 5.1.5 Storage

We recommend storing pipe coils horizontally on wooden planks. This will largely avoid any pipe damage and allow easy lifting of the pipe coils when moved at a later stage. Under no circumstances are pipe coils to be stored on top of sharp-edged objects. Pipe coils should not be stored upright due to the risk of them falling.

#### Attention: Injury Risk!

The small contact area between the ground and the coil would also allow objects to easily penetrate the outer jacket.



Fig. 42 Storage

## 5.2 Laying Pipes

### Cutting the Straps

RAUVITHERM pipes are supplied in coils with an outer diameter of up to 210 mm. When undoing the coil bindings, it is important to note that pipe ends can spring out.



Fig. 43



Fig. 44 Cutting the coil straps



When opening the bundled coil bindings, pipe ends can spring out! Always open bindings layer by layer.

**Do not stand in the danger zone!**

### Unwind Coils Layer by Layer

Ensure that the uncoiled pipe section does not twist, as otherwise kinks may form. Another reason for cutting the straps layer by layer.

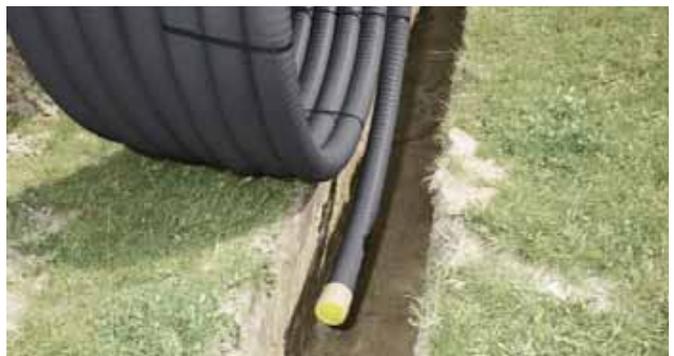


Fig. 45 Opening the coil layer by layer

## Uncoiling

For pipes with an outer diameter of up to 150 mm, the coils are usually uncoiled in an upright position. For larger pipe sizes, we recommend using a mechanical pipe unwinder. The coils can then, for example, be positioned horizontally on the pipe unwinder and uncoiled by hand or with a slow-moving vehicle.



In the case of Duo pipes, install the flow and return pipes on top of one another, so that branches can easily be added to the side connections.



Fig. 46 Uncoiling

## Bend Radius

The high flexibility of the RAUVITHERM pipes allows easy and quick laying. Obstacles can be bypassed and changes of direction in trenches are possible without the need for fittings. However, based on the pipe temperature, the minimum bending radius specified in the following table must be observed.



Fig. 47 Laying a bend area

## Bending Radil

If the bending radius has to be achieved at lower pipe jacket temperatures, the bend area should be pre-heated with a low burner flame. For installation in frost conditions, the bend area of the pipe must always be pre-heated!

RAUVITHERM outer diameter D	Minimum bending radius at 10 °C pipe jacket temperature
120 mm	0,9 m
150 mm	1,0 m
175 mm	1,1 m
190 mm	1,2 m
210 mm	1,4 m

Table 16 Minimum bending radius for RAUVITHERM

In view of the reduced pipe flexibility at low temperatures around freezing, the coil can be warmed up for a few hours in a heated building or a heated tent to facilitate installation.



Fig. 48 RAUVITHERM pipes

## Backfilling with Sand

Fill pipe trench up to 100 mm over the top of the pipes using sand of grade 0/4 and compact it by hand.



Fig. 49 Backfilling trenches with sand

## Identification Tape

For better identification during future excavation work, identification tape should be laid 40 cm above the pipes. The identification tape should be labelled "Caution – District Heating Pipeline". For easier location of the installed pipeline, identification tape with metallic strips can be used.

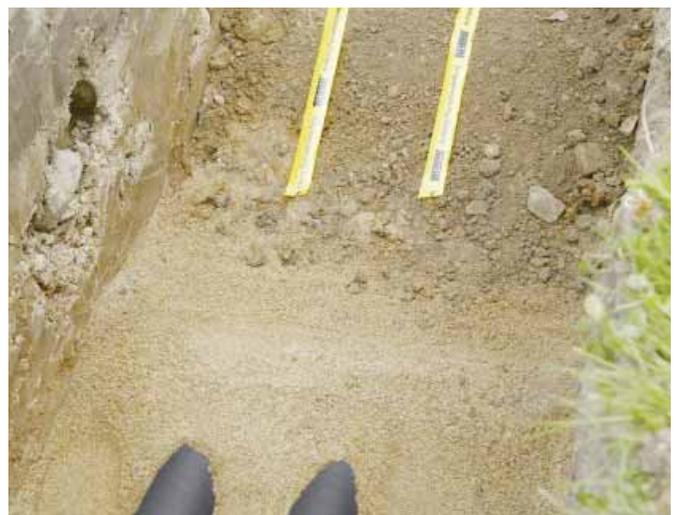


Fig. 50 Identification tape

### 5.3 Jointing Pipes with the Compression Sleeve Technique

**1** Cut pipe.



RAUVITHERM pipe could spring back!

**2** Expose lengths according to outer diameter of carrier pipe



If the end of the pipe is not square, an extra 2-4cm (approx.) should also be stripped so that the carrier pipe can be cut (see point 5).



Carrier Pipe Outer Diameter	Exposed Length L
20 - 40 mm	120 mm + 40
50	140 mm + 40
63 - 125 mm	160 mm + 40

Table 17 Exposing lengths

**3** Cut the pipe jacket all the way round with a saw or pipe cutter and peel it off.



Take care not to damage the carrier pipe!

**4** Remove the foam



Take care not to damage the oxygen diffusion barrier!



**5** Cut the carrier pipe square, if required (see point 2).



Please note: When installing a sleeve, slide a shrink hose over each end of the carrier pipe, before connecting the carrier pipe! (see 5.3.1).

**6** Slide compression sleeve on the pipe. Ensure that the outer milled ring faces towards the insulation of the pipe and the chamfered end faces towards the pipe end.

**7** Expand pipe twice, offset by approx. 30°.



Do not use expander in the area of the compression sleeve. Slide the compression sleeve right back to the insulation.



**8** Next, insert the fitting (REHAU T-piece for T-coupling or REHAU coupler for V-coupling). Position the clamping jaws over the tool and clamp on to the joint. Note: For diameters above 63 mm, use REHAU lubricant on the carrier pipe in the area of the compression sleeve.



Before using the tool, read the operating instructions supplied with the tool very carefully!!

If required for additional compression sleeve connection, cut out a recess to make room for the clamping tool. The insulation should then be removed as specified in the table. **Please ensure shrink sleeves are in position before making the joint!**



8a



8b

Carrier Pipe- Outer Diameter	I Tool A1 or M1	I Tool G1
20 - 40 mm	170 mm	-----
40 - 110 mm	-----	270 mm

Table 18 Cutting a recess for too;

**9** If required cut out recess for tool.

**10** Slide shrink hose over pipe ends.

**11** saw off shroud sides at the markings according to the OD of the outer pipe (see OD marking on shell).



10

**12** Slide the top of the T-Shroud over RAUVITHERM Pipe.

**13** Repeat the procedure with the other pipes according to steps 1-10.



12



13



**14** Slide the RAUVITHERM Shroud downward over the two other connection pipes.



**15** Align the shroud sides over each other.

Remove sealing tape cover on one side and position the tape between the two shroud sides.



Sealing tape needs to be positioned in such a manner that approx. 2mm of the tape overlap outside of the shell.



**16** Remove sealing tape cover completely and push both shroud sides together. Puncture sealing tape in preparation for the screw connection.



Ensure that the shroud sides are aligned.



**17** Seal the bottom of the shroud using the screws (part of the package). Use an electric drill.

Press overlapping sealing tape remains, tight against the shroud.

**18** Drill at the highest position at one of the three marked places a ventilation hole in the shroud. Use a centre bit (d=25mm)



**19** Clean the surface of the shell from dirt and grease

**20** Gently heat shrink the sleeves over the two lower ends of the T-Shroud (only one shrink sleeve for I-Shroud) with a soft flame.



Watch for the marking on the shell.

Start with shrinking the hose over the shell area. Let the area cool down and continue by shrinking the remaining hose over the pipe surface



**21** Seal the gap between the shroud and RAUVITHERM pipe at the higher side of the T-Shroud with a wider tape.



**22** Mix foam components.  
Attention: Observe safety instructions to the foam set. See page 26.

**23** Shake sealed bottle well (see instruction in the foam set)

**24** Fill content of foam bottle into the plug hole.



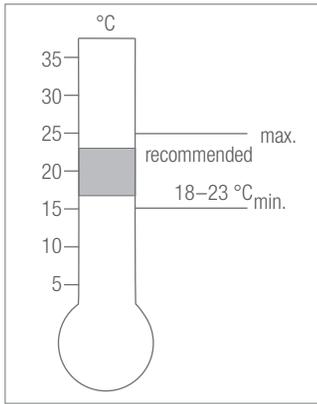
**25** Remove foam residuals. Push plug halfway in using a hammer.

**26** Shrink the remaining shrink hose over the upper end of T-shroud (see step 20)

**27** Installation finished.



Caution: The RAUVITHERM coupler foam is to be handled in accordance with the instructions for use.



Temperature	Shaking time	Processing time
25 °C	20 s	50 s
20 °C	25 s	40 s
15 °C	40 s	50 s

Table 19 Processing times for foam

## 5.4 Service Connection Pipes

### 5.4.1 Connecting through the basement

The RAUVITHERM pipes should be routed in straight lines. If the RAUVITHERM pipeline runs parallel to the building, the bend for entry into the building must have a bending radius of at least 2.5 x the value specified in Table 15. This protects the pipe from unnecessary stress where it penetrates the wall. If the spatial proportions are too small, prefabricated bends may also be used as a fall-back option.

In order to realise the connection inside the building, the pipes must project into the building by the amount specified in Table 20 (Page 29)

### 5.4.2 Prefabricated bends

The pre-fabricated RAUVITHERM bends are used where the possible bending radius for routing into the building is smaller than required under Table 15. This is usually the case when installing pipes going into a building without a basement.

#### Installation

- Install wall seal and position pre-fabricated bend in the foundations
- The vertical end must be secured before the ground plate/foundations are laid



Do not remove the protective end caps until the final connections have been made. If there is a danger of the unprotected carrier pipe ends becoming dirty or damaged by UV radiation, they must be protected with UV-resistant plastic film/tape.



Fig. 51 Prefabricated bends for UNO and DUO pipes

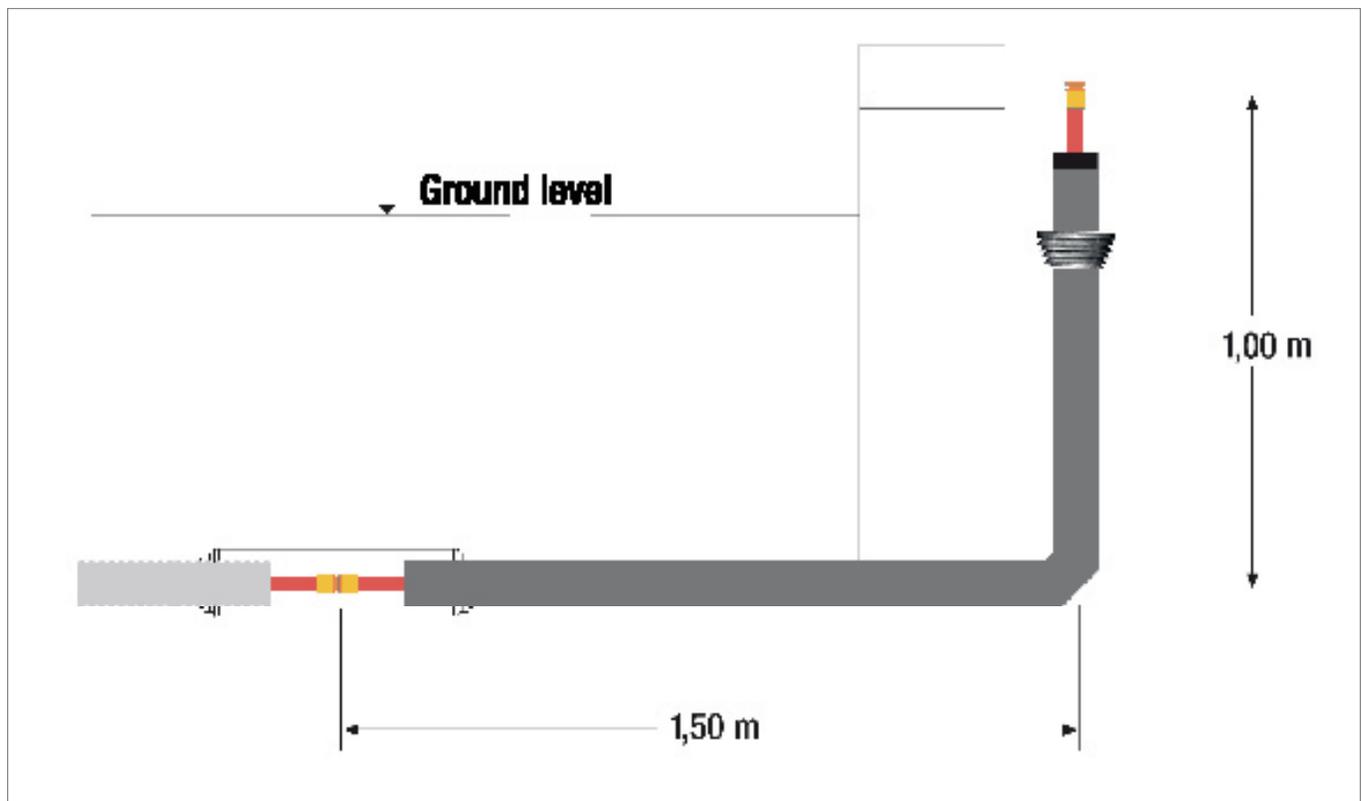


Fig. 52 Installing a prefabricated bend

### 5.4.3 Pre-fabricated Y- Pipe RAUVITHERM

The prefabricated Y-Pipe is used to transition from UNO to DUO, available for dimensions upto 63mm.

#### Installation

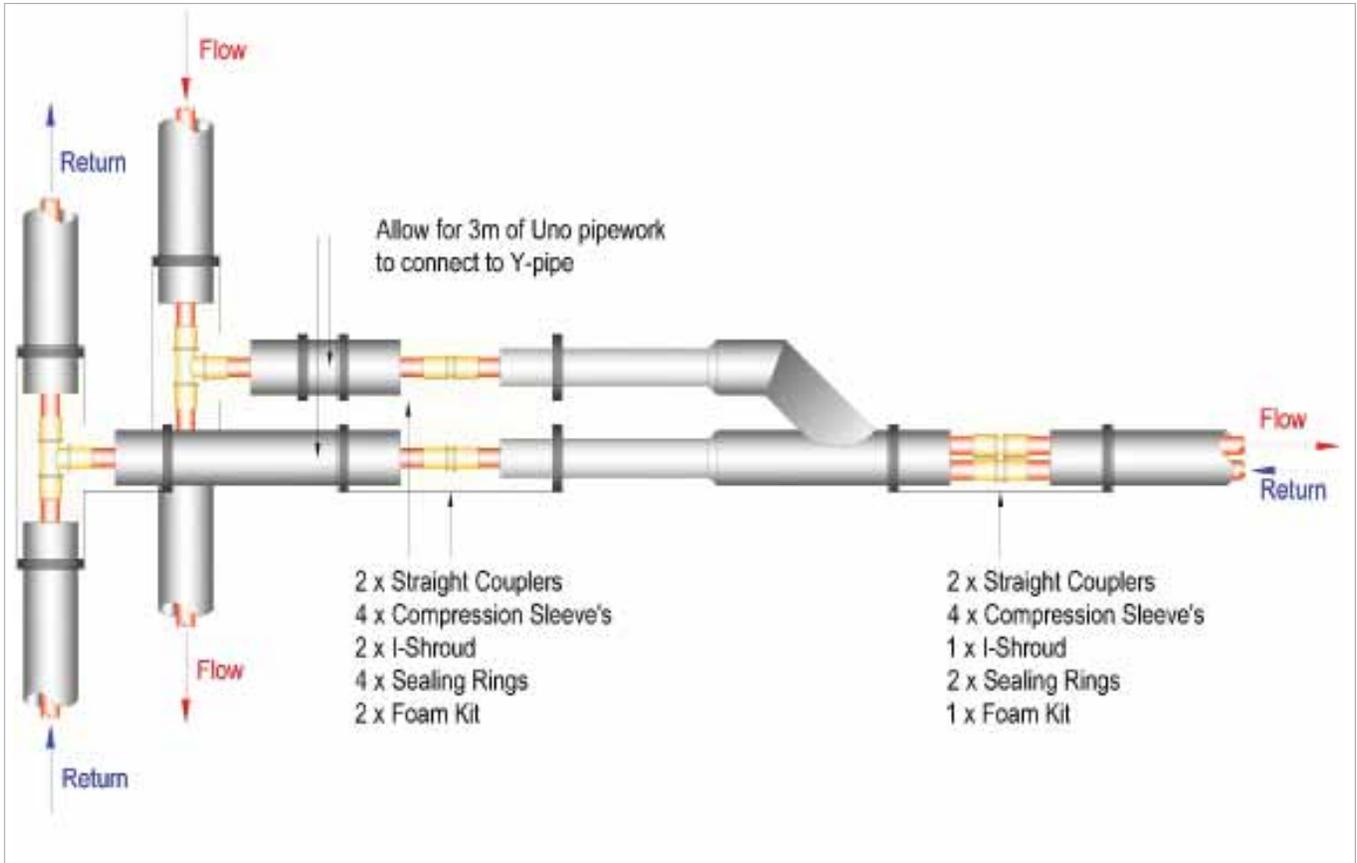


Fig. 53a Transition from UNO to DUO pipe using prefabricated Y-pipe

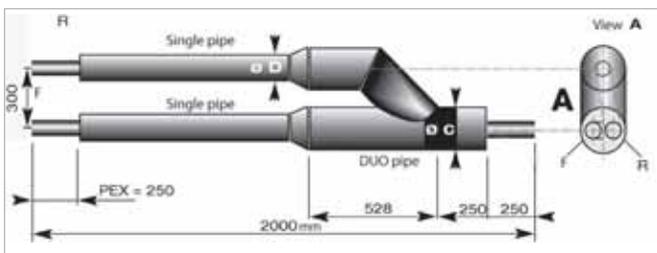


Fig. 53b Transition from UNO to DUO pipe using prefabricated Y-pipe

#### 5.4.4 Exposed lengths with end caps

End caps are used to close off the pipes where they penetrate the building wall. If the end cap should be installed inside a wall, the pipe jacket must be stripped back before the RAUVITHERM pipes are positioned in the trench. In this case, heat-shrink end caps must also be placed on the pipe ends beforehand. Otherwise, the pipes can be routed in first and stripped afterwards.

To carry out a compression sleeve joint with end caps, depending on the type of cap (heat-shrink end caps or push-on end caps), the exposed lengths shown in table 19 are required.

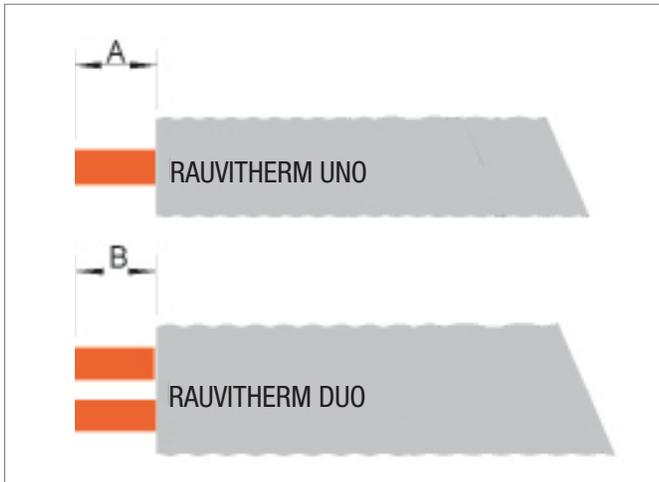


Fig. 54 Exposed lengths

#### Installing a heat-shrink end cap

- Expose RAUVITHERM pipe in accordance with Table 18
- Rough up the heat-shrink area with an abrasive cloth and preheat it to over 60 °C with a soft flame. Use temperature indicator strips to check the pre-heating temperature!
- Slide on heat-shrink end cap and shrink on using a soft flame
- Then complete the compression sleeve joint

Heat-shrink end cap dimensions	Dimensions
<b>RAUVITHERM UNO Carrier Pipe OD</b>	<b>A</b>
25 to 40 mm	150 mm
50 to 110 mm	175 mm
125 mm	200 mm
<b>RAUVITHERM DUO Carrier Pipe OD</b>	<b>B</b>
20 to 40 mm	150 mm
50 and 63 mm	175 mm

Table 20 Exposed lengths, heat-shrink end caps (A, B)



Fig. 55 Heat-shrink end caps for UNO and DUO pipes

#### 5.5 Linear thermal expansion during installation

##### 5.5.1 Linear thermal expansion in trenches

No expansion bellows or compensators are required for RAUVITHERM pipes when installed in trenches. As in the case of RAUVITHERM this concerns a slip pipe system, fixed points are to be set after all house connections (see table 19).

##### 5.5.2 Linear thermal expansion when connecting to buildings

To keep the thermal expansion within acceptable limits when connecting to a building, RAUVITHERM pipes should not extend more than the distances specified in Table 19 beyond the inner building wall into the building itself. If the push-on or heat-shrink end caps are inside the wall or extend into the core drill hole, the dimensions x can be reduced by 60 mm. The carrier pipe requires fixing brackets suitable for the forces listed in the table. Fixing brackets may be attached to the fitting body, but not to the compression sleeve.

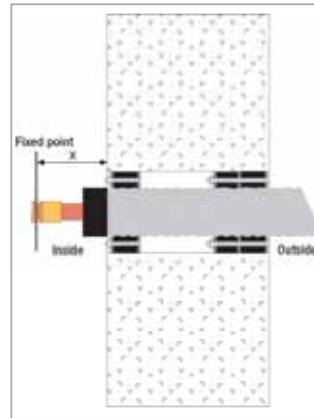


Fig. 56

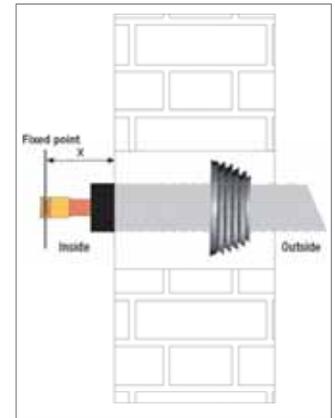


Fig. 57

Carrier Pipe OD x s [mm]	Max. distance to wall from - to x [mm]*	Max. anchor forces per pipe [kN]
25 x 2,3	220 - 270	0,93
32 x 2,9	220 - 270	1,50
40 x 3,7	220 - 270	2,40
50 x 4,6	220 - 270	3,70
63 x 5,7	260 - 300	5,80
75 x 6,8	260 - 300	8,20
90 x 8,2	260 - 300	11,90
110 x 10	260 - 300	17,70
20 x 2,8	220 - 270	1,00
25 x 3,5	220 - 270	1,70
32 x 4,4	220 - 270	2,10
40 x 5,5	220 - 270	3,30
50 x 6,9	220 - 270	5,20
63 x 8,7	260 - 300	8,20

Table 21 Fixed points: distance to the wall and occurring forces

\* To enable a fitting to be pressed in

## **5.6 Installation techniques**

### **5.6.1 Pipe in sleeve system**

For crossing underneath buildings or for areas with difficult access, a pipe-in-sleeve installation is possible with RAUVITHERM. The inner diameter of the sleeve pipe must be at least 2 cm bigger than the outer diameter of the RAUVITHERM pipe jacket. The RAUVITHERM pipe can be pulled in using a winching cable and towing sock, ensuring the maximum winching forces are not exceeded. A lubricant applied to the RAUVITHERM pipe jacket minimises the pipe friction. Changes in direction should only be made with the open-cut installation technique.

### **5.6.2 Installing during land development phase**

To develop plots for connection to a heating network where buildings will be erected at a later date, dead legs can be laid and closed off with isolating valves (available on request). The ball valves can be insulated with the REHAU insulation kit for end caps.

### **5.6.3 Tapping into existing lines**

The flexibility of the RAUVITHERM pipes allows the subsequent installation of T-joints. The network section must be taken offline for this and the heating water must be cooled to 30 °C.

# 6 COMMISSIONING / STANDARDS & GUIDELINES

## 6.1 Commissioning

### General Information

The RAUVITHERM pipes and joints must be pressure-tested before they are insulated or the trench is backfilled. The pressure test can be carried out immediately after completing the compression sleeve joints.

### Pressure test with water

#### Test Procedure

- Visually inspect the District Heating pipe work to ensure that there is no post installation damage
- Flush the district heating circuit and allow for water to run clear of bubbles and any dirt/chippings that may have got into the pipeline
- Pressurise the system to test pressure of 6 bar (or) 1.5 x operating pressure, whichever is greater. Close the isolation valve on the inlet and outlet. Ensure there are no leaks from the connections
- The above step may need to be repeated several times before the pressure within the system stabilises at the test pressure. This is due to the inherent flexible properties of PE-Xa.
- When the pressure is stabilised in accordance to the graph below, remove the pressure pump and the pressure test is successful.

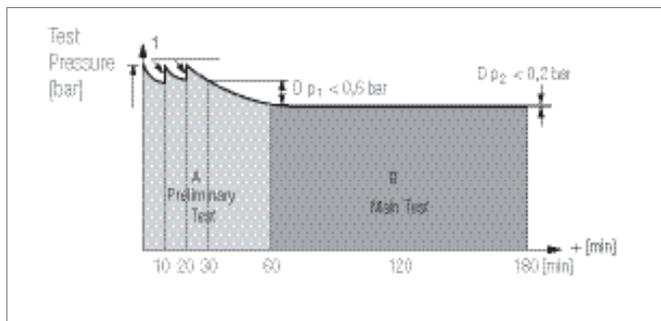


Fig 58 Pressure test diagram in accordance with DIN 1988

#### 1 - Repumping

#### A - Pressure drop due to expansion of the pipe

#### B - Main Test

### As-installed drawings

The actually installed pipe lengths are to be recorded and entered into an as-installed drawing as per DIN 2425-2.

### Corrosion Inhibitors

Note: When using corrosion inhibitors or flow conditioners, confirmation of their compatibility with PE-Xa and the fitting materials used is to be obtained from the manufacturer. The requirements of VDI 2035 relating to the quality and treatment of the feed water should also be observed.

## 6.2. Other applicable standards and guidelines

- DIN 2424 Part 2

Plans for public supplies, for water engineering and for transmission lines; plans for pipe-systems for distant-heating

- DIN EN 15632: 2009
- District Heating pipes - Factory insulated flexible pipe systems
- DIN 16892: 2000  
Cross linked polyethylene (PE-X) pipes)  
- General requirements, testing
- DIN 16893: 2000  
Cross linked polyethylene (PE-X) pipe  
- Dimensions
- DIN 13760 Miner's Rule
- DIN 4726  
Warm water floor heating systems and radiator pipe connecting – Piping of plastic materials  
- General requirements
- DIN 4729  
Cross linked polyethylene pipes for warm water floor heating system  
- General requirements
- DVGW Worksheet W531
- Manufacture, quality assurance and testing of pipes made of PE-Xa for drinking-water installation
- DVGW Worksheet W534  
Compression joints for pipes made of PE-Xa
- DVGW Worksheet W534(E)  
Pipe connectors and pipe connections
- VDI 2035 Prevention of damage in water heating installations
- WRAS Approved up to 110mm for UNO and DUO pipe

**6.3 Pressure Test Certificate**

1. **Project Name** .....

2. **Installation Date**

Max. Operating Pressure .....

Max. Operating Temperature .....

Test Pressure: .....

Ambient Temperature: .....

3. **Pressure Test** **Completed**

a) Flush and fill the circuit .....

b) Pressureise to 6 bar (or) 1.5 times operating pressure whichever is greater .....

c) Pressure several times again in accordance with the pressure test diagram (Pipe expansion causes initial pressure loss) .....

d) Test Period for 3 hours .....

e) Pressure test is succesful, if-there are no leaks within the circuits - pressure has not fallen by more than 0.1 bar per hour .....

4. **Confirmation**

The Pressure Teststing was carried out in accordance with the above recommendations.

No leaks were deducted and no component showed a permanent deformation.

Location: .....

Date: .....

M & E Contractor/

Installer: .....

# FURTHER REHAU PRODUCT RANGES



*RAUTHERMEX pre-insulated pipe*



*RAUGEO PE-Xa Ground-source Probes*



*REHAU Underfloor Heating*



*RAUTOOLS*



*RAUBIO Fermenter Heating*



*RAUBIO Gas Condensation Chamber*

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