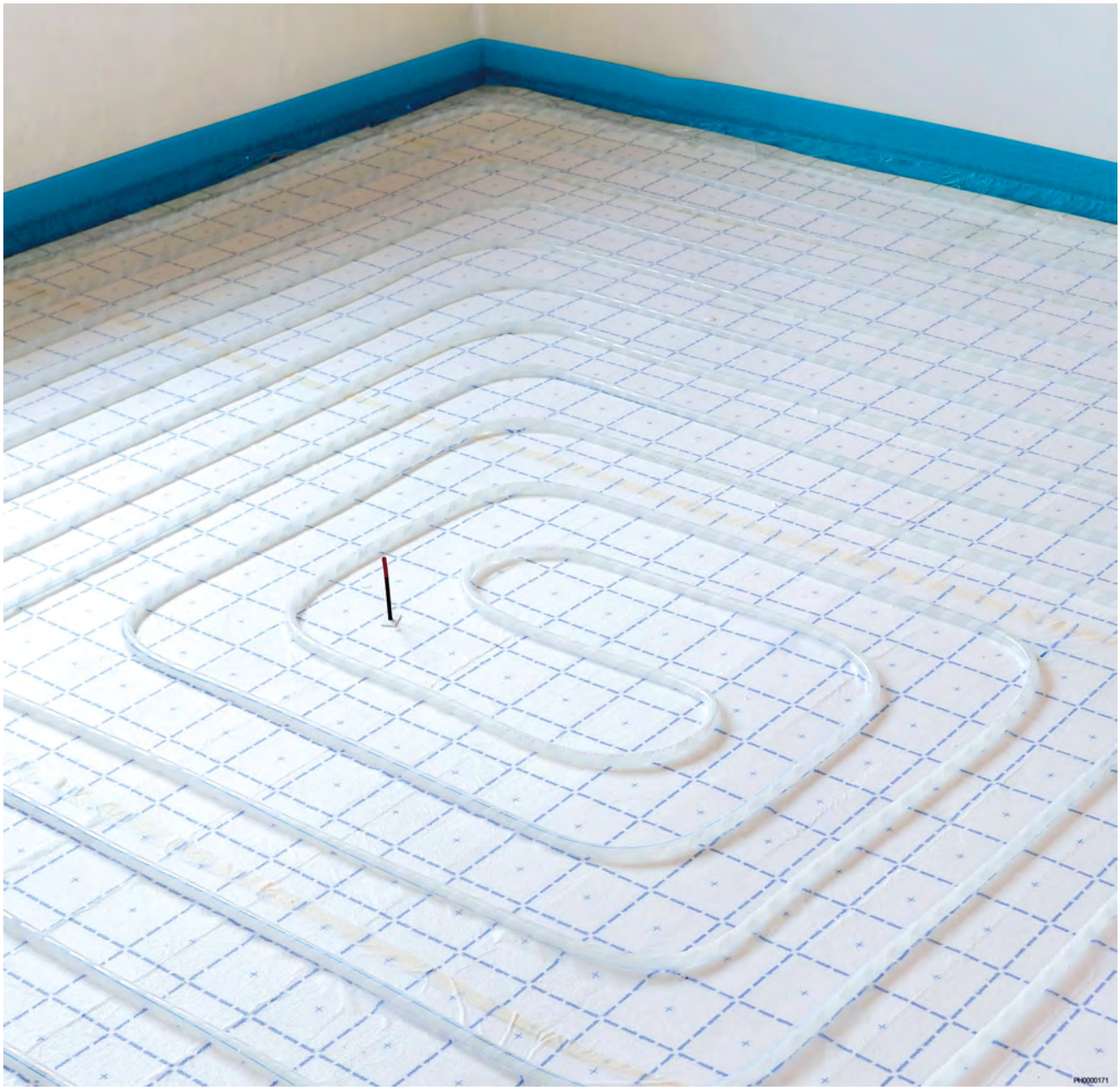
Uponor Klett underfloor heating/cooling

EN Technical information



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1 System description

Uponor Klett is a system for fast and easy laying of underfloor heating and cooling pipes. Uponor Klett is used in combination with either Uponor Klett Comfort Pipe PLUS (PE-Xa pipes) or Uponor Klett MLCP RED (composite pipe).

The oxygen-tight pipes are supplied spiral wound with hook tape. A suitable loop foil is laminated onto the corresponding insulation panel. The printed installation grid provides orientation during installation. The Uponor Klett pipes are pushed down on the laminated insulation panel at calculated distances. The hook tape then engages with the loop foil of the insulation panel, hence holding the pipes in place. Hook tape as well as loop foil are ideally suited for each other, ensuring maximum retention force.

1.1 Benefits

- Ultra-fine hook and loop fixation for greater retention force
- Fast and easy installation by a single person, no special tools required
- Corrections are possible at any time during installation, without damaging the panels
- The laminated moisture barrier between the screed and the insulation layer is not damaged during pipe installation
- Easy installation even in rooms out of square
- Also available as Uponor Klett Twinboard for installation on existing insulations
- Uponor Klett Silent 30-3 for a sustainable heating and cooling system with favourable impact sound characteristics
- Uponor Klett pipes are easily combinable with other standard system components of the Uponor portfolio.

1.2 Components

Note

For more detailed information, product range and documentation please visit the Uponor website: www.uponor.com.

Note

Detailed information about the range of components, dimensions etc is available in the price list.

Uponor Klett Comfort Pipe PLUS

- PE-Xa pipe spiral wound with hook tape
- Highly flexible PE-Xa pipe with 5 layers
- Oxygen-tight acc. to DIN 4726
- Dimensions 14 x 2 mm and 16 x 2 mm

Uponor Klett MLCP RED

RP0000268

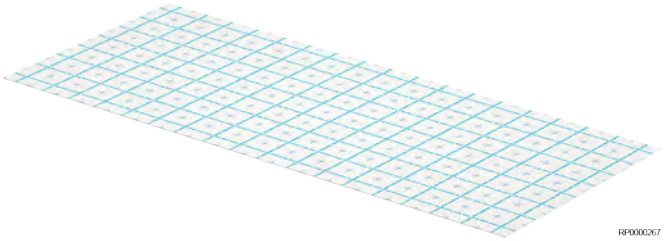
- Composite pipe spiral wound with hook tape
- Oxygen-tight acc. to DIN 4726
- Dimension 16 x 2 mm

Uponor jointing technology

RP0000269

- Screw, compression or Q&E jointings can be used as per pipe type

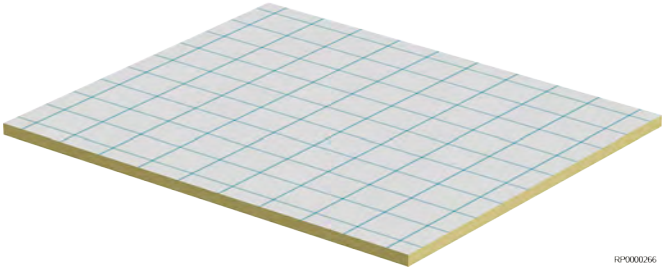
Uponor Klett Twinboard



RP0000267

- 3 mm PP double wall foldable board with installation area of 2,4 m x 1 m (2,4 m²)
- Can be used with distributed loads up to 5 kN/m²
- Clear separation of trades when used with existing insulation

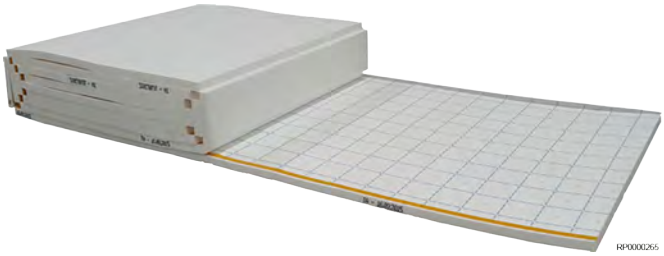
Uponor Klett Silent 30-3



RP0000266

- 30 mm Klett installation panel from mineral fibre insulation for optimised impact sound insulation and low construction heights
- Installation area 1,2 m x 1 m (1,2 m²)
- Thermal resistance Rλ,ins = 0,86 m²K/W
- Reduced pipe coverage of 30 mm possible with Knauf liquid screed FE 80 ECO
- For traffic loads up to 5 kN/m²
- Tested low-emission system

Uponor Klett panel roll



RP0000265

WLS 032

EPS panel with added graphite for increased heat insulation and lower construction heights

- Installation area 1 m x 10 m (10 m²)
- With integrated heat and impact sound insulation according to EN 13163.
- Available in dimension 25-2

EXTRA

- Installation area 1 m x 10 m (10 m²)
- With integrated heat and impact sound insulation according to EN 13163.
- Available in versions 25-2, 30-2, 30-3, 35-3

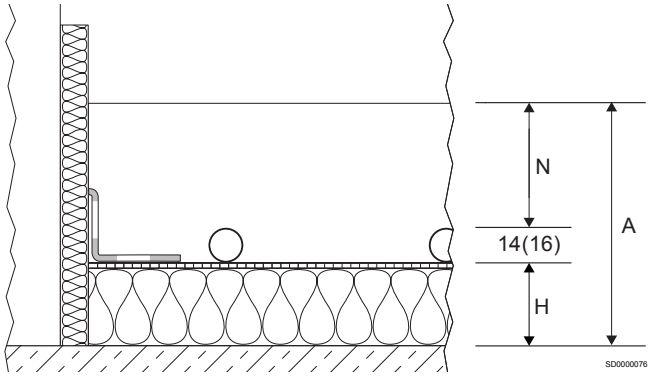
DEO

- Installation area 1 m x 10 m (10 m²)
- With integrated heat insulation according to EN 13163.
- Available in various dimensions

2 Planning/design

2.1 Floor constructions

Insulation combination



Item	Description
N	Minimum screed thickness
H	Insulation layer thickness (mm)
A	Structural height

As a result of combining insulations, the following constructions comply with the European minimum insulation requirements according to EN 1264-4 or EN 15377 for residential and non-residential buildings.

The masses per unit area of the ceiling and the screed as well as the dynamic stiffness of the Uponor heat and impact sound insulation have to be considered in providing the proof of impact sound insulation. The rated impact sound improvement of the floorings is calculated from the weight per unit area of the screed and the dynamic stiffness of the insulation or indicated by an equivalent test report.

Lower cement screed thicknesses or increased traffic load necessitate using the specified Uponor insulation materials and Uponor screed components as well as a cement quality corresponding to Portland CEM I 32.5.

It is not allowed to include more than two impact sound insulation layers in a floor construction. The sum of the compressibility of all insulation layers used must not exceed the following values:
- 5 mm for area loads ≤ 3 kN/m²
- 3 mm for area loads ≤ 5 kN/m²

Floor construction tables

These abbreviations are used in the following construction tables:

Abbreviations	Description
CT	Cement screed
CAF	Anhydride liquid screed
Td	Outer design temperature

Uponor Klett 35-3

Thermal insulation requirements	Insulation layer thickness	Thermal resistance of insulation	Dynamic stiffness s	Structural height A (2,0 kN/m²)[2)]	Structural height A (2,0 kN/m²)[2)]
	H [mm]	R_λ, ins [m² K/W]		CT+VD 450/VD 550N N ≥ 45 [mm]	CAF[3)] N ≥ 35 [mm]
Apartment ceiling separating heated rooms					
EN 1264-4	KP/KR35-3 = 35	0,778	s = 15 MN/m³	≥ 94 (96)	≥ 84 (86)
Floor slabs[1)], ceilings against unheated rooms in residential and non-residential buildings					
Reference value according to EnEV U = 0,35 W/m²K	(Klett EPS 35-3 = 35) + (EPS-DEO 85 = 85) = 120	3,18	s = 15 MN/m³	≥ 179 (182)	≥ 169 (172)
Floor ceilings against outside air in residential and non-residential buildings (ϑi ≥ 19 °C)					
Reference value according to EnEV U = 0,28 W/m²K	(Klett EPS 35-3 = 35) + (PUR 70 = 70) = 105	3,55	s = 15 MN/m³	≥ 164 (167)	≥ 154 (157)

[1)] Observe additional construction height for structural waterproofing according to DIN 18533. Groundwater level ≥ 5 m.

[2)] Observe dimensional tolerances according to DIN 18202, Tab.2 and 3.

[3)] Screed thickness depends on manufacturer.

Uponor Klett Silent 30-3

Thermal insulation requirements	Insulation layer thickness	Thermal resistance of insulation	Rated impact sound reduction	Structural height A (2,0 kN/m²)[2]		Structural height A (5 kN/m²)[2]	
	H [mm]	R_{λ}, ins [m² K/W]	ΔL_w[dB]	CT+VD 450/VD 550N N ≥ 30 [mm]	CAF[4] N ≥ 35 [mm]	CT+VD 450/VD 550N N ≥ 45 [mm]	CAF[3] N ≥ 65 [mm]
Apartment ceiling separating heated rooms							
EN 1264-4	Klett Silent 30-3 = 30	0,86	31 dB (45 mm CT covering)[4] 29 dB(with 30 mm CAF covering)[4]	≥ 74 (76)	≥ 79 (81)	≥ 89 (91)	≥ 109 (111)
Floor slabs[1]), ceilings against unheated rooms in residential and non-residential buildings							
Reference value according to EnEV U = 0,35 W/m²K	(Klett Silent 30-3 = 30) + (PUR 52 = 52) = 82	2,83	31 dB (45 mm CT covering)[4]	≥ 126 (128)	≥ 131 (133)	≥ 141 (143)	≥ 161 (163)
Floor ceilings against outside air in residential and non-residential buildings (ϑi ≥ 19 °C)							
Reference value according to EnEV U = 0,28 W/m²K	(Klett Silent 30-3 = 30) + (PUR 70 = 70) = 100	3,55	31 dB (45 mm CT covering)[4]	≥ 144 (146)	≥ 149 (151)	≥ 159 (161)	≥ 179 (181)

[1] Observe dimensional tolerances according to DIN 18202, Tab.2 and 3.
[2] Observe additional construction height for structural waterproofing according to DIN 18533. Groundwater level ≥ 5 m.
[3] Screed thickness depends on manufacturer.
[4] Measurement and evaluation of Uponor Klett Silent for proof of sound insulation suitability has been conducted by accredited testing laboratories or a suitable certification body. The measured values enable evaluation as per the standard while considering the insulation materials and screeds actually used.

Uponor Klett 30-2

Thermal insulation requirements	Insulation layer thickness	Thermal resistance of insulation	Dynamic stiffness s	Structural height A (2,0 kN/m²)[2]		Structural height A (5 kN/m²)[2]	
	H [mm]	R_{λ}, ins [m² K/W]		CT+VD 450/VD 550N N ≥ 30 [mm]	CAF[3] N ≥ 35 [mm]	CT+VD 450/VD 550N N ≥ 45 [mm]	CAF[3] N ≥ 65 [mm]
Apartment ceiling separating heated rooms							
EN 1264-4	KP/KR30-2 = 30	0,75	s = 20 MN/m³	≥ 74 (76)	≥ 79 (81)	≥ 89 (91)	≥ 109 (111)
Floor slabs[1]), ceilings against unheated rooms in residential and non-residential buildings							
Reference value according to EnEV U = 0,35 W/m²K	(Klett EPS 30-2 = 30) + (PUR 52 = 52) = 82	2,83	s = 20 MN/m³	≥ 126 (128)	≥ 131 (133)	≥ 141 (143)	≥ 161 (163)
Floor ceilings against outside air in residential and non-residential buildings (ϑi ≥ 19 °C)							
Reference value according to EnEV U = 0,28 W/m²K	(Klett Silent 30-3 = 30) + (PUR 70 = 70) = 100	3,55	s = 20 MN/m³	≥ 144 (146)	≥ 149 (151)	≥ 159 (161)	≥ 179 (181)

[1] Observe additional construction height for structural waterproofing according to DIN 18533. Groundwater level ≥ 5 m.
[2] Observe dimensional tolerances according to DIN 18202, Tab.2 and 3.
[3] Screed thickness depends on manufacturer.

Uponor Klett WLS 032 – 25-2

Thermal insulation requirements	Insulation layer thickness	Thermal resistance of insulation	Dynamic stiffness s	Structural height A (2,0 kN/m²)[2]		Structural height A (5 kN/m²)[2]	
	H [mm]	R_λ, ins [m² K/W]		CT+VD 450/VD 550N N ≥ 30 [mm]	CAF[3] N ≥ 35 [mm]	CT+VD 450/VD 550N N ≥ 45 [mm]	CAF[3] N ≥ 65 [mm]
Apartment ceiling separating heated rooms							
EN 1264-4	KP/KR25-2 = 25	0,78	s = 30 MN/m³	≥ 69 (71)	≥ 74 (76)	≥ 84 (86)	≥ 104 (106)
Floor slabs[1]), ceilings against unheated rooms in residential and non-residential buildings							
Reference value according to EnEV U = 0,35 W/m²K	(Klett EPS 25-2 = 25) + (PUR 85 = 85) = 110	3,03	s = 30 MN/m³	≥ 154 (156)	≥ 159 (161)	≥ 169 (171)	≥ 189 (191)
Floor ceilings against outside air in residential and non-residential buildings (ϑi ≥ 19 °C)							
Reference value according to EnEV U = 0,28 W/m²K	(Klett EPS 25-2 = 25) + (PUR 70 = 70) = 95	3,4	s = 30 MN/m³	≥ 139 (141)	≥ 144 (146)	≥ 154 (156)	≥ 174 (176)

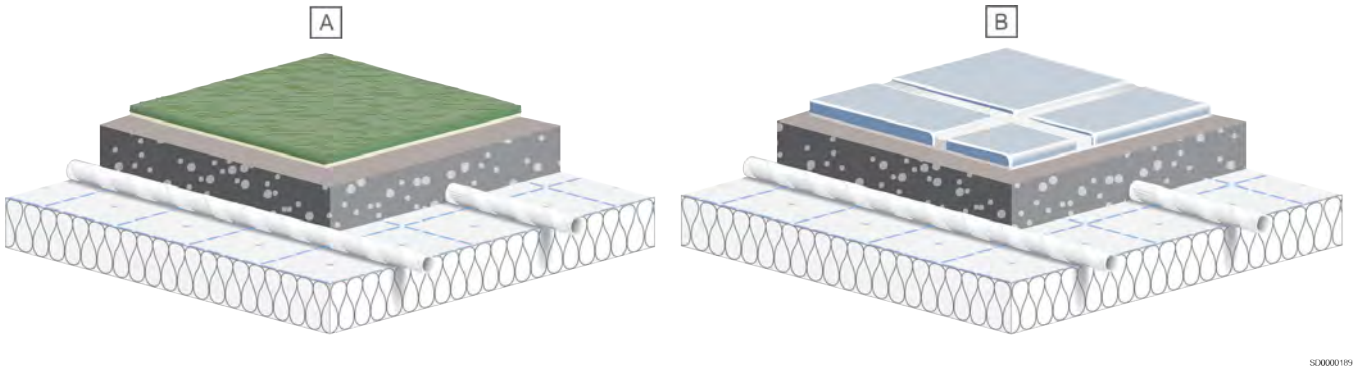
[1] Observe additional construction height for structural waterproofing according to DIN 18533. Groundwater level ≥ 5 m.
[2] Observe dimensional tolerances according to DIN 18202, Tab.2 and 3.
[3] Screed thickness depends on manufacturer.

Uponor Klett 25-2

Thermal insulation requirements	Insulation layer thickness	Thermal resistance of insulation	Dynamic stiffness s	Structural height A (2,0 kN/m²)		Structural height A (5 kN/m²)	
	H [mm]	R_λ, ins [m² K/W]		CT+VD 450/VD 550N N ≥ 30 [mm]	CAF[1] N ≥ 35 [mm]	CT+VD 450/VD 550N N ≥ 45 [mm]	CAF[1] N ≥ 65 [mm]
Apartment ceiling separating heated rooms							
EN 1264-4	KP/KR 25-2 = 25	0,6	s = 30 MN/m³	≥ 69 (71)	≥ 74 (76)	≥ 84 (86)	≥ 104 (106)

[1] Screed thickness depends on manufacturer.

2.2 Tables for cement screed load distribution layer



Item	Description	Item	Description
A	Cement screed load layer	B	Cement screed load layer (Bathrooms)

The following design tables facilitate fast and generally applicable determination of the installation distance and the max. heating circuit size. They do not, however, replace detailed planning and calculation.

When using wet screed, the following points must be particularly observed:

- The entire surface must be sealed without gaps (trough design).
- The continuous operating temperatures must not exceed 55 °C.

Nominal thickness 45 mm, thermal conductivity 1,2 W/mK (dimension 14 mm)

ϑi = 20 °C, Rλ,B = 0,15 m²K/W

		$\vartheta_{V,des}$ = 55,5 °C[1)]		$\vartheta_{V,des}$ = 50 °C		$\vartheta_{V,des}$ = 45 °C	
$\vartheta_{F,m}$ [°C]	q_{des} [W/m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]
29	100	10	5				
28,6	95	10	7,5				
28,2	90	10	10				
27,8	85	15	10	10	5		
27,3	80	15	13	10	7,5		
26,9	75	20	13,5	10	10,5		
26,5	70	25	14	15	11,5	10	5,5
26,1	65	25	19	20	12,5	10	9
25,7	60	30	20,5	25	13	15	10
25,2	55	30	26,5	25	18,5	15	14
24,8	50	30	32	30	22	20	17
24,4	45	30	38	30	28,5	25	19,5
≤ 23,9	≤ 40	30	42	30	35	30	24,5

ϑi = 24 °C, Rλ,B = 0,02 m²K/W (bathrooms)

		$\vartheta_{V,des}$ = 55,5 °C[1)]		$\vartheta_{V,des}$ = 50 °C		$\vartheta_{V,des}$ = 45 °C	
$\vartheta_{F,m}$ [°C]	q_{des} [W/m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]
33	100	10	14	10	11,5	10	6
32,6	95	10	14	10	12,5	10	7,5
32,2	90	10	14	10	14	10	8,5
31,8	85	10	14	10	14	10	10
31,3	80	10	14	10	14	10	11,5
30,9	75	10	14	10	14	10	13

		$\vartheta_{V,des}$ = 55,5 °C[1)]		$\vartheta_{V,des}$ = 50 °C		$\vartheta_{V,des}$ = 45 °C	
$\vartheta_{F,m}$ [°C]	q_{des} [W/m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]
30,5	70	10	14	10	14	10	14
≤ 30,1	≤ 65	10	14	10	14	10	14

The information in these design tables are based on the following basic data:

$R_{\lambda,ins}$ = 0,75 m²K/W, ϑ_u = 20 °C, concrete ceiling 130 mm, spread = 3 – 30 K, max. heating circuit length = 150 m, max. pressure loss per heating circuit incl. 2 x 5 m connection line Δp_{max}= 250 mbar. In case of other supply temperatures, thermal resistances or basic data, please use design charts.

[1)] In case of $\vartheta_{V,des}$ > 55,5 °C, the limit heat flux density and hence the max. floor surface temperature of 29 °C or, as per the bathroom design table, 33 °C is exceeded.

Nominal thickness 45 mm, thermal conductivity 1,2 W/mK (dimension 16 mm)

ϑi = 20 °C, Rλ,B = 0,15 m²K/W

		$\vartheta_{V,des}$ = 54,9 °C[1)]		$\vartheta_{V,des}$ = 50 °C		$\vartheta_{V,des}$ = 45 °C	
$\vartheta_{F,m}$ [°C]	q_{des} [W/m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]
29	100	10	9				
28,6	95	10	13				
28,2	90	15	12,5				
27,8	85	15	17,5	10	10		
27,3	80	20	18	10	14		
26,9	75	20	21	15	15,5		
26,5	70	25	27	20	16	10	11
26,1	65	25	35	20	23,5	10	14
25,7	60	30	36	25	27,5	15	19
25,2	55	30	42	25	35	20	22
24,8	50	30	42	30	39,5	20	28
24,4	45	30	42	30	42	25	35
≤ 23,9	≤ 40	30	42	30	42	30	40,5

ϑi = 24 °C, Rλ,B = 0,02 m²K/W (bathrooms)

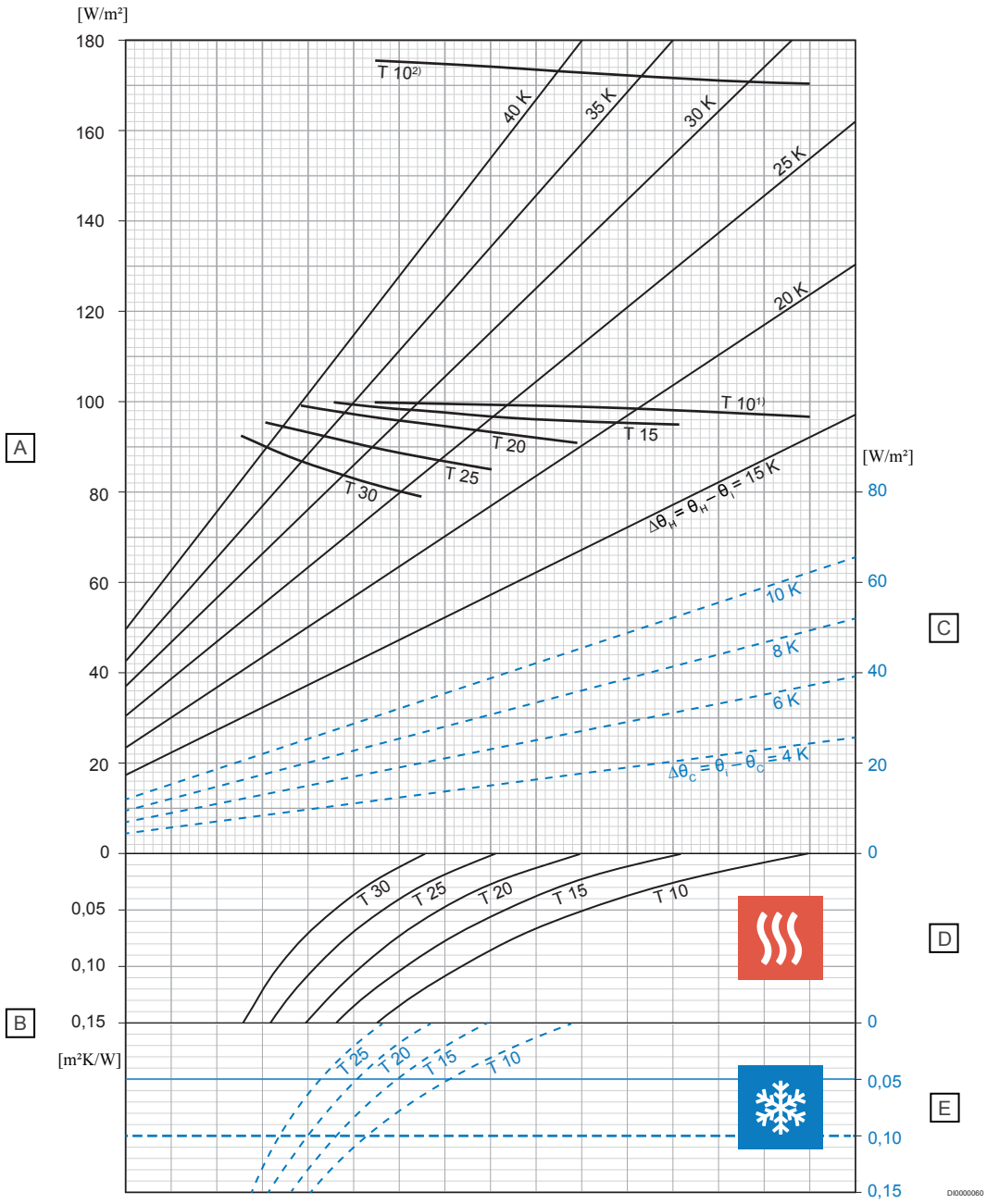
		$\vartheta_{V,des}$ = 54,9 °C[1)]		$\vartheta_{V,des}$ = 50 °C		$\vartheta_{V,des}$ = 45 °C	
$\vartheta_{F,m}$ [°C]	q_{des} [W/m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]	Vz [cm]	$A_{Fmax.}$ [m²]
33	100	10	14	10	14	10	12
32,6	95	10	14	10	14	10	14
32,2	90	10	14	10	14	10	14
31,8	85	10	14	10	14	10	14
31,3	80	10	14	10	14	10	14
30,9	75	10	14	10	14	10	14
30,5	70	10	14	10	14	10	14
≤ 30,1	≤ 65	10	14	10	14	10	14

The information in these design tables are based on the following basic data:

$R_{\lambda,ins}$ = 0,75 m²K/W, ϑ_u = 20 °C, concrete ceiling 130 mm, spread = 3 – 30 K, max. heating circuit length = 150 m, max. pressure loss per heating circuit incl. 2 x 5 m connection line Δp_{max}= 250 mbar. In case of other supply temperatures, thermal resistances or basic data, please use design charts.

[1)] In case of $\vartheta_{V,des}$ > 54,9 °C, the limit heat flux density and hence the max. floor surface temperature of 29 °C or 33 °C (bathrooms) is exceeded.

Uponor Klett Comfort Pipe PLUS 14 x 2 mm



Item	Description
A	Specific thermal output q_H [W/m²]
B	Thermal resistance $R_{\lambda,B}$ [m²K/W]
C	Specific cooling output q_C [W/m²]

D - Heating

T [cm]	q_H [W/m²]	$\Delta\theta_{H,N}$ [K]
10	97,8	15,9
15	95,1	18,2
20	91,4	20,4
25	85,2	22,0
30	78,9	23,6

[1] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 29 °C or θ_i 24 °C and $\theta_{F,max}$ 33 °C

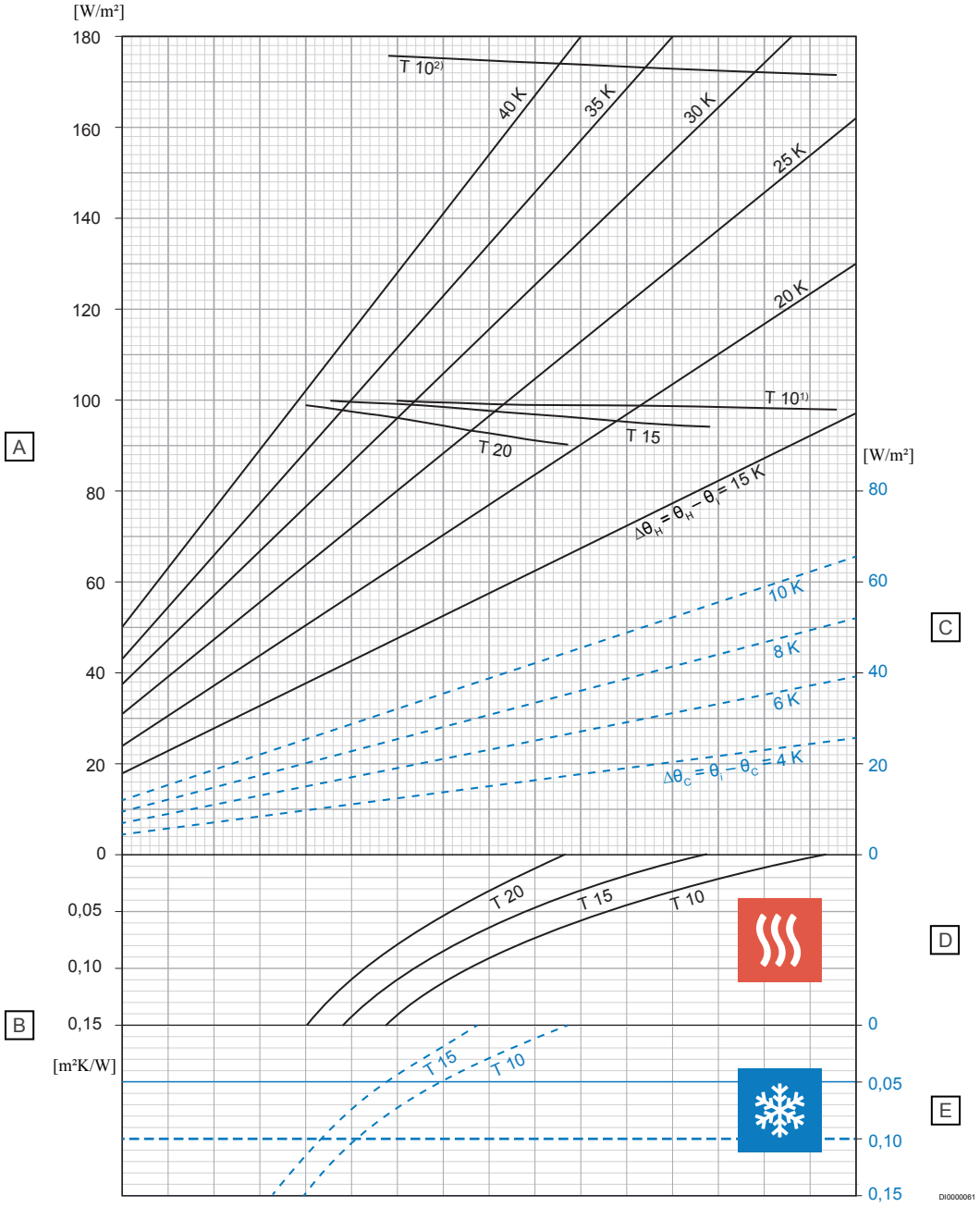
[2] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 35 °C

E - Cooling

T [cm]	q_C [W/m²]	$\Delta\theta_{C,N}$ [K]
10	34,6	8
15	30,6	8
20	27,0	8
25	24,0	8

Uponor Klett Comfort pipe PLUS 14 x 2,0 mm and cement screed load distribution layer ($s_ü$ = 45 mm with $\lambda_ü$= 1,2 W/mK)

Uponor Klett Comfort Pipe PLUS 16 x 2 mm (Silent)



Item	Description
A	Specific thermal output q_H [W/m²]
B	Thermal resistance $R_{\lambda,B}$ [m²K/W]
C	Specific cooling output q_C [W/m²]

D - Heating

T [cm]	q_H [W/m²]	$\Delta\theta_{H,N}$ [K]
10	97,8	15,6
15	94,9	17,7
20	91,0	19,7

[1] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 29 °C or θ_i 24 °C and $\theta_{F,max}$ 33 °C

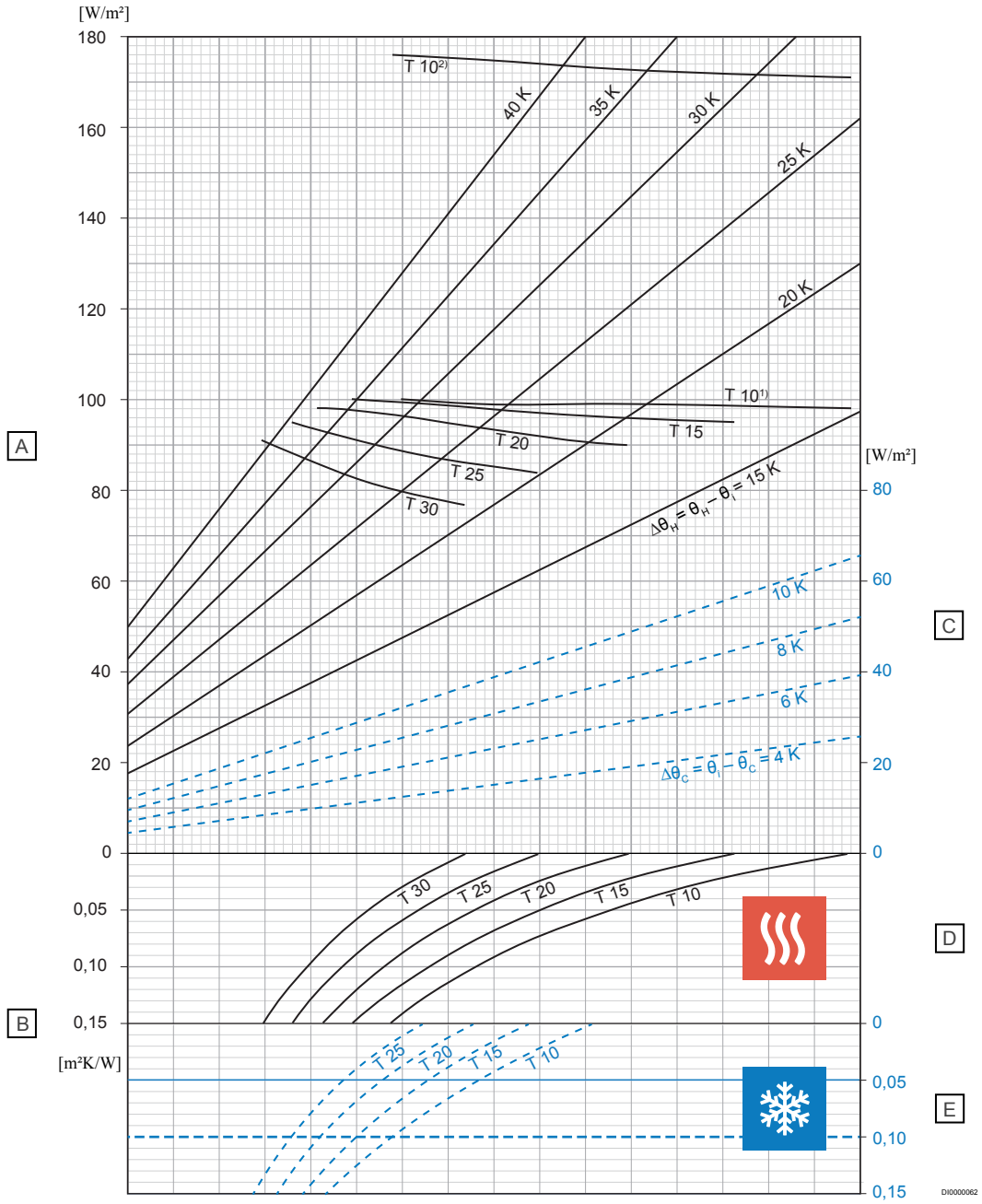
[2] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 35 °C

E - Cooling

T [cm]	q_C [W/m²]	$\Delta\theta_{C,N}$ [K]
10	35,1	8
15	31,2	8

Uponor Klett Comfort pipe PLUS 16 x 2,0 mm and cement screed load distribution layer ($s_ü$ = 45 mm with $\lambda_ü$= 1,2 W/mK)

Uponor Klett MLCP RED



Item	Description
A	Specific thermal output q_H [W/m²]
B	Thermal resistance $R_{\lambda,B}$ [m²K/W]
C	Specific cooling output q_C [W/m²]

D - Heating

T [cm]	q_H [W/m²]	$\Delta\theta_{H,N}$ [K]
10	97,8	15,5
15	94,8	17,5
20	90,9	19,5
25	84,4	20,9
30	77,7	22,1

[1] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 29 °C or θ_i 24 °C and $\theta_{F,max}$ 33 °C

[2] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 35 °C

E - Cooling

T [cm]	q_C [W/m²]	$\Delta\theta_{C,N}$ [K]
10	35,3	8
15	31,4	8
20	27,9	8
25	24,9	8

Uponor Klett MLCP RED pipe 16 x 2,0 mm and cement screed load distribution layer ($s_ü$ = 45 mm with $\lambda_ü$= 1,2 W/mK)

3 Installation

3.1 Installation process

Note

Installation must be performed by a qualified person in accordance with local standards and regulations.

The installation process varies from country to country. Always follow the local standards and regulations whenever the Uponor systems should be installed.

As a guidance, always read and follow the instructions given in respective Uponor installation manual.

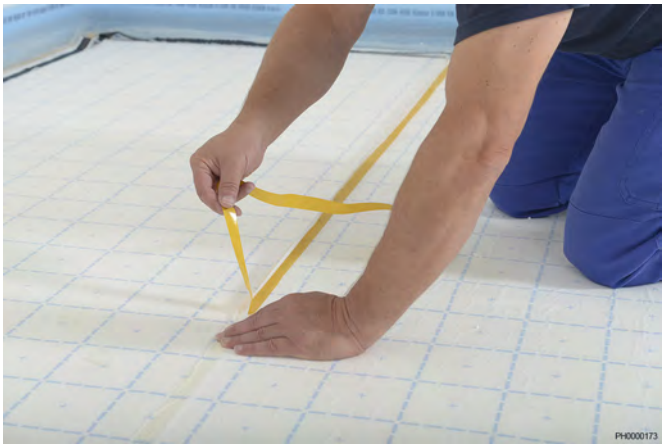
3.2 Installation of Klett panel and pipe

Uponor Klett can be installed fast and easily. The heating pipe is unrolled either by hand or with the handy mobile Uponor pipe uncoiler before it is positioned on the installed insulation panels. The printed installation grid (10 x 10 cm) facilitates orientation for even pipe distances. Special installation or fastening tools are not required.

Position the Multi edging strip

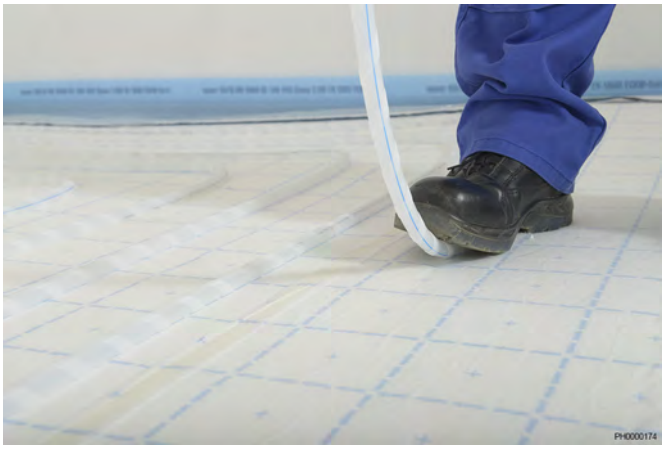
As a first step, an Uponor Multi edging strip is positioned with its rear adhesive strip to all ascending components. The laminated self-adhesive PE foil ensures the required sealing of the screed.

Join the Gaps



Uponor Klett is supplied with a one-sided self-adhesive foil protrusion. Hence masking of butt joints at the construction site is omitted, saving an entire work process.

Position the pipes



The Uponor Klett pipes are attached to the adhesive foil using light pressure. The positioning of the pipes can be corrected even after they have been attached without damaging the screed-sealing foil lamination of the Klett panels.

4 Technical data

4.1 Uponor Klett Comfort Pipe PLUS

	14 x 2,0 mm	16 x 2,0 mm
Pipe designation	Uponor Klett Comfort Pipe PLUS	Uponor Klett Comfort Pipe PLUS
Pipe dimension	14 x 2,0 mm	16 x 2,0 mm
Pipe length	240 m; 640 m	240 m; 640 m
Material	PE-Xa, five-layer pipe	PE-Xa, five-layer pipe
Colour	White with two blue longitudinal stripes	White with two blue longitudinal stripes
Pipe marking	Uponor Comfort Pipe PLUS 14x2,0 EN ISO 15875 C PE-Xa Class 5/6 bar, Oxygen diffusion tight/DIN 4726 3V372 KOMO K79614 AENOR 0744 (Land code,Material code pipe,Material code evoh,Machine,Year,Month,Date) Made in (country)	Uponor Comfort Pipe PLUS 16x2,0 EN ISO 15875 C PE-Xa Class 5/6 bar, Oxygen diffusion tight/DIN 4726 3V372 KOMO K79614 AENOR 0744 (Land code,Material code pipe,Material code evoh,Machine,Year,Month,Date) Made in (country)
Manufactured	acc. to EN ISO 15875	acc. to EN ISO 15875
DIN-CERTCO registration no.	3V372	3V372
Area of application	Class 4 + 5 / 6 bar (EN ISO 15875)	Class 4 + 5 / 6 bar (EN ISO 15875)
Max. operating temperature	70 °C (EN ISO 15875)	70 °C (EN ISO 15875)
Pipe jointings	Uponor screw connection, Uponor Q&E technology	Uponor screw connection, Uponor Q&E technology
Weight	0,079 kg/m	0,091 kg/m
Water content	0,079 l/m	0,121 l/m
Oxygen tightness	Acc. ISO 17455; DIN 4726	Acc. ISO 17455; DIN 4726
Density	0,934 g/cm³	0,934 g/cm³
Material class	Class B2 and class E, DIN 4102 / EN 13501	Class B2 and class E, DIN 4102 / EN 13501
Min. bending radius	8 x D; free-hand bending 5 x D; supported bending (70 mm)	8 x D; free-hand bending 5 x D; supported bending (80 mm)
Pipe roughness	0,0005 mm	0,0005 mm
Ideal installation temperature	> 0 °C	> 0 °C
UV protection	Opaque cardboard (store remaining quantities in the cardboard box)	Opaque cardboard (store remaining quantities in the cardboard box)
Approved water additive	Uponor antifreeze agent GNF, material class 3 acc. to DIN 1988 part 4	Uponor antifreeze agent GNF, material class 3 acc. to DIN 1988 part 4

4.2 Uponor Klett MLCP RED

Description	Value
Pipe designation	Uponor Klett MLCP RED
Pipe dimension	16 x 2,0 mm
Pipe length	240 m; 480 m
Material	Multi-layer composite pipe (PE-RT - bonding agent - aluminium with longitudinal weld and safety overlapping - bonding agent - PE-RT), monitored by SKZ (Southern German Plastics Centre), oxygen-tight according to DIN 4726.
Max. operating temperature	60 °C
Max. operating pressure	4 bar (58000 psi)
DIN-CERTCO registration no.	3V286 PE-RT/AL/PE-RT

4.3 Uponor Klett Panel Silent 30-3

Description	Value
Short designation according to EN 13162	MW EN 13162 T6(T+)-SD20-CP3 (30-3)
Dimensions	1200 x 1000 x 30 mm
Material, insulation	Mineral fibres
Max. traffic load [G]	5 kN/m²
Thermal resistance [$R_{\lambda,ins}$]	0,86 m²K/W
Compressibility	3 mm
Dynamic stiffness [s´]	20 MN/m³
Area of application according to EN 4108	DES-sm
Rated impact sound reduction [ΔL_w]	31 dB (45 mm CT covering)[1)]
Fire behaviour acc. to EN 13501-1	Class E
Melting point of the rockwool	> 1000 °C
Foil grid	100 x 100 mm
Type of system	Wet system
Load distribution layer	Cement screed or anhydrite screed

[1)] Measurement and evaluation of Uponor Klett Silent for proof of sound insulation suitability has been conducted by accredited testing laboratories or a suitable certification body. The measured values enable evaluation as per the standard while considering the insulation materials and screeds actually used.

4.4 Uponor Klett Twinboard foldable panel

Description	Value
Dimensions	2400 x 1000 x 3 mm
Material	Double wall foldable PP panel
Max. traffic load [G]	5 kN/m²
Fire behaviour acc. to EN 13501-1	Class E
Melting point of the rockwool	> 1000 °C
Foil grid	100 x 100 mm
Type of system	Wet system
Load distribution layer	Cement screed or anhydrite screed

4.5 Uponor Klett Panel roll WLS 032 – 25-2

Description	Value
Dimensions	10000 x 1000 x 25 mm
Material	EPS with added graphite
Max. traffic load [G]	5 kN/m²
Thermal resistance [$R_{\lambda,ins}$]	0,75 m²K/W
Dynamic stiffness [s´]	30 MN/m³
Fire behaviour acc. to EN 13501-1	Class E
Foil grid	100 x 100 mm
Type of system	Wet system
Load distribution layer	Cement screed or anhydrite screed

4.6 Uponor Klett Panel roll EXTRA

	25 – 2	30 – 2	30 – 3	35 – 3
Dimensions	10000 x 1000 x 25 mm	10000 x 1000 x 30 mm	10000 x 1000 x 30 mm	10000 x 1000 x 35 mm
Material	EPS	EPS	EPS	EPS
Max. traffic load [G]	5 kN/m²	5 kN/m²	4 kN/m²	4 kN/m²
Thermal resistance [$R_{\lambda,ins}$]	0,56 m²K/W	0,75 m²K/W	0,67 m²K/W	0,75 m²K/W
Dynamic stiffness [s´]	30 MN/m³	20 MN/m³	20 MN/m³	15 MN/m³
Fire behaviour acc. to EN 13501-1	Class E	Class E	Class E	Class E
Foil grid	100 x 100 mm			
Type of system	Wet system			
Load distribution layer	Cement screed or anhydrite screed			

4.7 Uponor Klett Panel roll DEO ND 26

Description	Value
Dimensions	10000 x 1000 x 26 mm
Material	EPS-DEO
Max. traffic load [G]	30 kN/m²
Thermal resistance [$R_{\lambda,ins}$]	0,76 m²K/W
Compressive stress	≥ 100 kPa
Fire behaviour acc. to EN 13501-1	Class E
Foil grid	100 x 100 mm
Type of system	Wet system
Load distribution layer	Cement screed or anhydrite screed

4.8 Disclaimer

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