



REHAU®

Unlimited Polymer Solutions



PIPE SYSTEMS FOR SUPPLY NETWORKS FOR RENOVATION AND NEW INSTALLATION

The prices in this catalogue take effect on 01 Jan 2013. All previous price overviews and gross price lists thereby become invalid. The catalogue contains non-binding price recommendations. The prices do not include value added tax. Prices subject to change. Misprints, amendments and errors excepted.

Delivery and invoicing will be in accordance with the REHAU terms and conditions of delivery and payment with which you are familiar. These can be viewed at www.rehau.com or sent to you on request.



Due to a system conversion to SAP in 2012, our article numbers have changed to material numbers.

The previous article numbers have become material numbers with 2 extra digits:

old: 123456-789 (article number)

new: 11234561789 (material number)

To illustrate this, we have visually identified the additional digits:

1 = 1, e.g.: **1**123456**1**789

Please note that in the system all quotations, order confirmations, dispatch notes and invoices will largely only be issued with the 11-digit number.

PIPE SYSTEMS FOR SUPPLY NETWORKS

CUSTOMISED FOR ANY APPLICATION

Universal: Pressure Pipes in Polymer Materials

Polymer materials are increasingly superseding the traditional materials of cast iron and steel in the production of pipes. Modern synthetic pressure pipes offer the best requirements for use in the supply of drinking water and gas in local and district heating grids, heating systems and compressed air lines through to wastewater pipes, in private households and local administration areas as well as in the industrial environment. With pressure pipes, the specific advantages of polymer materials are manifested equally in their simple, economical processing and in their reliable everyday operation.

Customised for Any Application

Whether high-density crosslinked PE-Xa for maximum reliability even at increased operating temperatures or robust PE 100-RC for cost-effective installation with no sand filling, the material used can be optimally adjusted for the respective application – so drinking water can be transported to the consumer with no contamination and gas pipes remain absolutely sealed even under extreme conditions. Polymer pipes from REHAU are designed for maximum efficiency and resilience in all installation situations.

Robust, Economical and Safe from the Outset

REHAU pressure pipes in durable polymers guarantee maximum operating reliability over decades. They do not corrode and they display different advantages depending on the pipe material chosen, e.g. such as high notched impact strength, outstanding temperature resistance or the avoidance of stress cracking in the case of point loads.

Many REHAU pressure pipe systems are therefore ideally suited to quick, cost-effective, trenchless installation with no sand filling.

REHAU: Pressure Pipes from the Polymer Specialist

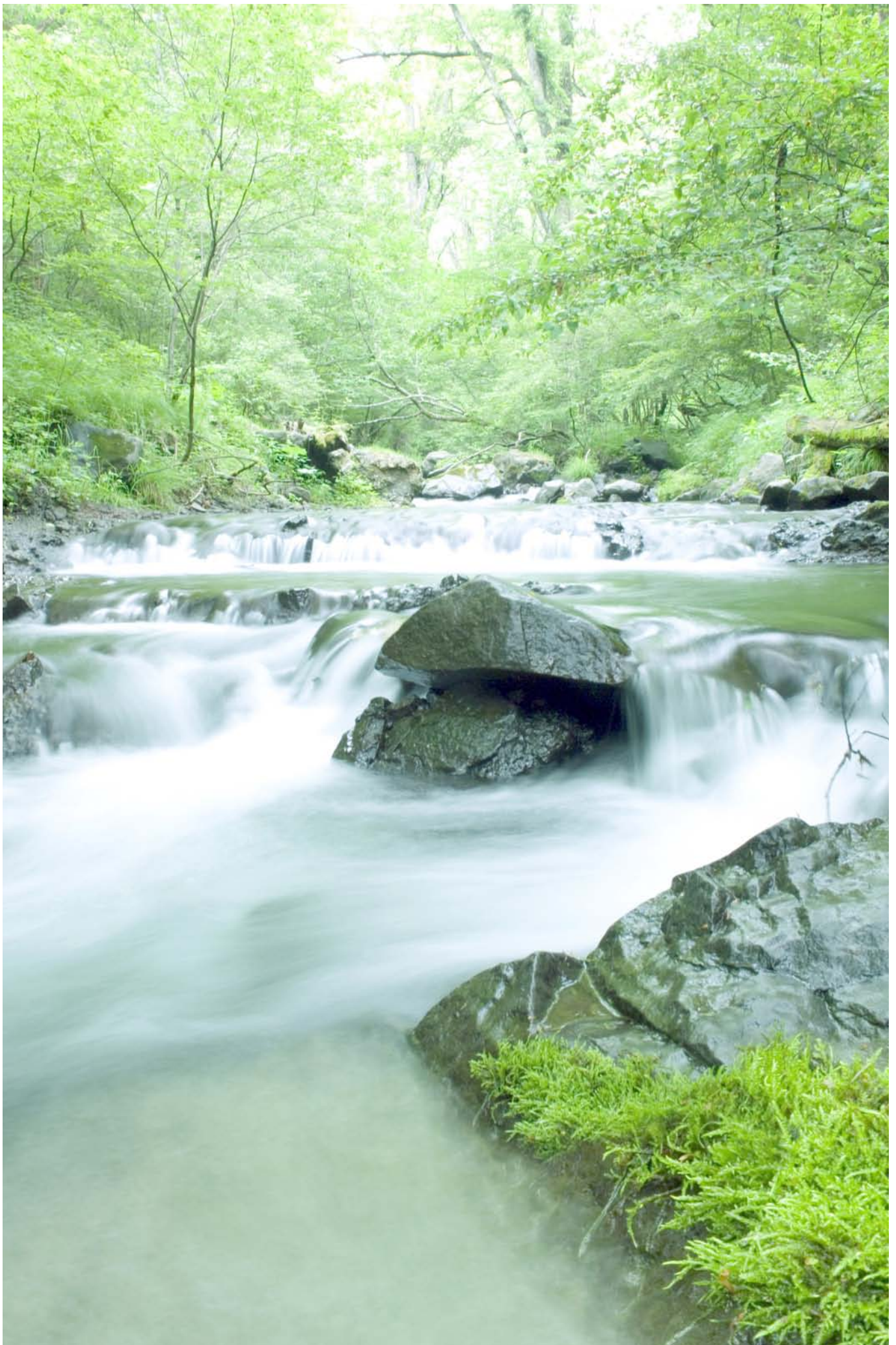
As a leading polymer processor with its own research and development, REHAU has decades of experience with polymer materials.

The versatile pressure pipe systems from REHAU offer economical and future-proof solutions in certified quality, which are suitable for construction sites for all applications. All components are optimally matched to each other. Customers benefit from comprehensive advice in the planning phase and expert support in the project implementation.



Operating
reliability up to
100 years.

Comprehensive
service.



CONTENTS

Pipe Systems for Supply Networks	3
Additional Reliability – Pressure Pipes in RAU-PE-Xa	6
First Things First	8
Product Advantages	10
Product Variants	13
Packaging Types	17
Installation with no Sand Filling – RAUPROTECT in PE 100-RC	18
First Things First	20
Product Advantages	22
Product Range	24
Packaging Types	26
Trenchless Renovation – U-LINER	28
First Things First	30
Product Advantages	32
Product Variants	36
Product Range	37
Trenchless Renovation – AWADUKT PP TL	38
First Things First	40
Product Advantages	44
Product Range	46
Flexible Route Use – RAUJET in PVC-U	48
First Things First	50
Product Range and Packaging Types	52
Planning and Installing the Pressure Pipes	54
Planning and Installing the U-Liner	64
Planning and Installing AWADUKT PP TL	71
Planning and Installing RAUJET	76
REHAU Service	80

ADDITIONAL RELIABILITY – PRESSURE

 **REHAU®** TRINKWASSER PE-Xa 90



PIPES IN RAU-PE-XA

x8,2 SDR 11 Grad B U11 SDR 14,6 711 216-422

Experience Provides Security

Wherever reliable, efficient and cost-effective pipelines are needed, RAU-PE-Xa pipes are the first choice.

Since 1971, over 750 million metres of RAU-PE-Xa pipes from REHAU have been successfully used in the broadest range of areas worldwide.

To be sure: RAU-PE-Xa pressure pipes for gas, wastewater and drinking water.

FIRST THINGS FIRST

APPLICATIONS – BENEFITS – PROPERTIES

Maximum resistance to stress cracking.

Long, guaranteed depreciation times.

Applications:

For All Current Installation Methods

- Installation with no sand filling
- Trenchless installation and renovation, e.g.:
 - Ploughing-in
 - Cutting-in
 - Horizontal directional drilling
 - Relining
 - Burst lining

Extreme Installation Conditions

- Use in areas of mining subsidence

Connection Options

- Electrofusion jointing
- Mechanical connection with off-the-shelf clamp, screw and push fittings

Water Management

- For domestic connection or supply/disposal routes that are kilometres long
- Suitable for use in drinking water protection areas
- Suitable for drinking water protection areas 2 and 3

Benefits:

Cost Saving

- Ideally suited to quick and cost-advantageous installation techniques with no open trench
- Compactable material of any desired grain size and shape can be used
- Large stock lengths as coils or on drums
- Small bending radii possible due to high flexibility
- Long service life. Long, guaranteed depreciation times

Very High Operating Reliability

- Notch depths of up to 20 % of the pipe wall thickness permitted
- Coloured identification coating as a visual check of the flaking in the context of welding preparation and as additional UV protection
- Excellent resistance to stress cracking/point loads
- Outstanding chemical resistance

Convincing Quality

- German gas and water association (DVGW) certified system
- Constant internal/external checking, incl. external monitoring by SKZ (southern German polymer centre)
- Many years of REHAU experience with respect to reliability
- 10-year guarantee on all integrated PE-Xa pipes possible on request (Germany)

Properties:

- Resistance to notches
- Resistance to point loads
- Stress cracking resistance
- No rapid crack propagation
- High resistance to abrasion
- High notched impact strength at extremely low temperatures
- High flexibility at low temperatures
- Can be used up to a constant temperature of 95 °C
- High recovery capacity (memory effect)



PRODUCT ADVANTAGES

Maximum reliability
in the case of
installation with no
sand filling.

Resistance to Point Loads

In the case of pipes in conventional thermoplastics that are not crosslinked, point loads from outside, e.g. due to stones, can cause hairline cracking in the structure. This so-called stress cracking corrosion can cause premature failure of the pipes. As a result of the crosslinking of the molecule chains with RAU-PE-Xa, resistance to the formation of stress cracks is considerably improved by comparison with a pipe in conventional PE 80 or PE 100.

PE-Xa pipes therefore offer the greatest reliability in the case of installation with no sand filling.

Recovery Capacity

RAU-PE-Xa pipes have excellent recovery capacity. This property, which is also called the memory effect, has a particularly positive impact on the manufacture of mechanical pipe joints. Shape recovery of kinks can be achieved by heating.

Long-Term Hydrostatic Pressure Resistance

With polymer materials that are subject to mechanical loads, the creep behaviour must be taken into account. Based on laboratory and practical experience with pipes in crosslinked polyethylene, parameters have been identified, which allow extrapolation of the long-term hydrostatic strength to 100 years. Allowing for a safety factor of 1.5, wastewater pressure pipes with a positive operating pressure of 12.5 bar (SDR 11) are reliable for at least 100 years at 20 °C. With a safety factor of 1.25, SDR 11 wastewater pressure pipes can be pressurised up to 15 bar.



Advantages at a Glance

	PE-Xa	PE 100	PE 100-RC
Resistance to slow and rapid crack propagation	+++	0	+
Resistance to notch formation	+++	0	++
Resistance to point loads	+++	0	+
Flexibility and ease of installation	+++	0	0
Thermal resistance	+++	+	+
Installation with sand filling	No	Yes	No
Trenchless installation	Yes	No	Yes
Shape recovery of kinks	Yes	No	No
Low linear expansion	++	+	+

Long durability even at notch depths of 20 %.

High flexibility even on winter construction sites.

Notch Behaviour

During the underground installation of pipes and possibly also during subsequent operation, notches can form on the pipe surface. These notches grow under mechanical load, whether from internal pressure or soil load, over the service life of the pipes.

The notch depth and the speed at which the notches grow are critical for the life expectancy of such a pipeline. RAU-PE-Xa has significantly greater resistance to the formation of notches and crack propagation than pipes in conventional polyethylene that is not crosslinked.

Long-term internal pressure tests have demonstrated that the minimum service life required by DIN 16892 is significantly exceeded even in the case of notch depths of up to 20 % of the pipe wall thickness.

In the FNCT (Full Notch Creep Test), whereby a test piece notched all around is subjected to a constant tensile load of 4 N/mm² in a 2 % wetting solution at a temperature of 95 °C, a service life of over 6000 hours was achieved. RAU-PE-Xa pipes are therefore especially suited to trenchless installation techniques, with which damage to the pipe surface is virtually unavoidable.

Rapid Crack Propagation

Rapid crack propagation refers to the tendency of pipes to develop rapidly extending cracks of great length at high pressures, with compressible media and at low temperatures in the case of pipe damage in longitudinal direction.

Even at temperatures down to –50 °C and pressures up to 16 bar, RAU-PE-Xa pipes display no crack propagation. In the case of incomplete ventilation and if there is air in the water, the air present in a RAU-PE-Xa pipeline system cannot cause rapid crack propagation. RAU-PE-Xa pipes are therefore especially suitable for networks with higher operating pressures.

Ideal in routes
constructed in a
confined space.

High Flexibility

The high flexibility of PE-Xa pipes, whether cut lengths or coils, allows easy and quick installation. As such, smaller obstacles can be avoided by bending the pipes and changes of direction within the trench are possible without the need to use fittings. Smaller bending radii are possible with RAU-PE-Xa pipes compared with PE 80 or PE 100 pipes.

Coloured Identification Coating

According to the intended purpose, the colourless RAU-PE-Xa pipes are coated with a coloured identification coating according to the application. This serves both as additional UV protection and as a visual check of the flaking in the context of welding preparation.



PRODUCT VARIANTS

Construction projects are frequently associated with high financial outlay and numerous unexpected events. It is good to be able to depend on reliable, hard-wearing systems such as the REHAU pressure pipes in RAU-PE-Xa: one less worry.

REHAU pressure pipes in RAU-PE-Xa are compliant with DIN 16892/16893 and approved under DVGW GW 335 – part A3.





RAU-PE-Xa** Drinking Water Pipes

are the most widely installed REHAU pressure pipes in RAU-PE-Xa.

Uncompromising quality for one of our basic foodstuffs, which must meet the highest demands: our drinking water

	Operating pressure (bar)	Safety factor
SDR 11	12.5	1.5
SDR 7.4*	20.0	1.5



RAU-PE-Xa** Wastewater Pressure Pipes

complement your water management.

Even when laid in sensitive ecological areas, e.g. such as drinking water protection areas, RAU-PE-Xa wastewater pressure pipes give you the necessary reliability that you can trust.

	Operating pressure (bar)	Safety factor
SDR 11	15	1.25
SDR 7.4*	24	1.25



RAU-PE-Xa** Gas Pipes

Gas supply systems from REHAU stand for safety, reliability and economy. As supply lines for underground installation, the systems are suitable both for conventional trench installation and for trenchless installation. Maximum allowable operating pressure in accordance with DVGW rule G472: 8 bar.

* On request

**Reference:

Compaction guidelines plus product, planning and installation information for **RAU-PE-Xa wastewater, gas and drinking water pipes** can be found in the section on installation.

PRODUCT RANGE

RAU-PE-Xa Drinking Water Pipes

PE-Xa pipes compliant with DIN 16892/DIN 16893 with DVGW registration number

Carrier pipe

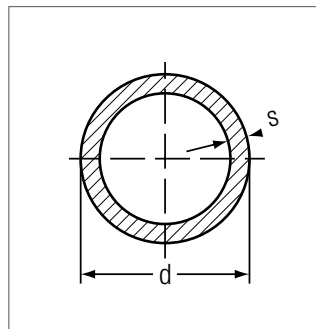
Material: RAU-PE-Xa

Colour: Natural (no colouring)

Identification coating

Material: PE-HD

Colour: RAL 5012 light blue



		SDR 11 to 12.5 bar operating pressure (safety factor C = 1.5)		
Mat. No. 100 m coils	Mat. No. 6 m cut lengths	d mm	s mm	Weight ¹⁾ kg/m
11364711100	11364711006	25	2.3	0.167
11364811100	11364811006	32	2.9	0.269
11364911100	11364911010	40	3.7	0.425
11365011100	11365011006	50	4.6	0.658
11365111100	11365111006	63	5.8	1.040
11366611100	11366611006	75	6.8	1.450
11366711001	11366711006	90	8.2	2.100
11366811002	11366811004	110	10.0	3.110
11364241100	11364241006	125	11.4	4.020
11364721100	11364721006	160	14.6	6.590

		SDR 7.4 to 20 bar operating pressure (safety factor C = 1.5)		
Mat. No. 100 m coils	Mat. No. 6 m cut lengths	d mm	s mm	Weight ¹⁾ kg/m
On request	On request	40	5.5	0.594
On request	On request	50	6.9	0.926
On request	On request	63	8.6	1.450

¹⁾ Weights in accordance with DIN 16893/Other sizes on request

RAU-PE-Xa Wastewater Pressure Pipes

PE-Xa pipes compliant with DIN 16892/DIN 16893

Quality assurance and inspection on the basis of
DVGW rule GW 335-A3

Carrier pipe

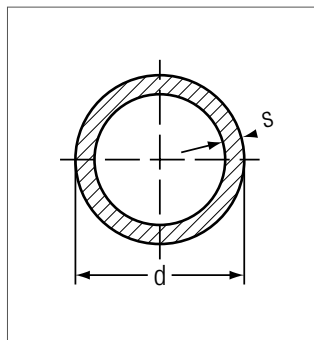
Material: RAU-PE-Xa

Colour: Natural (no colouring)

Identification coating

Material: PE-HD

Colour: RAL 8023 orange brown



		SDR 11 to 15 bar operating pressure (safety factor C = 1.25)		Weight ¹⁾ kg/m
Mat. No. 100 m coils	Mat. No. 6 m cut lengths	d mm	s mm	
11364131001	11364131006	50	4.6	0.658
11362521001	11362521006	63	5.8	1.040
11362621001	On request	75	6.8	1.450
11364821100	11364821006	90	8.2	2.100
11364231001	On request	110	10.0	3.110
11360091100	11360091006	125	11.4	4.020
11360161001	On request	160	14.6	6.590

¹⁾ Weights in accordance with DIN 16893/Other sizes on request

RAU-PE-Xa Gas Pipes

Carrier pipe

Material: RAU-PE-Xa

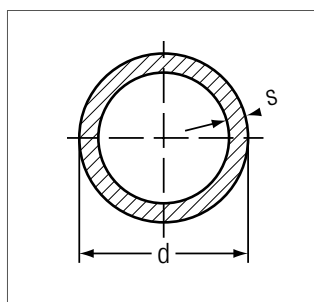
Colour: Natural (no colouring)

Identification coating

Material: PE-HD

Colour: RAL 1018 zinc yellow

Compliant with DIN 16892/DIN 16893 with DVGW registration number



		SDR 11 to 8 bar operating pressure		Weight ¹⁾ kg/m
Mat. No. 100 m coils	Mat. No. 6 m cut lengths	d mm	s mm	
11804611100	11804611006	32	2.9	0.269
11804711100	11804711006	40	3.7	0.425
11804811100	11804811006	50	4.6	0.658
11804911100	11804911006	63	5.8	1.040
11808311100	11808311006	75	6.8	1.450
11808411100	11808411006	90	8.2	2.100
11808511001	11808511006	110	10.0	3.110
11809011100	11809011006	125	11.4	4.020
11800011100	11800011006	160	14.6	6.590

PACKAGING TYPES

Coils



Standard length 100 m				
d mm	Internal Ø Approx. m	External Ø Approx. m	Width Approx. m	Weight Approx. kg
25	0.65	1.10	0.16	17
32	0.80	1.10	0.19	27
40	0.80	1.20	0.28	43
50	1.00	1.55	0.25	66
63	1.20	1.90	0.26	104
75	1.50	2.05	0.40	145
90	1.75	2.50	0.37	210
110	2.00	2.80	0.45	311
125	2.30	3.00	0.66	402
160	2.35	3.00	1.12	659

Timber Frame Crates

Sizes and weight as required

Other Packaging Types

On request. We are available to advise.

The pipe ends are sealed with end caps.



INSTALLATION WITH NO SAND FILLING – RAU





PROTECT IN PE 100-RC

The solid-walled pipe structure of RAUPROTECT using raw materials from the top quality, non crosslinked material generation PE 100-RC with excellent stress cracking resistance ensures that no crack initiation occurs even in the case of point loads on the inside of the pipe.

Particularly in rural areas where traditional pipe installation is generally associated with high costs, trenchless installation of RAUPROTECT is an ideal, cost-effective alternative. With the use of REHAU drinking water and pressure drainage systems, significant cost savings can be achieved in conjunction with a high level of reliability.

FIRST THINGS FIRST

APPLICATIONS – BENEFITS – PROPERTIES

Trenchless suitable for all soil classes.

10-year guarantee on all RAUPROTECT pipes.

Applications:

Excellent Suited to Modern Installation

Techniques:

- Cutting-in
- Ploughing-in
- Steered pipe jacking
- Long-section relining
- Burst lining
- Installation in an open pipe trench with no sand filling
- Suitable for all soil classes
- Areas of mining subsidence
- In water protection areas II and III

Benefits:

Time and Cost Saving:

- Trenchless installation
- Can be laid without cost-intensive soil replacement (trenchless installation)
- The acquisition of bedding material and disposal of excess excavation material are no longer necessary

Reliability:

- High operating reliability
- Quality management
- Material monitored on the basis of drinking water standards
- DVGW approvals
- 10-year guarantee on all integrated RAUPROTECT PE 100-RC pipes possible on request (Germany)



Properties:

Every metre of pipe is quality assured thanks to RQS and traceable due to plain text lettering including traceability barcode that is applied by laser, hard-wearing and durable.

Scratch Resistant

Notches in PE 100-RC RAUPROTECT are permitted up to a depth of 20 % of the wall thickness with no significant reduction of the service life.

Heavy-Duty

RAUPROTECT in PE 100-RC with material resistance that is huge for PE offers short-term ring stiffness of at least 20 kN/m². SDR 11 pipes are even well above this.

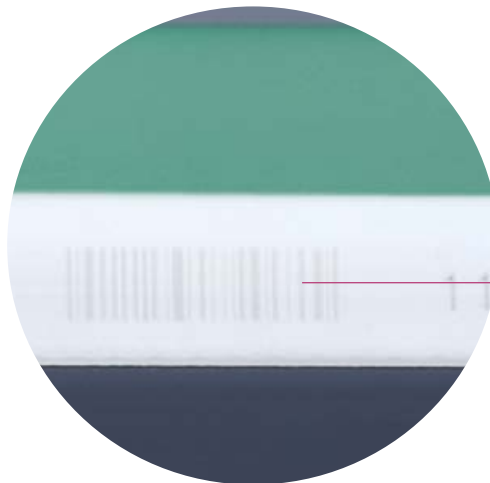
Compatible

RAUPROTECT pressure pipes can be connected with all off-the-shelf heater coil and clamp fittings or by butt welding.

Chemically Resistant

RAUPROTECT pipes in PE 100-RC are particularly resistant when transporting chemically aggressive waste liquids. If the waste liquids carry lyes, acids, saline solutions and alcohols then RAUPROTECT is resistant even at higher temperatures.

Notch depths of up to 20 % of the wall thickness permitted.



PRODUCT ADVANTAGES

Service life over 100 years.

Every metre of pipe is quality assured.

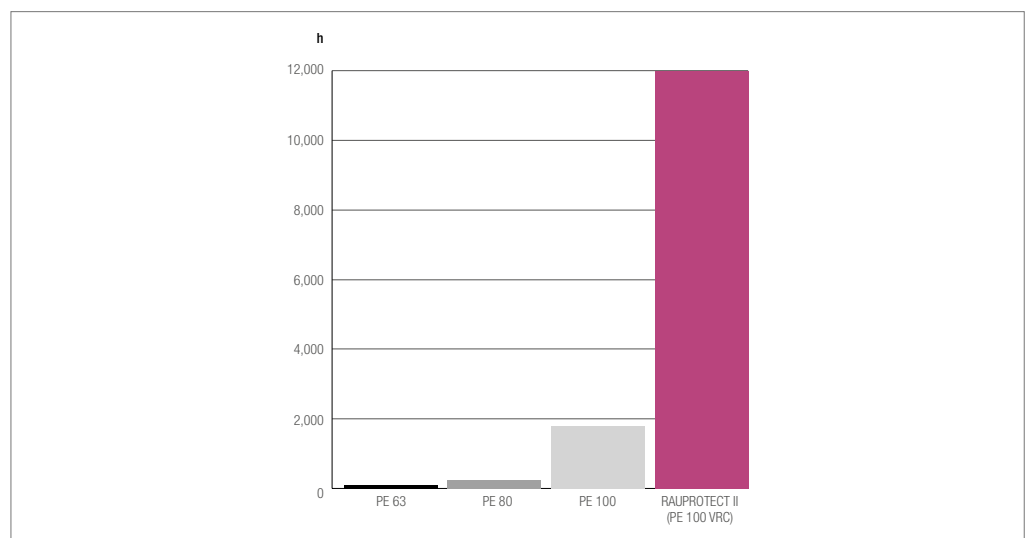
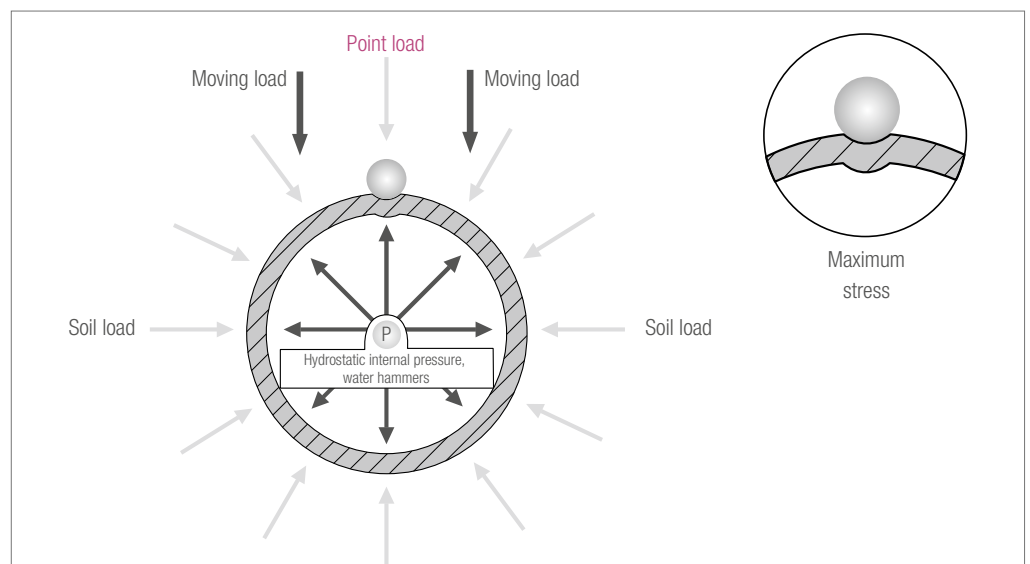
Resistance to Stress Cracking

The solid-walled RAUPROTECT available in PE 100-RC with excellent resistance to stress cracking ensures that no crack initiation occurs even in the case of point loads on the inside of the pipe. This is confirmed by TÜV Süd in its approval of RAUPROTECT in PE 100-RC in accordance with PAS 1075.

Resistant

RAUPROTECT in PE 100-RC is particularly resistant to:

- Surface damage from transport and installation
- Point loads from sharp-edged stones/bedding material up to soil class 7
- Stresses in the pipe wall due to external forced loads (soil settlements, route crossings, moving loads)





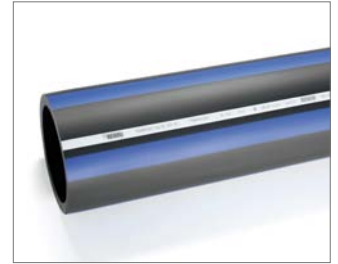
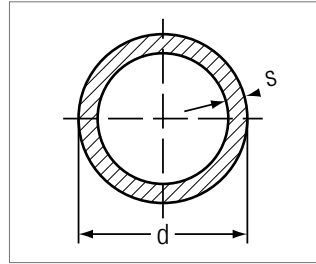
PRODUCT RANGE

RAUPROTECT in PE 100-RC Drinking Water

Sizes as per DIN 8074 and DIN EN 12201
Weights as per table KRV, status March 2008
With DVGW registration number

Pipe colour: RAL 9004 deep black

Stripe colour: RAL 5005 signal blue



SDR 11

Operating pressure 16 bar where $C^{(1)} = 1.25$ /Operating pressure 12.3 bar where $C^{(1)} = 1.6$

Mat. No. 100 m coils	Mat. No. 12 m cut lengths	d mm	s mm	Weight kg/m
1 131189 1 100	1 131189 1 012	63	5.8	1.06
1 131195 1 100	1 131195 1 012	75	6.8	1.48
1 131196 1 100	1 131196 1 012	90	8.2	2.14
1 131198 1 100	1 131198 1 012	110	10	3.18
1 131199 1 100	1 131199 1 012	125	11.4	4.12
1 131205 1 100	1 131205 1 012	140	12.7	5.13
1 131206 1 100	1 131206 1 012	160	14.6	6.74
1 131208 1 100	1 131208 1 012	180	16.4	8.51
-	1 131209 1 012	200	18.2	10.5
-	1 131215 1 012	225	20.5	13.3
-	1 131216 1 012	250	22.7	16.3
-	1 131218 1 012	280	25.4	20.5
-	1 131219 1 012	315	28.6	25.9
-	1 131225 1 012	355	32.2	32.9
-	1 131226 1 012	400	36.3	41.7

SDR 17

Operating pressure 10 bar where $C^{(1)} = 1.25$ /Operating pressure 7.8 bar where $C^{(1)} = 1.6$

Mat. No. 100 m coils	Mat. No. 12 m cut lengths	d mm	s mm	Weight kg/m
1 131148 1 100	1 131148 1 012	63	3.8	0.728
1 131149 1 100	1 131149 1 012	75	4.5	1.030
1 131156 1 100	1 131156 1 012	90	5.4	1.470
1 131158 1 100	1 131158 1 012	110	6.6	2.190
1 131159 1 100	1 131159 1 012	125	7.4	2.790
-	1 131165 1 012	140	8.3	3.500
-	1 131166 1 012	160	9.5	4.570
-	1 131168 1 012	180	10.7	5.770
-	1 131169 1 012	200	11.9	7.120
-	1 131175 1 012	225	13.4	9.030
-	1 131178 1 012	250	14.8	11.10
-	1 131179 1 012	280	16.6	13.90
-	1 131185 1 012	315	18.7	17.60
-	1 131186 1 012	355	21.1	22.40
-	1 131188 1 012	400	23.7	28.30

¹⁾ C = Safety factor

Other lengths/sizes on request

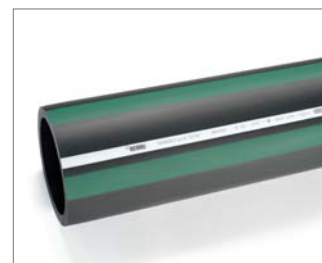
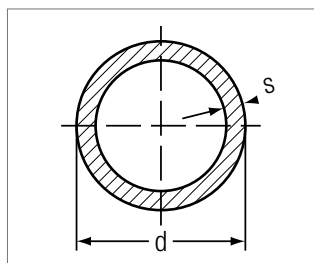
RAUPROTECT in PE 100-RC Wastewater

Sizes as per DIN 8074 and DIN EN 13244
Weights as per table KRV, status March 2008

Quality assurance and inspections on the basis of DVGW rule
GW 335-A2

Pipe colour: RAL 9004 deep black

Stripe colour: Green



SDR 11

Operating pressure 16 bar where $C^1 = 1.25$ /Operating pressure 12.3 bar where $C^1 = 1.6$

Mat. No. 100 m coils	Mat. No. 12 m cut lengths	d mm	s mm	Weight kg/m
11312671100	11312671012	50	4.6	0.67
11309381100	11309381012	63	5.8	1.06
11309411100	11309411012	75	6.8	1.48
11309481100	11309481012	90	8.2	2.14
11309511100	11309511012	110	10	3.18
11309581100	11309581012	125	11.4	4.12
11309611100	11309611012	140	12.7	5.13
11309681100	11309681012	160	14.6	6.74
11309701100	11309701012	180	16.4	8.51
-	11309711012	200	18.2	10.5
-	11309781012	225	20.5	13.3
-	11309791012	250	22.7	16.3
-	11309801012	280	25.4	20.5
-	11309811012	315	28.6	25.9
-	11309881012	355	32.2	32.9
-	11309891012	400	36.3	41.7

¹⁾ C = Safety factor

Other lengths/sizes on request

SDR 17

Operating pressure 10 bar where $C^1 = 1.25$ /Operating pressure 7.8 bar where $C^1 = 1.6$

Mat. No. 100 m coils	Mat. No. 12 m cut lengths	d mm	s mm	Weight kg/m
11308481100	11308481012	63	3.8	0.728
11308581100	11308581012	75	4.5	1.030
11308681100	11308681012	90	5.4	1.470
11308711100	11308711012	110	6.6	2.190
11308781100	11308781012	125	7.4	2.790
-	11308811012	140	8.3	3.500
-	11308881012	160	9.5	4.570
-	11308911012	180	10.7	5.770
-	11308981012	200	11.9	7.120
-	11309011012	225	13.4	9.030
-	11309111012	250	14.8	11.10
-	11309181012	280	16.6	13.90
-	11309211012	315	18.7	17.60
-	11309281012	355	21.1	22.40
-	11309311012	400	23.7	28.30

¹⁾ C = Safety factor

Other lengths/sizes on request

PACKAGING TYPES

Coils

Standard length: 100 m

All pipe ends are sealed with end caps.



SDR 17				
d mm	Internal Ø Approx. m	External Ø Approx. m	Width Approx. m	Weight Approx. kg
63	1.50	2.05	0.28	73
75	1.60	2.15	0.40	103
90	2.40	2.90	0.41	147
110	2.40	3.00	0.54	219
125	2.30	3.00	0.60	279

SDR 11				
d mm	Internal Ø Approx. m	External Ø Approx. m	Width Approx. m	Weight Approx. kg
50	1.50	1.90	0.28	67
63	1.50	2.05	0.28	106
75	1.60	2.15	0.40	148
90	1.75	2.50	0.44	214
110	2.40	3.00	0.52	318
125	2.30	3.00	0.60	412
140	2.40	2.90	0.95	513
160	2.35	3.00	1.14	674
180	2.35	3.00	1.24	851

Timber Frame Crates

Standard length: 12 m

All pipe ends are sealed with end caps.



RAUPROTECT IN PE 100-RC WASTEWATER

d mm	Height Approx. mm	Width Approx. mm	Contents Units
50	330	1160	108
63	390	1195	88
75	560	1185	102
90	580	1140	69
110	590	1160	48
125	550	1180	34
140	610	1180	30
160	540	1180	20
180	580	1140	17
200	660	1160	15
225	550	1180	10
250	610	1060	8
280	660	1180	8
315	725	1010	6
355	810	1125	6
400	895	860	4

Other Packaging Types

On request

TRENCHLESS RENOVATION –



U-LINER



Under the brand name U-Liner, REHAU supplies the practice-approved close-fit liner for trenchless renovation of pressure lines for drinking water and wastewater as well as unpressurised sewers.

After installation, the liners sit in the old line with no significant annular clearance and autonomously meet the requirements for statics and operating pressures up to max. 10 bar in the same way as new pipes. In the case of greater operating pressures, the U-Liners protect the pipe from internal corrosion and incrustation.

FIRST THINGS FIRST

APPLICATIONS – BENEFITS – PROPERTIES

High reliability due to uniform pipe run.

Leak-free domestic connections even after cleaning.

Applications:

Trenchless Renovation of Drinking Water, Municipal and Industrial Wastewater Pipes and Sewers

In Case of Pipe Inaccessibility

- Pipes covered e.g. with concrete slabs
- High pipe density in the ground
- High groundwater levels
- Greater sewer depths

In Areas Sensitive to Construction

- High moving load
- In historic city centres for the protection of the structure
- In water protection zones II and III

To Extend the Operating Life of the Pipe

- Increasing static resilience
- Minimising pipe joints
- Increasing the chemical resistance of the pipe

Benefits:

Economy:

- Significant cost saving potentials of up to 30 % compared with open installation depending on installation conditions
- Long depreciation periods
- Low maintenance cost
- Maintaining traffic flow
- Using the existing pipe route
- Accessibility of neighbouring properties remains largely preserved
- Tree population, traffic spaces and historic building stock are preserved

Properties:

Product:

- Solid-walled pipe in high quality PE 80 and PE 100 material
- Quality of new pipes with a life expectancy of at least 50 years
- Quality produced and inspected in the plant
- Best hydraulic properties due to smooth internal surfaces
- Guaranteed high static resilience
- Uniform pipe run to minimise pipe joints

U-Liner for Wastewater Pressure Lines:

- SKZ inspected and monitored reliability with operating pressures of up to 10 bar
- Protection of the old pipe against corrosion

U-Liner AC:

- DIBT-approved
- Connection of side junctions with all approved cap seal and compression techniques
- Seal compliant with DIN EN 1610, IKT confirmed
- Resistance to high-pressure rinsing of the pipe system in accordance with DIN 19523, method 2, IKT confirmed

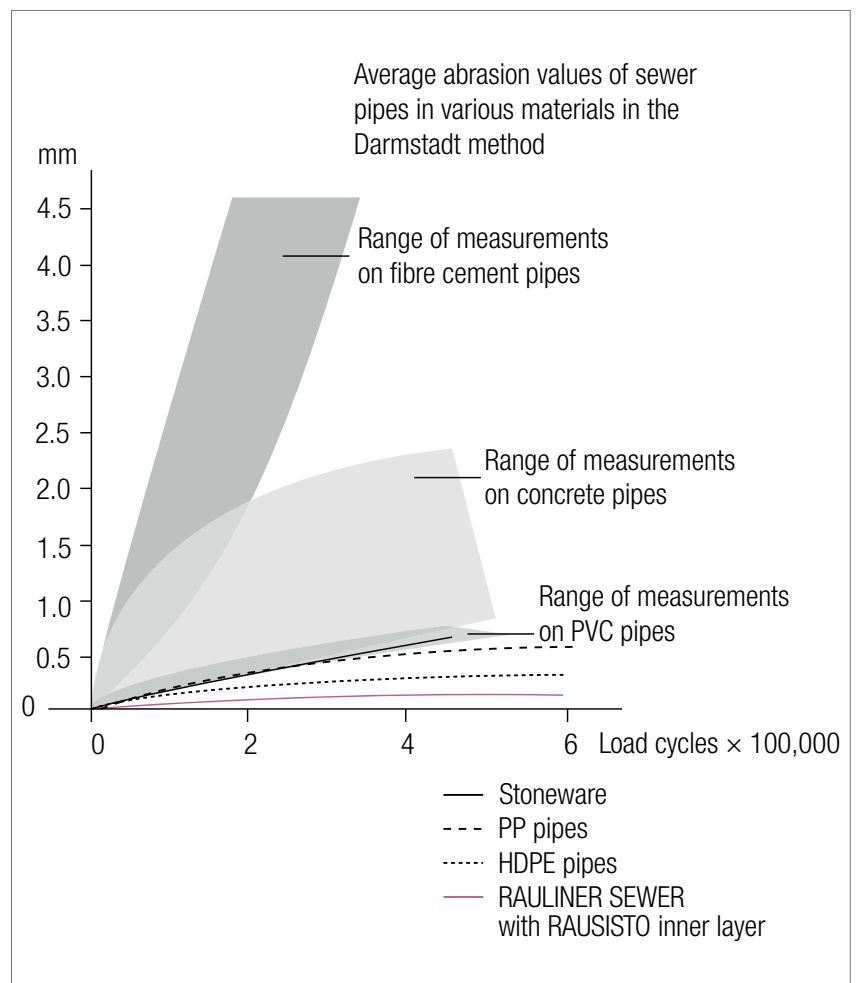
U-Liner AW:

- DIBT-approved
- Chemically and thermally resistant
- Can be high-pressure flushed
- Inner layer that is easy for a camera to inspect

U-Liner RAUSISTO

- Outstandingly high resistance to abrasion
- Increased chemical and thermal resistance
- DIBT-approved

Cost saving potential of up to 30 %



PRODUCT ADVANTAGES

Flow rate is largely maintained.

Smooth Outside and Inside

With wall roughness of 0.01 mm, U-Liner drinking water and wastewater pipes are considerably smoother than steel, cast iron or concrete pipes and largely compensate for the minimal loss of cross section. If deposits occur in the line due to the media then standard flushing of the pipe is sufficient and the pipes are as good as new.

Chemically Resistant

U-Liners display their strengths particularly in the transport of chemically aggressive waste liquids. If the waste liquids carry lyes, acids, saline solutions and alcohols then U-Liners in PE 100 are resistant even at higher temperatures.





Unending

U-Liners are wound unendingly onto a drum up to the largest size of DN 400.

This allows a significant saving of storage area on the construction site and a reduction of traffic disruption. The pipe lengths can be laid and removed in one piece.

The pipe joints in the line are reduced to a minimum.

Weldable

The U-Liners in PE 80 and PE 100 are unconditionally weldable in accordance with DVS. Off-the-shelf fittings are available for the close-fit external diameter after removal. Removed U-Liner pipes can be connected by electrofusion fittings. Domestic connections to removed U-Liners can be created by welding on tapping clamps.

Minimal
environmental and
traffic disruption.

Reliable pipe
branches.

All variants approved for DIBT sewers.

Greater reliability: pipe quality assurance in the plant.

U-Liner for High-Pressure Water Pipe

Reliable

The basic pipes are produced solid-walled in a PE 100 material that is suitable for the application. The material and pipe properties such as ring stiffness, material resistances and dimensions are already set, checked and monitored in the plant during production. In the course of installation, the pipe diameter is adapted to the existing line.

Professional

Installation is undertaken by specialist companies with many years of experience, so high installation quality is guaranteed in accordance with the relevant regulations.

Resilient

U-Liners for drinking water and high-pressure sewer applications are manufactured in the high-strength material PE 100 and offer pressure capacity of up to 10 bar at 20 °C, as do comparable new pipes.

If there are particularly high demands on the pipes in terms of point load resistance due to fragments in the existing pipe or in the construction trench, we recommend the use of PE 100-RC U-Liners with outstanding resistance to stress cracking.

Approved

U-Liners for the area of drinking water are approved by DVGW and their quality is constantly monitored. For the area of high-pressure sewers, the U-Liners are inspected on the basis of the DVGW standards.





U-Liner for Gravity Pipelines

Adhesive

The permanent, coextruded, adhesive inner layer of the U-Liner AC allows the economic use of cap seal and compression techniques for connecting side junctions. Complex, expensive and moreover unreliable weld solutions with the robot have therefore finally been consigned to history.

Securely Stuck

Extensive test results are available to REHAU with respect to the adhesive strength of the inner layer on the base pipe material in accordance with DIN EN 1542. With strength of 3 N/mm^2 , the adhesive strengths are at least twice those of comparable adhesive joints on concrete surfaces.

Abrasion Resistant

If abrasive materials such as stones or grit are transported in the wastewater, the highly abrasion resistant RAUSISTO inner layer ensures a longer service life of the wastewater pipe, particularly in the case of direction changes in the pipe run. Ideal for transporting abrasive substances.

Approved

U-Liners AC and AW are approved by the German Institute for Structural Engineering with effect from 5th February 2010 as a renovation process for underground wastewater pipes in the nominal bore range from DN 150 to DN 400. The approval confirms the high quality of the liners used and the reliability in proper and professional installation of the pipes.

Up to 600 m can be installed per day.

PRODUCT VARIANTS



U-LINER AC

The adhesive, trenchless and economic solution for joining domestic connections. U-Liner AC (adhesive connection) consists of a PE 80 base pipe, which guarantees the load resistance under the static requirements. The permanent, coextruded, adhesive inner layer on the inside of the pipe allows the use of all cap seal and compression techniques for connecting side junctions. Ideal for the renovation of municipal sewers.



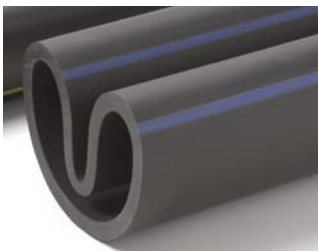
U-LINER AW

In addition to the static load resistance, the base pipe in PE 80 material ensures the high chemical resistance of the newly laid pipe. The translucent inner layer allows optimal viewing conditions in the case of sewer inspection and cleaning. Ideal for the renovation of industrial sewers.



U-LINER RAUSISTO

On the inside, the U-Liner displays an inner layer in the material RAUSISTO that is coextruded with the PE 80 base pipe. Whilst the base pipe provides the static load resistance, the RAUSISTO inner layer optimally ensures abrasion resistance to abrasive substances and increases the chemical resistance.



U-Liner for Pressure Lines

In the area of drinking water and wastewater pressure, only materials that are nationally approved and authorised for the respective use are employed. The drinking water U-Liner is approved by DVGW in accordance with GW 335 A2.

U-LINERS

U-Liners is a registered trademark of PRS Rohrsanierung GmbH.

PRODUCT RANGE



U-LINER for pressure pipes in PE 100**

Mat. No. U-Liner Drinking water*	Mat. No. U-Liner Wastewater*	DN	SDR	Size	Authorised Op. pressure bar	Supply length	External drum diameter m	Drum width m
11356331xxx*		100	17	93 × 6.5	10	1130	3.0	2.15
11349481xxx*		125	17	121 × 7.7	10	890	3.0	2.15
11322521xxx*		150	17	142 × 9.5	10	840	3.0	2.15
11350961xxx*		200	17	190 × 12.7	10	395	3.0	2.15
11349681xxx*		225	17	221 × 13.6	10	335	3.0	2.15
11356431xxx*		250	17	240 × 15.6	10	284	3.2	2.15
11356531xxx*		300	17	293 × 18.2	10	225	3.2	2.15
11356381xxx*		350	17	340 × 21.3	10	120	3.2	2.15
11354731xxx*		400	17	390 × 24.3	10	111	3.2	2.15

Special lengths on request

U-LINER for gravity pipelines in PE 80**

Mat. No. U-Liner AC	Mat. No. U-Liner AW	Mat. No. U-Liner RAUSISTO*	DN	SDR	Size	Ring stiffness kN/m ³	Supply length m	External drum diameter m	Drum width m
11396731xxx*	11356731xxx*		150	26	142 × 6.2	4.3	615	3.0	2.15
11396831xxx*	11356831xxx*		200	26	190 × 8.3	4.3	520	3.0	2.15
11396931xxx*	11356931xxx*		225	26	215 × 9.2	4.3	330	3.0	2.15
11397031xxx*	11357031xxx*		250	26	240 × 10.3	4.3	390	3.2	2.15
11397131xxx*	11357131xxx*		300	26	290 × 12.2	4.3	229	3.2	2.15
11396361xxx*	11356361xxx*		350	32.25	340 × 11.3	2	180	3.2	2.15
11396461xxx*	11356461xxx*		400	32.25	390 × 12.8	2	155	3.2	2.15

Special lengths on request

* The full material number is defined individually as required according to the packaging.

** Price on request

TRENCHLESS RENOVATION – AWADUKT



PP TL

With maximum reliability due to the innovative jointing technique, REHAU offers a solution for trenchless new installation of sewers both in existing and in new pipe routes.

FIRST THINGS FIRST

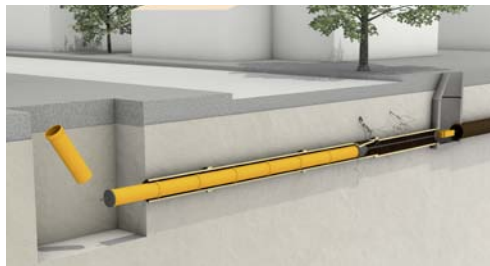
APPLICATIONS – BENEFITS – PROPERTIES

Usable for soil classes 1 – 7.

Applications:

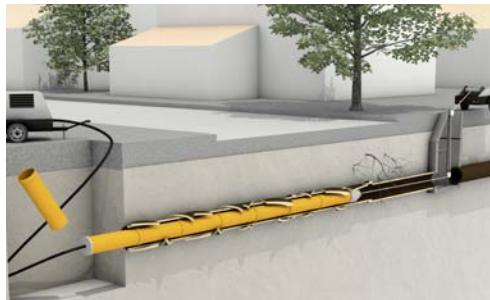
- Increasing static resilience
- Increasing chemical resistance
- Can be laid even on winter construction sites
- Pipes covered e.g. with concrete slabs
- With high moving loads
- Usable even with a high groundwater level

Installation Method



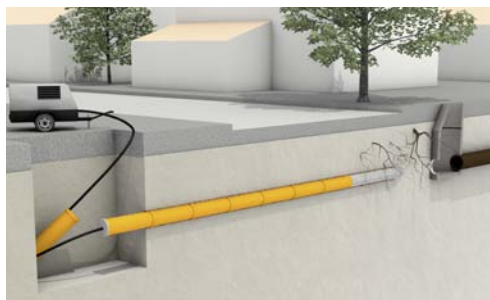
Renovation Method RELINING

- Use of the existing route without complex approvals
- Easy installation



Renovation Method CALIBRE BURST LINING

- Use of the existing pipe route without complex approvals
- Increasing the static resilience of the pipe
- Reducing location deviations, pipe socket misalignments



New Installation SOIL DISPLACEMENT

- No soil excavation
- Preservation of the surfaces
- No traffic congestion
- Quick installation

Benefits:

Time and Cost Saving

- Space-saving installation method with no disruption to traffic flow
- Significant cost saving potentials of up to 30 % compared with open installation
- Long depreciation periods as with new pipes
- Low maintenance cost

Reliability

- Quality management
- Inspected pipe quality

Permanent Function

- Guaranteed new pipe quality

Conservation of the Environment

- Accessibility of neighbouring properties remains largely preserved
- Traffic spaces and historic building stock are preserved and harmful emissions are avoided

Easy, quick installation with screw thread.

Cost saving of up to 30 %.



High static
resilience with
SN >20.

Properties:

High Impact Strength

- Minimising damage from transport and storage
- Can be high-pressure flushed up to 340 bar

Quick Installation

- Due to smooth external surfaces
- No protruding socket joints

Permanently Leak-Free Even in the Case of Deformations and Angles

- Double seal with lip seal as primary seal and Q-TE-C as secondary seal
- Leak-free up to at least 2.5 bar test pressure

High Ring Stiffness > SN 20

- Absorption of all static loads



**Stretch and Shear Resistant Jointing Technique
(with Trapezoidal Thread)**

- Absorption of high tensile and compression forces in the joint confirmed by SKZ

High Chemical and Thermal Resistance

- Use of filler-free polypropylene compliant with DIN EN 1852
- Operating temperature range from -20 °C to +90 °C (short-term)

Leak-free up to
2.5 bar.

PRODUCT ADVANTAGES

Environmental advantage.

Huge resistance to scratches and grooves.

High Ring Stiffness

AWADUKT PP TL stands out for a high level of stiffness of at least 20 kN/m² (SN20). It therefore has a large reserve compared with standard sewer pipes and significantly exceeds the set requirements with respect to static resilience. Subsequent soil settlement due to construction works near the pipe, location deviations or increased moving loads in the area of the pipe are no longer an issue.

Short installation times

Even with rough or broken pipe walls in the old sewer, the pipes can be continuously pushed or inserted into the sewer pipe without becoming stuck. With two people, the metre-long DN 200 pipes are screwed together in a few minutes and can be pushed up to 80 metres into the sewer with no further aids. Quicker installation can be achieved due to the minimised friction of the pipes on the internal walling of the sewer.

Economical and Environmentally Friendly

Because of the trenchless installation of AWADUKT PP TL, significant cost saving potentials of up to 30 % can be achieved compared with conventional open installation, depending on the conditions on site.

Noise and odour nuisances are limited to a minimum. The accessibility for neighbours is preserved.

If there is already a pipe in place then the pipe route can be used for the new pipeline.





Versatile Use

The tensile and compression forces of the screw connections as confirmed by accredited institutions are particularly advantageous. They allow the pipes to be pushed into the sewer as well as providing support by inserting the pipes if necessary. The sewer pipe system is therefore ideally suited not only to relining by also to boring and bursting processes.

Leak-Free

The pipe connections are secured with a double seal: whilst a lip seal provides the seal under standard installation conditions up to 2.5 bar, a secondary Q-TEC-C seal ensures additional reliability under extreme conditions, for example such as greater angles.

Huge Impact Strength

In addition to the stiffness, the huge strength and resistance to impact stresses must be mentioned, which allow installation of the pipes even in the cold part of the year.

Robust and Flexible

In storage and on the construction site, during transport or handling in the construction trench, when connecting or pushing/pulling the pipes in fragile sewers, AWADUKT PP TL demonstrates its high reserves with respect to mechanical strength, flexibility and scratch resistance.

Because of the material flexibility, even jamming of the pipe ends when connecting and corresponding counterpressures do not necessarily result in breaking of the pipe ends.

Suitable for winter construction sites.

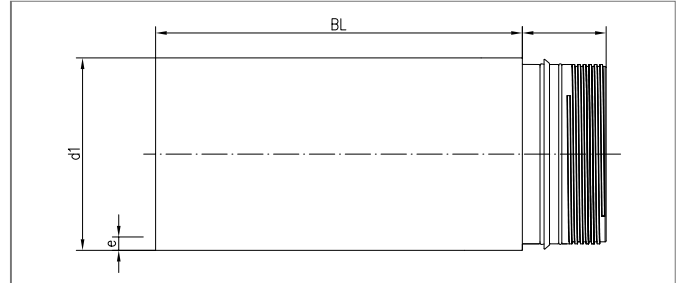
PRODUCT RANGE

AWADUKT PP TL

Pipes with longitudinally force-locked threaded joint

Material: RAU-PP 2300

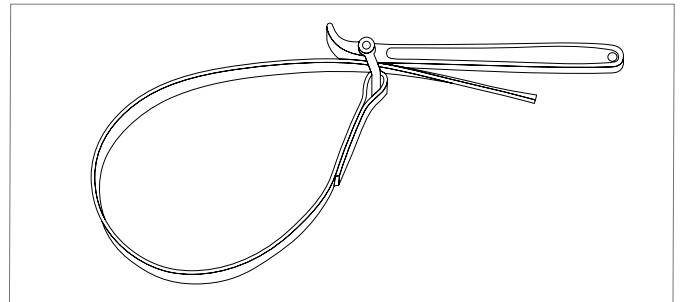
Colour: Orange



Mat. No.	DN/OD	BL (mm)	d1 (mm)	e (mm)	Weight (kg/m)	Units/Pal
13106411001	160	500	160	9	3.80	40
13106511001	160	1000	160	9	3.80	20
13106611001	200	500	200	11	5.80	12
13106711001	200	1000	200	11	5.80	12

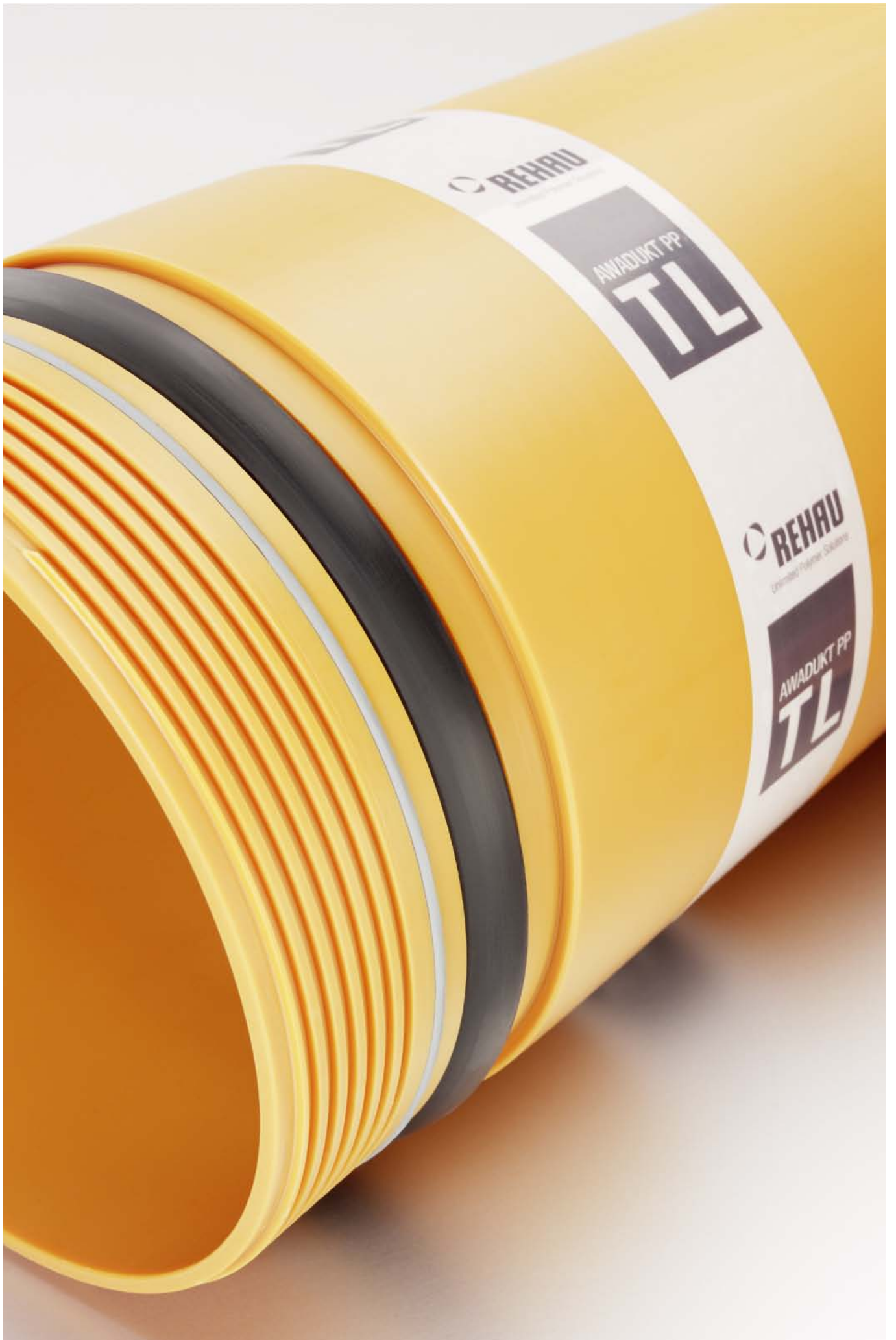
Thrust plate/jacking heads on request

AWADUKT PP TL Strap Wrench



Mat. No.	Weight (kg/Unit)	PU
13109711001	0.6	1

The strap wrench must always be ordered in pairs



Trenchless Renovation – AWADUKT PP TL

FLEXIBLE ROUTE USE – RAUJET IN PVC-





RAUJET ducts in PVC-U offer maximum security for your gas, drinking water, telecommunication and power lines to prevent mechanical damage when installing. The RAUJET ducts are laid cost-effectively and simply as jacking pipes using the burst lining and soil displacement methods. The specially moulded, internal socket guarantees a smooth external surface of the pipe to minimise sheath friction.

FIRST THINGS FIRST

APPLICATIONS – BENEFITS – PROPERTIES

High static
resilience up to
SLW 60.

Ensuring the
service life of the
carrier pipes.

Applications:

Large-scale diversions, temporary traffic lights, traffic jams and superfluous environmental pollution are finally consigned to history due to trenchless installation techniques.

RAUJET ducts from REHAU offer security for your carrier line when installing using the burst lining and soil displacement methods.

With these trenchless installation techniques, the RAUJET ducts can be laid for telecommunication lines, power cables, gas and water pipes with no significant underground construction work.

The specially moulded, internal RAUJET socket produces a smooth external pipe surface on pipes that are pushed together, so the sheath friction affecting the ducts during installation is minimised.

The use of the impact mole technique requires soil that can be displaced in the zone of the pipe as well as sufficient coverage. With recommended minimum coverage of $10 \times \emptyset$ DR (external diameter of the displacing body), resilience of SLW 60 (100 kN/m²) is guaranteed over the entire RAUJET size range in accordance with ATV-A 127.

Benefits and Product Advantages

- Cost-effective protection of the carrier line
- Greatest possible free cross section due to optimised pipe wall thickness
- Static resilience up to SLW 60 (100 kN/m²)
- Specific colour coding depending on application
- Minimisation of sheath friction by internal RAUJET socket and therefore smooth external pipe surface
- Strong and leak-free RAUJET connections due to the use of Tangit adhesive
- Tree population, traffic spaces and historic building stock are preserved
- Reusable route
- Low traffic obstruction and disruption due to smallest construction sites



PRODUCT RANGE AND PACKAGING TYPES

Plant Standard

RAUJET (PVC-U)

Material: RAU-PVC 1109

Installation length: 1000 mm

Other installation lengths on request

Colour Coding/Warning Notice

RAUJET pipes – with the exception of black – are colour coded for the specific application of the carrier pipe/cable.

The lettering also gives the corresponding warning notice.

Lettering:

“Caution! Gas line”

“Caution! High voltage”

“Caution! Water line”

Colour:



Mat. No.	Black	Yellow	Blue	Red	da (mm)	s (mm)	te (mm)	di _{min} (mm)	Approx.kg Unit	Unit/ HRV*	HRV* Length(cm)	HRV* Width (cm)	HRV* Height(cm)
11007001	002	007	006		50	1.8	61	41.0	0.45	332	108	107	96
11033111	001	007	006	008	63	1.9	65	53.0	0.60	263	108	119	106
11014511	002	008	007		75	2.2	69	64.0	0.84	189	108	118	97
11014741	002	009	008		85	2.5	72	72.0	1.00	138	109	119	92.5
11006901	002	007	006		110	3.2	80	95.0	1.77	86	110	117	98.5
11006801	002				125	3.7	85	109.0	2.31	68	109.5	117	100
11006701	001				140	4.1	90	122.0	2.89	53	110	118	97.5
11006601	002				160	4.7	96	138.0	3.77	39	110	116	94.5

*HRV = timber frame crate





PLANNING AND INSTALLING THE



PRESSURE PIPES

PLANNING AND INSTALLING THE PRESSURE PIPES IN PE-XA AND RAUPROTECT IN PE 100-RC

Notes on Planning

Professional Requirements for the Personnel

For planning, construction, building execution, pressure testing and initial operation, the requirements of the current directives, e.g. G472, W400, DWA-A 116 and KRV installation guide, must be observed. The pipeline construction companies to be commissioned to carry out the installation work must hold and have proven the necessary qualifications for this. The qualifications are considered to have been proven if the pipeline construction companies hold the relevant DVGW certification in accordance with DVGW GW 301 and GW 330/GW 331. Particular attention must be paid to observance of EC directive 96/57/EEC and of the construction site ordinance.

Transport

Before loading the pipes onto the lorry, the loading area must be cleaned. There must be no nails, screws or other sharp objects protruding from the loading area. All pipes should be supported over their entire length if possible and not project beyond the loading area. Secure the pipes against slipping! Do not draw the pipes over sharp edges when loading/unloading! Do not drag the pipes over the ground!



Storage

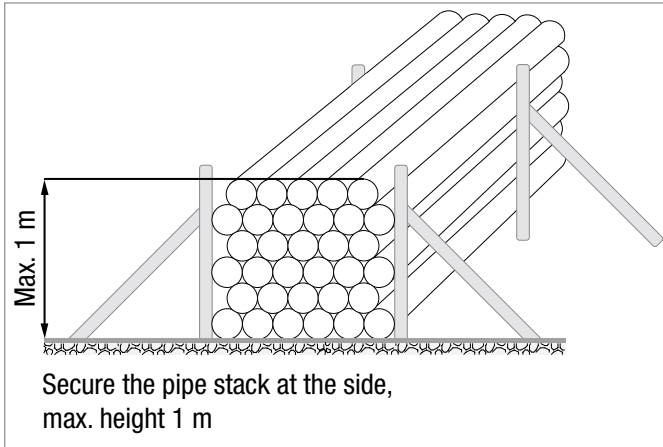
The storage area should be level and allow support over the entire pipe length. Do not store the pipes with stones or sharp-edged objects!

RAU-PE-Xa pressure pipes with a yellow, blue or brown identification coating in PE-HD can be stored outside in central Europe for up to 1 year with no effect on the service life of the pipe. From experience, RAUPROTECT pipes can be stored outdoors in central Europe for up to 2 years with no effect on the strength properties.

In the case of longer periods of outdoor storage or in areas of strong sunshine, e.g. by the sea, in southern countries or at heights over 1500 m, storage must provide protection from the sun. When covering with tarpaulins, good ventilation of the pipes and fittings must be ensured in order to prevent a heat build-up and therefore deformations. Transparent sheets or tarpaulins are not suitable for covering the pipes. There are no restrictions on storage time in the case of storage with protection from light. Sealing elements should essentially be stored out of the sun and in a cool place.



The height of the pipe stack should be max. 1 m. Secure the pipes from rolling away to the side (risk of accident)!



Coils should be stored flat and not on top of one another.



If the coils are stored standing up, they must be secured at the side to prevent falling over (risk of accident).

Pipes and parts of pipelines must be stored such that they do not become dirty inside. The sealing caps should therefore be removed only on installation.

Avoid contact with harmful media (see DIN 8075 supplementary sheet 1)!

After cutting coils or cut lengths, the end caps must be replaced on the pipes remaining in storage.



NOTES ON INSTALLATION

Earthworks

The requirements of DVGW rules G 472/W 400 and DWA-A 116-2 must essentially be followed for earthworks and installation work.

It is not necessary to create a specific bed for installation when excavating the pipe trench.



Checking the Pipes and Pipe Components

The pipes and pipe components must be checked for damage from transport and storage before being placed in the pipe trench. Pipes with grooves, scratches or extensive deposits of over 20 % of the wall thickness are not to be installed.

Specific Features in the Processing of Coils



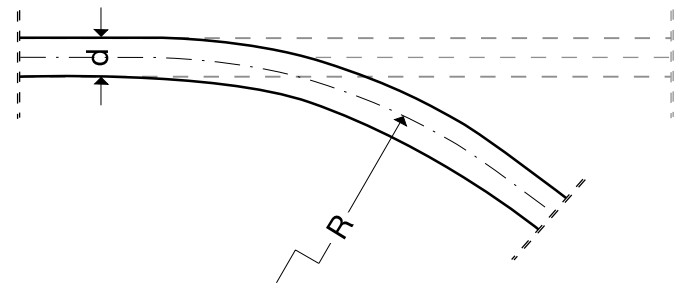
When unwinding the pipes from drums or coils, it must be noted that the pipe ends can spin away when the bindings are released. As significant forces are released particularly in the case of larger diameters, proceed accordingly with caution (risk of accident)!

When unwinding, ensure that the pipe does not twist, otherwise kinks can form.

Minimum Bending Radii

The high flexibility of the pipes, whether cut lengths or coils, allows easy and quick installation. As such, smaller obstacles can be avoided by bending the pipes and changes of direction within the trench are possible without the need to use fittings. The minimum bending radii dependent on pipe temperature must be observed here. Smaller bending radii are possible with RAU-PE-Xa pipes compared with pipes in PE that is not crosslinked.

Installation temperature	Minimum bending radius R	
	RAU-PE-Xa	RAUPROTECT
20 °C	10 × d	20 × d
10 °C	15 × d	35 × d
0 °C	20 × d	50 × d



The decrease in flexibility at low temperatures means that the pipes are less easy to unwind/install at installation temperatures around freezing point. In this case, interim storage of the coils in a heated hall or heated tent over a period of a few hours immediately before installation will help with processing. Alternatively, the pipes can be heated by passing warm air or steam through them. When doing this, it must be ensured that the pipes are not made dirty inside.

Squeeze-off Technique

According to DVGW rule GW 332, shutting off the medium flow using the squeeze-off technique is permitted for PE pressure pipes for integration and repair measures – however, practical experience to date is available only for diameters up to 160 mm and wall thicknesses up to 10 mm. The specifications from the datasheet must be observed. The squeeze point must be at least $5 \times$ the external diameter away from the next pipe connection. The distance from a previous squeeze point must be at least $6 \times$ the external diameter.

Creating Fitting Lengths

The pipes are cut to length either with a pipe cutter or with a fine-toothed saw.



When cutting to length, ensure that the pipes are free of tension! If necessary, apply a fixing to both pipe sections to be separated, otherwise they could spring away (risk of accident)!

Ensure that the cuts are perpendicular to the pipe axis. When sawing, use a cutting jig. Remove burrs and irregularities from the joint faces using a scraper, rasp or similarly suitable tool. When cutting to length and installing, observe the variation in pipe length due to temperature (see [initial operation/retrofitting/length variation](#)). If the pipes are laid outdoors, e.g. in a duct, high tensile forces occur at the fixed points as a result of the lengthening or shortening of the pipe due to temperature. The total length of the pipeline must therefore be planned in relation to temperature.



JOINTING TECHNIQUE

The following jointing techniques are possible:

- Electrofusion jointing (HM)
- Mechanical connection with off-the-shelf clamp, screw and push fittings
- Butt fusion jointing (HS) (RAUPROTECT only)

Welded Joints

The pipes can be welded by electrofusion jointing (please observe directive DVS 2207-1 supplementary sheet 1). Both RAUPROTECT pipes and standard pipes in PE 100 can be welded. Butt fusion jointing is not yet possible for RAU-PE-Xa pipes at present.

Electrofusion Jointing (HM)

RAUPROTECT and RAU-PE-Xa pipes can be welded with off-the-shelf electrofusion fittings. For installation of the joints, follow the fitting instructions of the fitting manufacturers.

Preparation for Electrofusion Jointing

Weld preparation is very important for the weld quality.

It is therefore essential to follow the fitting manufacturer's installation instructions.

Immediately before welding, the machined point on the pipe must be cleaned with a suitable cleaning cloth. Ensure here that no dirt particles from the sections of pipe that have not been cleaned previously are introduced to the weld area with the cleaning cloth. The external pipe surface must then be removed to a thickness of approx. 0.2 mm by scraping once with a suitable rotary scraper. The specific structure of RAU-PE-Xa pipes allows simple checking of the scraping process:

If the coloured identification coating is not completely removed after one-off rotary scraping then this is an indication of uneven and possibly inadequate cutting removal. In such cases, it is recommended to remove the rest of the coloured identification coating with a hand scraper. Do not repeat scraping with a rotary scraper, so the external pipe diameter is not reduced to below the minimum size required for proper welding.

Any remains of the coloured identification coating on the RAU-PE-Xa pipe will have no lasting effect on the weld quality.

In cases where use of a rotary scraper is not possible, e.g. in confined spaces in the pipe trench, the use of a hand scraper is permitted. For such exceptional cases, it is recommended to fully remove the coloured identification coating from the RAU-PE-Xa pipes in the area to be worked on. This guarantees that enough material has been removed in order to be able to create a proper weld.

The coloured identification coating of the RAU-PE-Xa pipes thus offers a visual option for checking in order to ensure optimum welding.

Unlike conventional pressure pipes in PE 80 or PE 100, RAUPROTECT in PE 100-RC displays a permanently applied label strip on the outside of the pipe, which carries both plain text lettering in accordance with the standard and the traceability barcode for complete traceability.

The current rotary scrapers generally follow the external contour of the pipe to be processed. In the area of the label strip on a RAUPROTECT pipe, a slight discontinuity may remain, which nevertheless represents no problem for the durability of the joint. After one-off scraping with a functional rotary scraper, any remains of the strip still present should be fully removed using an ordinary scraper.

Butt Fusion Jointing (HS)

With this method, RAUPROTECT in PE 100-RC can be welded to standard pipes in PE-HD. To do this, the pipe ends are heated on a heated plate and butt jointed by pressing together.



Pressure Test

Initial operation of the line may take place only once the pressure test processes in accordance with DVGW worksheet G 472/G 469 have been conducted faultlessly in observance of the specifications in DIN EN 12327 for gas, W 400-2 for water and DWA-A 139 for wastewater.

To keep the cost as low as possible for finding and eliminating any leaks, the length of the pipe section to be tested should not exceed a reasonable size. Moreover, the line should be covered only sufficiently for the effects of temperature on the result of the pressure test to be largely eliminated. The connection points should remain accessible as far as possible.

Corrosion Protection of Metallic Accessories

Corrosion protection compounds that are hot or that contain solvents must not come into contact with the pipe. If sealants and lubricants containing fat are used then the pipes must be protected from direct contact by means of sheaths that are impermeable to fat.

The processing instructions, particularly concerning the compatibility of the intended corrosion protection agent with PE 100 pipes, are to be obtained from the respective manufacturer. The corrosion protection may be applied only after the pressure test.

Backfilling of the Pipe Trench

When installing, compactable material of any grain size and shape may be used to backfill the pipe trench in the area of the pipeline.

If the pipe temperature is significantly higher than the temperature of the pipe trench due to direct solar radiation, the pipe should be lightly covered before final backfilling of the pipe trench. The remaining backfilling of the pipe trench should be carried out in accordance with the current civil engineering regulations.

Exposed areas of the pipe must be protected with a cover that is impermeable to light or with pipe insulation. For exposed emergency supply lines, RAUPROTECT drinking water pipes can be used as an alternative.



Initial Operation

The stipulations according to DVGW W 291 (A) apply for drinking water pipelines. The pipelines must be cleaned and flushed before initial operation.

Subsequent Installation of Pipe Sections

For the creation of mechanical or electrofusion joints, the line must be tension and pressure free on separation. The latter can be achieved by setting shut-off bladders or squeezing-off the pipeline.

To avoid electrostatic charges, the pipe surface must be kept wet at the work point in the case of mechanical processing of polyethylene pipes carrying gas, e.g. when separating. Use an air purge system (e.g. tapping clamp), to guarantee that no internal pressure from gases can build up during the connection work.

Length Variation in the Case of Temperature Fluctuations

The length variation caused by temperature fluctuations is significantly greater than with metallic pipes.

The following must be taken into account when calculating length variation ΔL :

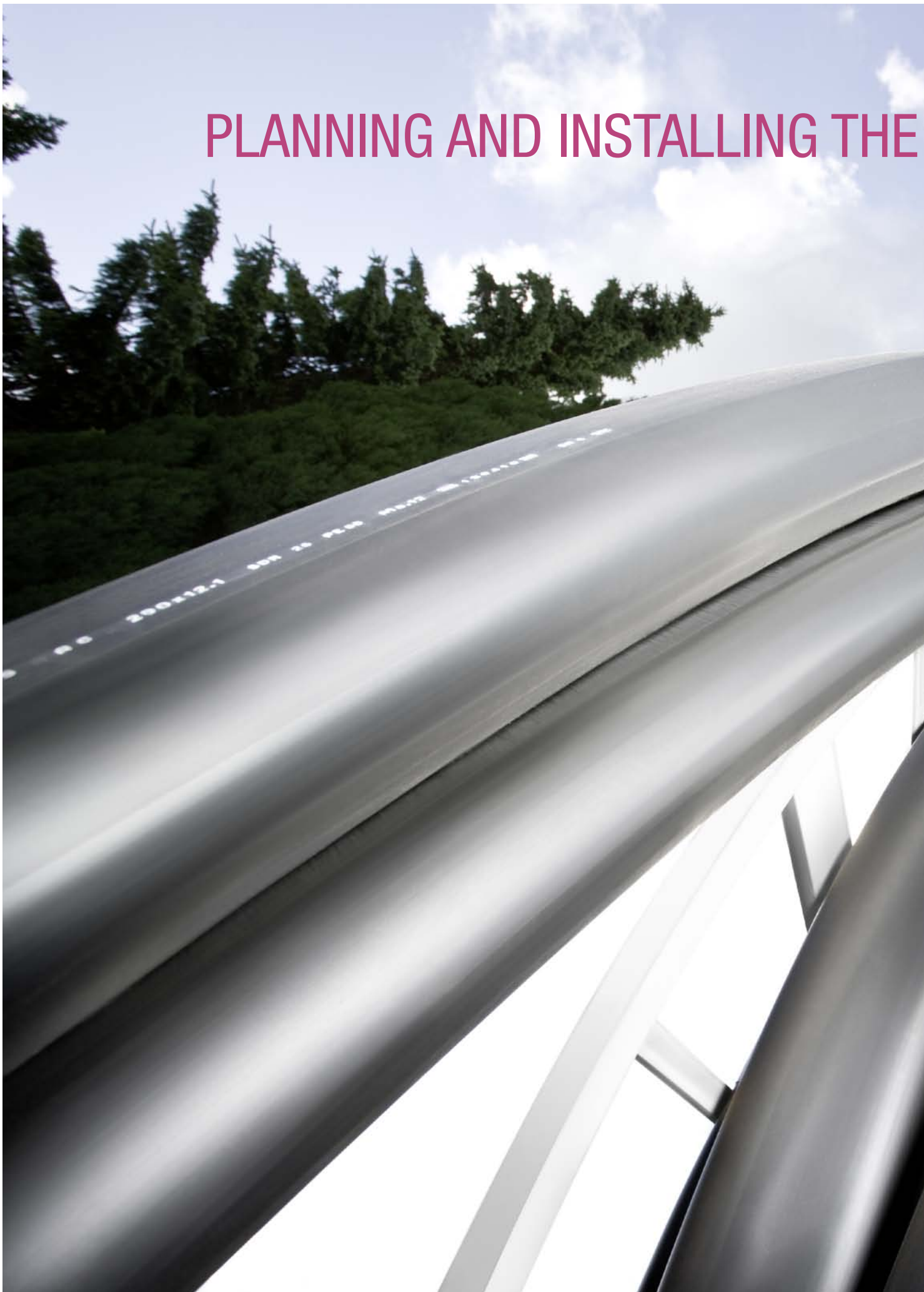
- Prevalent temperature at the time of installation (T1)
- Lowest and highest expected pipe wall temperature during operation of the system (T2)
- Coefficient of linear thermal expansion
 - For RAU-PE-Xa $\alpha = 1.5 \times 10^{-4} \text{ K}^{-1}$
 - For RAUPROTECT $\alpha = 2.0 \times 10^{-4} \text{ K}^{-1}$

Calculation examples:

$$\Delta L \text{ (m)} = L \text{ (m)} \times \Delta T \text{ (K)} \times \alpha \text{ (} 10^{-4} \text{K}^{-1}\text{)} \text{ where } \Delta T = T_2 - T_1 \text{ (K)}$$

		Temperature Difference from Installation Temperature	
		RAU-PE-Xa	RAUPROTECT
Pipe length	10 m		
Installation temperature	+15 °C		
Lowest expected pipe wall temperature	+5 °C		10 K
Greatest expected contraction		$\Delta L_1 = 10 \text{ m} \times 10 \text{ K} \times 1.5 \times 10^{-4} \text{ K}^{-1} = 15 \text{ mm}$	$\Delta L_1 = 10 \text{ m} \times 10 \text{ K} \times 2.0 \times 10^{-4} \text{ K}^{-1} = 20 \text{ mm}$
Highest expected pipe wall temperature	+20 °C		5 K
Greatest expected extension		$\Delta L_1 = 10 \text{ m} \times 5 \text{ K} \times 1.5 \times 10^{-4} \text{ K}^{-1} = 7.5 \text{ mm}$	$\Delta L_1 = 10 \text{ m} \times 5 \text{ K} \times 2.0 \times 10^{-4} \text{ K}^{-1} = 10 \text{ mm}$

PLANNING AND INSTALLING THE



U-LINER



PLANNING AND INSTALLING THE U-LINER

Applications

The method is used for the trenchless renovation of:

- Steel or cast iron pressure pipes
- Concrete, reinforced concrete, stoneware, fibre cement, cast iron, GRP, PVC-U and PE-HD sewer pipes

The method is suitable if the old pipeline is no longer able to cope with the demands from a hydraulic and static perspective, there are leaks to be mended, the pipeline needs protecting from dirt, and the operating life of the pipe is to be extended. The method is particularly advantageous in the case of inaccessible holders, a heavy volume of traffic or complex building structures.

In addition to the pipe material, the economic analysis must also take into account all other factors of the construction measure including traffic regulations and environmental constraints, e.g.:

- Protecting the surfaces with minor construction measures
- Protecting the tree population and historic building stock
- Unimpeded traffic flow during the construction measure
- Minimising nuisance to residents
- Avoiding harmful emissions in the atmosphere or groundwater



Planning

Based on the internal diameter of the existing pipeline, the external diameter of the U-Liner is selected to be at least 1.5 % smaller than the smallest internal diameter of the old pipeline. Using gauges, the critical points can be localised and removed with the aid of appropriate equipment. The wall thicknesses are measured on the basis of DIN 8074. The minimal reduction of pipe cross section due to the wall thickness of the U-Liner is compensated by eliminating hindrances to the flow, e.g. such as ingrown roots and incrustation and by improving the inner surface of the pipe (k value of the PE pipe is 0.01 mm).

In most cases, the renovation even results in improvement of the hydraulic flow capacity and in a self-cleaning effect.

Compared with pipes that are laid using the cut-and-cover method, the loads affecting a liner

are lower, as the installation of the liner does not disrupt the balance between the old pipe and the surrounding soil.

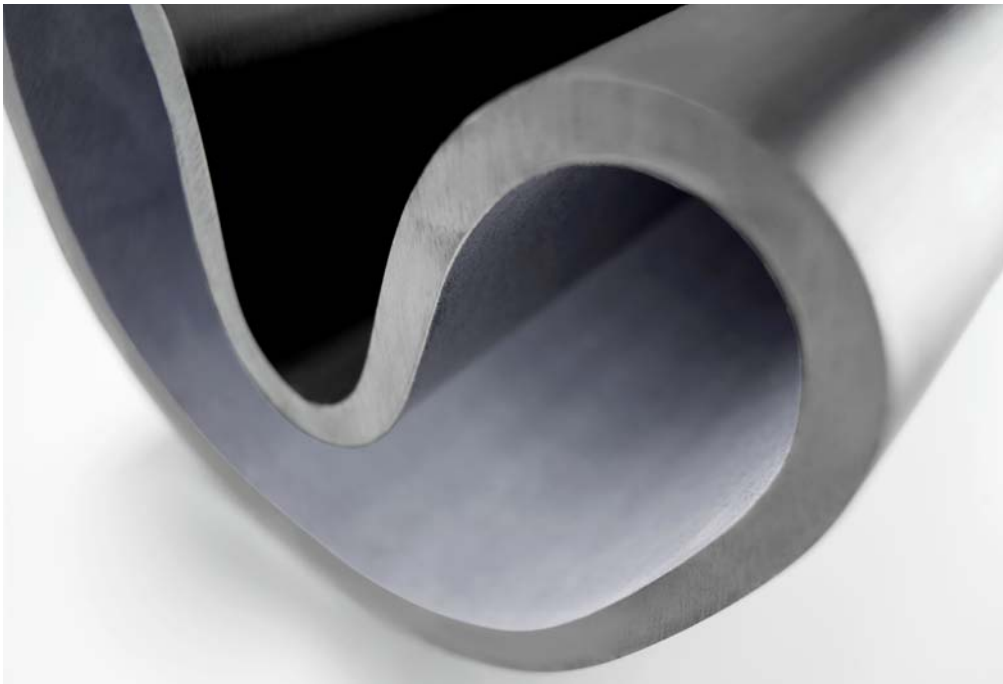
The planning is conducted using suitable calculation methods, as described in ATV (general technical regulations) datasheet M 127 "Static calculation for the renovation of sewer channels and pipes with lining and assembly processes", part 2 as a supplement to worksheet ATV-DVWK-A 127.

The different loads are discussed in detail as examples here: e.g. soil and moving loads, groundwater pressure, support from the old pipe (depending on the CLOSE-FIT result).

The U-Liners can be used both as self-supporting liners, which withstand all loads alone, and as liners that provide additional support with reduced wall thickness, e.g. which absorb only any groundwater load present.



The planning is the responsibility of the planner or installer and must therefore be carried out by professionals trained for such. REHAU accepts no responsibility for improper and incorrect planning services or for damages due to deficient planning.





Installation

Installation is carried out by specialist companies with over 15 years of experience, so high installation quality in observance of the relevant regulations is guaranteed.

The accessibility of the line and the presence of spaces for the steam system, drum lorry, winch and compressor are critical to whether the U-Liners can be laid.

The preparatory work is limited to the creation of starting and target excavations and the cleaning of the line, such that the required free pipe cross section exists for inserting the U-Liners.

In the case of sewer pipes, the existing shafts are used. The U-Liners are inserted from the drum directly into the line to be renovated. There is no need to lay out the pipe run in advance or for butt welding in the case of pipe diameters from DN 200.

This produces space and time savings compared with other pipe run methods.

The maximum permitted tensile forces in accordance with GW 320-2 must not be exceeded during insertion. With the controlled and documented installation process, up to 600 m can be laid per day. The method therefore guarantees extremely low installation times.



PLANNING



AND INSTALLING AWADUKT PP TL

PLANNING AND INSTALLING AWADUKT PP TL



Bleaching of the pipes or discolouration due to storage in the sun has no negative effect on the quality of the PP pipes.

Transport and Storage

Proper transport and correct storage must be ensured in order to guarantee the function of the AWADUKT PP TL pipes.

The pipes are supplied packaged in skeleton containers or on pallets. Suitable transport equipment must be used for loading and unloading. Tipping and throwing are not permitted.

Avoid sagging and impact loads! Grooves and scratches particularly in the area of joints can cause leaks in the screw connection.

Pipes, fittings and other joint accessories must be checked on delivery in order to ensure that they are compliant with the planning requirements and display no damage.

All materials must be stored appropriately in order to prevent dirt and damage. This particularly concerns the seals of the AWADUKT PP TL. The secondary seals are supplied in a sealed, watertight bag and must be protected from moisture for the duration of storage until installation.

The pipes are to be protected from the sun, e.g. with bright tarpaulins. Provide good ventilation in order to prevent heat build-up under the tarpaulins!

Lowering into the Pipe Trenches

For safety reasons and to avoid damage, appropriate equipment and methods must be used to lower the components into the pipe trenches.

The pipes are principally lowered into the pipe trenches by hand due to the light weight of smaller diameters. The pipes must not be thrown into the pipe trenches. When using lowering equipment, ensure that the pipes do not become damaged.



Joining Technique

For connecting side inlets, we recommend the use of AWADOCK POLYMER CONNECT, AWADOCK T-FLEX or saddle pieces. Connect to concrete shafts with AWADUKT KGF shaft linings.

In the case of scratches on the outside of the pipe from the pipe end to be pushed in, we recommend replacing the pipe concerned with a new one that has no surface damage in order to ensure the seal of the shaft joint.

To do this, the pipe end can be separated from the laid pipe run at the screw connection. The new pipe must be protected from damage in the planned area of the shaft lining during assembly on the pipe run and when pushing into the shaft lining.

Notes on Installation

The regulations of DWA datasheets ATV-DVWK-A 125 (pipe jacking and related procedures) and ATV-DVWK-A-161 (static calculation of jacking pipes) must be observed.

In the case of annular clearances of >5 mm between the external pipe wall and the soil present and in the case of geologically unfavourable conditions, we recommend filling the gap with load-bearing insulating material. In the case of greater tensile forces during installation (e.g. over longer lines), we recommend appropriate tensioning of the pipes. If AWADUKT PP TL is used in steered auger boring, then strong screw joints must be ensured so the thread is not loosened by material movement.

Use thrust plates for preliminary pressing of the pipe without damaging the pipe. Insert the plates into the end of the pipe that is connected last and tension with the expander head ahead of the first pipe.



If the AWADUKT PP TL are laid in relining, we recommend the use of a jacking head instead of the expander head in the case of elbows, angles or for example with offset sockets. The jacking head allows support for insertion of the pipes into the existing line by means of tensile force.





Pipes, pipe components and sealants must be checked for damage before being lowered into the pipe trench.

Screw Connection from AWADUKT PP TL

AWADUKT PP TL pipes must be checked for damage to the thread and seal before forming the screw connection.

If necessary, clean dirt from the internal and external threads in order to ensure a proper connection. To guarantee a leak-free joint, there must be no dirt on the sealing surfaces (see picture 1).



A grey secondary seal (swelling seal) supplied must be removed from the bag without stretching the seal. Reseal the bag to protect the remaining seals from moisture.

To place the secondary seal in the groove provided for this, the seal must be carefully rolled over the external thread up to the groove and with minimal stretch (see picture 2).



The secondary seal must be inserted such that it lies evenly in the groove provided, over the entire circumference of the pipe (see picture 3).





For the screw process, the black lip seal and the inside of the socket ahead of the internal thread must be coated with standard lubricant for plastic pipes (no silicone lubricant). It must be ensured here that the seals are sitting correctly. Do not coat the threads with lubricant (see picture 4).



Now push the pipes together and tighten the screw joints by hand (see picture 5).



With two strap wrenches, screw the pipes as far as they will go, using the second strap wrench for resistance (see picture 6).

PLANNING AND INSTALLING RAUJET





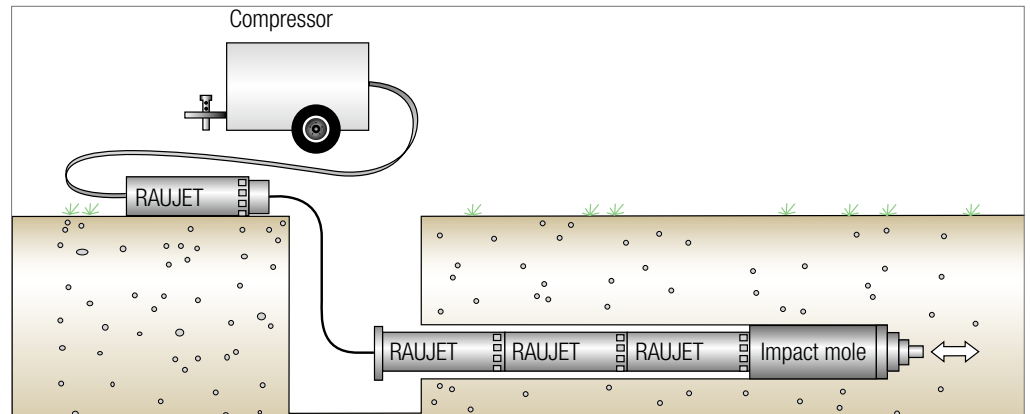
 **REHAU**
Unlimited Polymer Solutions

PLANNING AND INSTALLING RAUJET

1. Soil displacement method

Using an impact mole powered by compressed air, heavily frequented roads, railway embankments, gardens and other surfaces deserving preservation

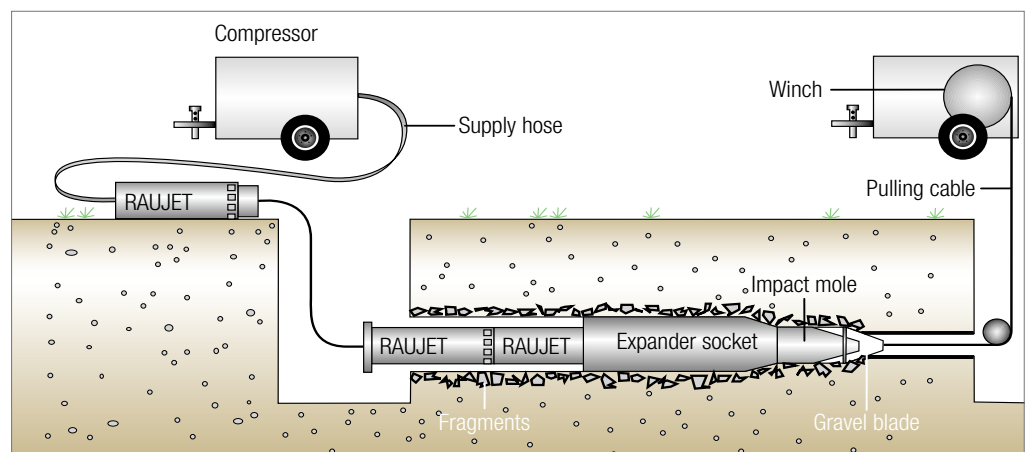
can be underpassed with no trench accurately over a length of 25 m and more.



2. Burst lining method

Gas and water supply pipes can be renovated using the burst lining method with RAUJET pipes. The dynamic impacts of the impact mole destroy the old pipe and displace the fragments into the surrounding earth. In the same operation, the RAUJET pipes,

which are tensioned in the soil by means of a chain, are inserted into the soil channel with almost no friction. After a certain time, the relaxation of the constricted soil in the area of the pipe results in good filling of the duct run.



3. Installing the carrier pipe

After installing the RAUJET duct, the carrier pipe or cable can be drawn in with the aid of a conical back-pulling head or sock. For shorter holding

lengths, the carrier pipe can also be pushed in. It is recommended to insert the new pipe in the direction of the socket.

REHAU SERVICE



Unlimited Polyn



SYSTEMATIC SERVICE

REHAU SERVICES





Services in all Project Phases

As a planner, specialist wholesaler or even construction company, you are in competition. Schedules are becoming tighter and your clients expect statements about construction costs, economy and technical feasibility even in the design phase. From the outset, you need reliable information, the right tools and reliable partners. REHAU helps you to meet these requirements. With an optimum service package, we support you in all project phases – from design through technical and economic planning to construction.

SERVICES

WE ARE AT YOUR SIDE – ALWAYS AND EVERYWHERE



TECHNICAL SUPPORT

We provide personal advice on the telephone and on site. Make an appointment with one of our technical specialists, who will support you with tackling your project challenge.



PLANNING SUPPORT

Our REHAU planning centre supports you with the design and planning of your construction projects.



TENDER SPECIFICATIONS

To ensure that you receive the product you want, we support you with detailed tender specifications in Word or GAEB format online at: www.rehau.com



SALES DOCUMENTS

You receive detailed information about our ranges, products and solutions conveniently over the Internet or in printed form. We also support the trading of target group specific, professional sales promotion aids. Talk to us!



TECHNICAL DOWNLOADS

We provide forms for you for calculating pipe statics and for hydraulic dimensioning as well as test reports and fitting and installation instructions to download at: www.rehau.com



CONSTRUCTION SITE SUPPORT AND BRIEFING

Do you have any questions about the initial installation of our products? We will be happy to come to you on the construction site and give you and your colleagues a qualified briefing.



10-YEAR GUARANTEE

We are confident of our product solutions. We therefore offer you far more than the guarantee required by law. 10-year guarantee incl. installation and removal costs.



PIPE STATICS

Our technical specialists perform static calculations specifically for the building in accordance with ATV-DWK A127 – and free of charge. With the statics certificate you are always on the safe side.



QUALITY ASSURANCE THROUGH SELF AND EXTERNAL MONITORING

We have our pipe ranges tested and monitored regularly by independent institutions.

REHAU E-Business

For specialist wholesalers with their own inventory control system:

EDI (Electronic Data Interchange) is the paper-free office of today.

The following advantages can be achieved with EDI:

- You reduce your costs
- You minimise lead times
- You avoid errors
- You have a smooth data stream with no media disruption in both directions
- We keep you updated by e-mail with our "Civil Engineering News and Innovations" newsletter



REHAU ACADEMY

We know how precious your time is.

The REHAU ACADEMY seminars therefore come straight to the point with the important content: practical knowledge from the areas of technology, law and sales.

Invest your time – it is worth it.

The events take place regularly in our training centres, in the REHAU sales offices and directly on customers' sites. Only with excellent advice can the potential of our system solutions be optimally exploited on all levels.

Our seminars are recognised training measures of the German chambers of engineers, e.g. NRW (North Rhine – Westphalia) or Bavaria.



INNOVATIVE SYSTEMS FOR CONSTRUCTION

FROM ENERGY-EFFICIENT CONSTRUCTION TO RESOURCE-SAVING WATER MANAGEMENT

REHAU is a leading supplier of integrated system solutions for construction, with comprehensive service in planning, implementation and operation, e.g. for energy-efficient construction and sustainable water management.

Window and Curtain Walling Technology

Systems for:

- 1** Windows
- 2** Lift and slide doors
- 3** Curtain walling
- 4** Front doors
- 5** Roller shutters and louvre shutters
- 6** Ventilation technology
- 7** Interior window boards
- 8** Front door panels
- 9** Terrace systems
- Patio doors
- Winter gardens

Building Services

Systems for:

- 10** Subsurface heating/cooling
- 11** Wall heating
- 12** Drinking water and heating installations
- 13** Central vacuum cleaner systems
- 14** Sound-insulating domestic wastewater system
- Concrete core tempering
- Electrical installations
- Acoustic chilled ceilings

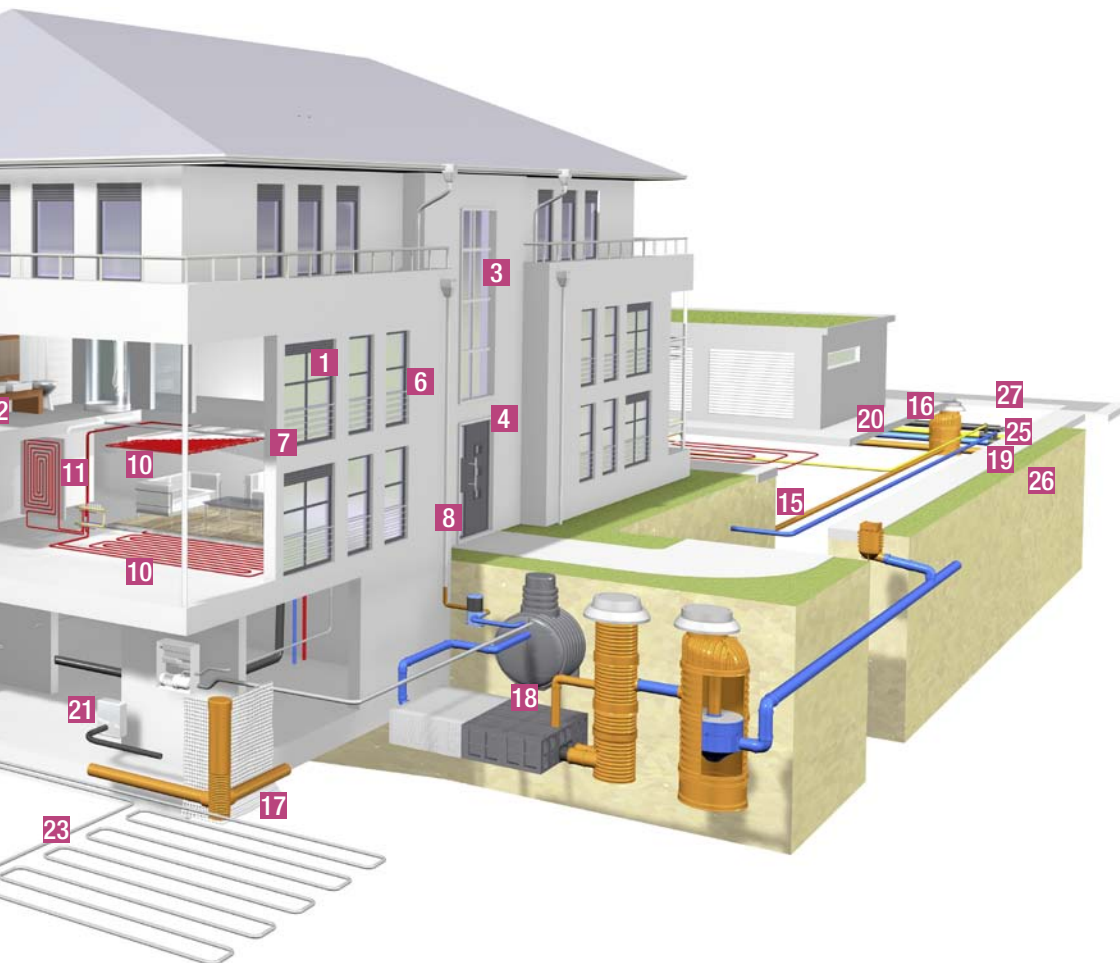
Civil Engineering

Systems for:

- 15** Wastewater and stormwater sewers
- 16** Wastewater shafts
- 17** Drainage pipe systems
- 18** Stormwater management
- 19** Drinking water pipes
- 20** Gas lines
- 21** Local and district heating supply
- 22** Geothermal heat exploitation with probes



- 23** Geothermal heat exploitation with collectors
- 24** Ground-air heat exchanger
- 25** Communication lines
- 26** Trenchless pipe construction
- 27** Earthworks and traffic route construction
- Building inlets
- Sewage treatment plants
- Biogas plants



Window and Curtain Walling Technology

System solutions for windows, front doors, roller shutters, louvre shutters and curtain walling. Whether renovation project or new build: systems and first-class services for all construction phases from building planning to completion.

Building Services

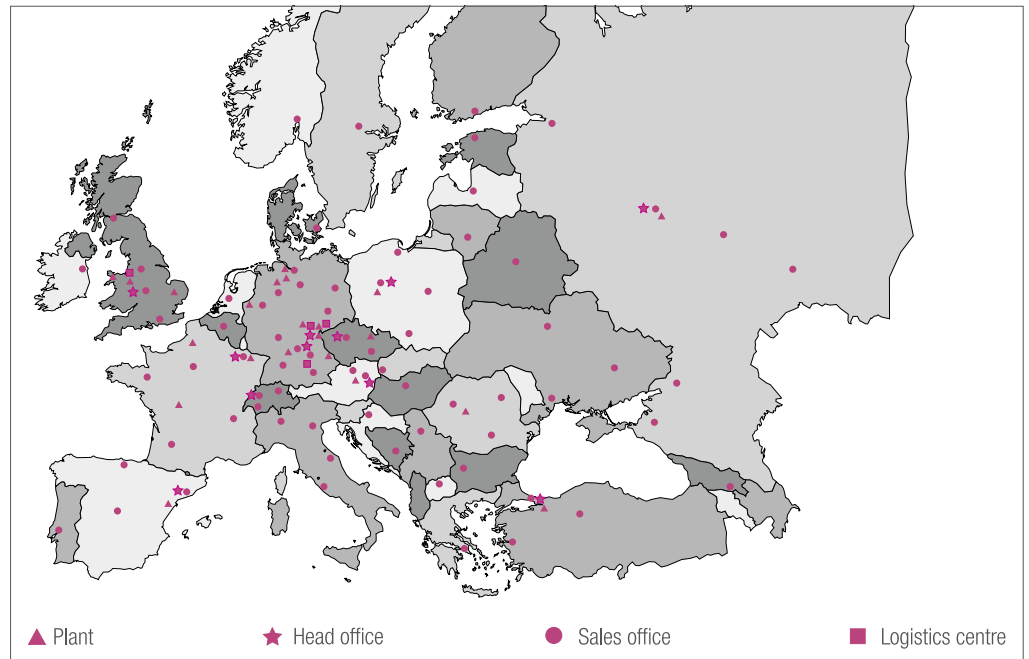
System solutions: from subsurface heating/cooling through plumbing, heating, gas and electrical installations to industrial pipe and compressed air networks.

Civil Engineering

System solutions: from supply through communications engineering, geothermal energy and stormwater management to traffic route construction, earthworks, foundation engineering and disposal.

REHAU SALES OFFICES

ALWAYS NEAR TO YOU



REHAU locations in Europe

REHAU wants to be near to its customers. Regional REHAU sales offices are available to you for quick, satisfactory and constant support on site. Here, competent employees provide qualified advice as well as processing enquiries and dealing with problems.

The current REHAU products are kept ready for you in high-performance logistics centres and large warehouses. We support you with advice and assistance from the preparation and development of large projects or difficult designs through to completion.

REHAU SALES OFFICES

IN GERMANY

Berlin Sales Office

Stralauer Platz 34
10243 Berlin
Tel.: +49 (0)30 66766-0
Fax: +49 (0)30 66766-133
berlin@rehau.com

Bochum Sales Office

Vita Campus
Universitätsstraße 140
44799 Bochum
Tel.: +49 (0)234 68903-0
Fax: +49 (0)234 6890391
bochum@rehau.com

Frankfurt Sales Office

Gewerbegebiet Dietzenbach Nord
Waldstraße 80-82
63128 Dietzenbach
Tel.: +49 (0)6074 4090-0
Fax: +49 (0)6074 29029
frankfurt@rehau.com

Hamburg Sales Office

Tempowerkring 1c
21079 Hamburg
Tel.: +49 (0)40 733402-100
Fax: +49 (0)40 7314237
hamburg@rehau.com

Leipzig Sales Office

Gewerbegebiet Nord-West
Ringstraße 4
04827 Gerichshain
Tel.: +49 (0)34292 82-0
Fax: +49 (0)34292 75180
leipzig@rehau.com

Nuremberg Sales Office

Am Pestalozziring 12
91058 Erlangen/Eltersdorf
Tel.: +49 (0)9131 93408-0
Fax: +49 (0)9131 616193
nuernberg@rehau.com

Stuttgart Sales Office

Malmsheim
Haldenstraße 1
71272 Renningen
Tel.: +49 (0)7159 1601-0
Fax: +49 (0)7159 5951
stuttgart@rehau.com

For European exporting companies please contact:

REHAU AG+Co
International Business Development CE
P.O. Box 3029
91018 Erlangen, Germany
Tel.: +49 (0)9131 9250
Fax: +49 (0)9131 92-5564
erlangen@rehau.com



REHAU sales offices in Germany

Terms and Conditions of Delivery and Payment:

Under € 5,000.00 net value of goods ex works, from € 5,000.00 net value of goods carriage free to receiving station. Additional carriage for express goods at the expense of the orderer.

Term of payment: 10 days 2 %, 30 days strictly net. Delivery and invoicing under the REHAU terms and conditions of delivery and payment with which you are familiar. These can be viewed at www.rehau.com or sent on request.

Minimum order quantity:

€ 250.00 net value of goods. Other items from the standard REHAU ranges can also be included to achieve this net value of goods.

Prices:

All prices are exclusive of value added tax.

Delivery period:

On request.

Article identification:

For clear identification of the items, the item, material and colour number must be specified.

Subject to technical changes.

In the case of queries, please contact our applications technology.

This document is protected by copyright. All rights based on this are reserved. No part of this publication may be translated, reproduced or transmitted in any form or by any similar means, electronic or mechanical, photocopying, recording or otherwise, or stored in a data retrieval system.

Our verbal and written advice relating to technical applications is based on experience and is to the best of our knowledge correct but is given without obligation. The use of REHAU products in conditions that are beyond our control or for applications other than those specified releases us from any obligation in regard to claims made in respect of the products. We recommend that the suitability of any REHAU product for the intended application should be checked. Utilization and processing of our products are beyond our control and are therefore exclusively your responsibility. In the event that a liability is nevertheless considered, any compensation will be limited to the value of the goods supplied by us and used by you. Our warranty assumes consistent quality of our products in accordance with our specification and in accordance with our general conditions of sale.

Other REHAU ranges

Sewer technology



Telecommunications

www.rehau.com