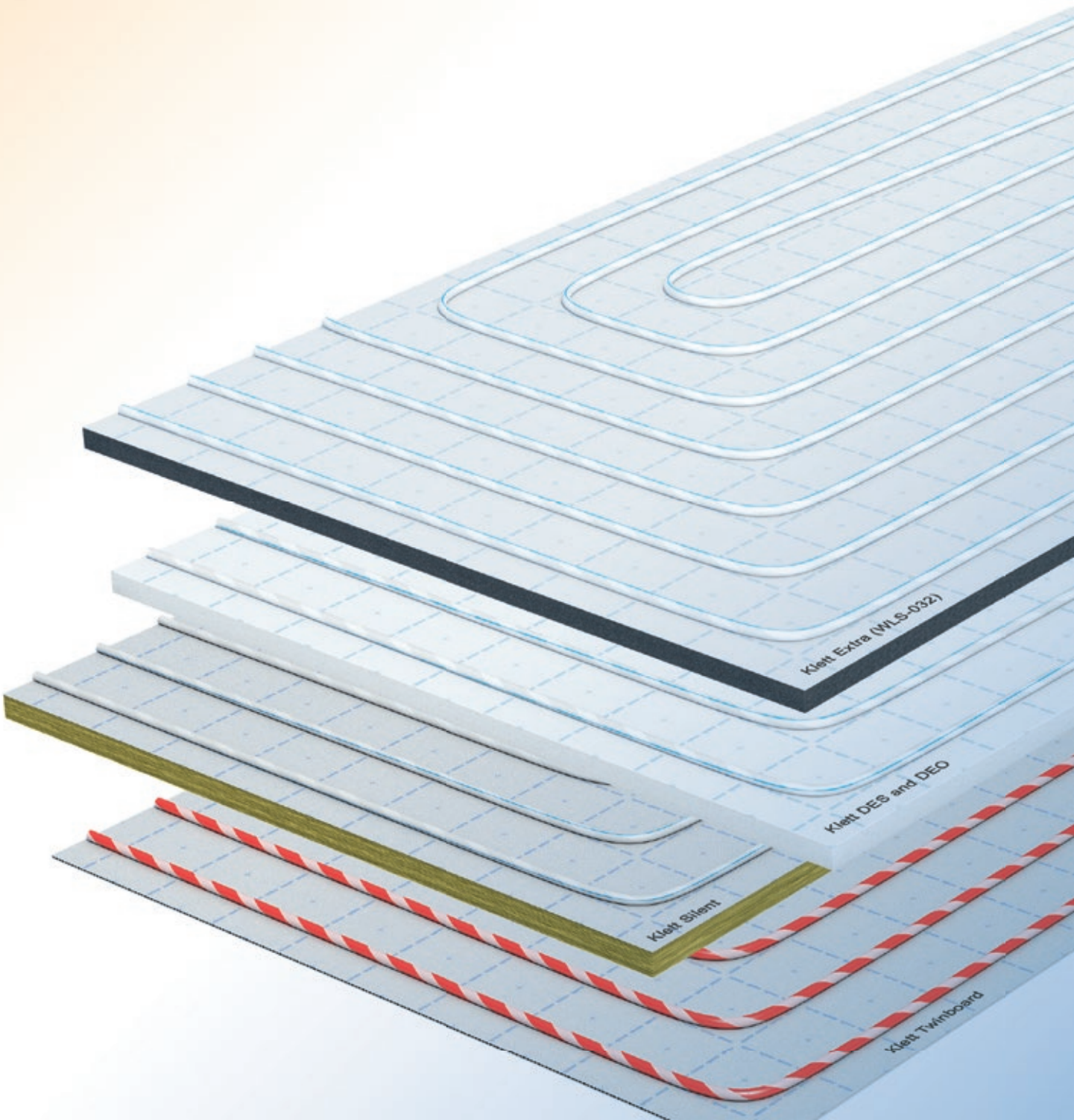
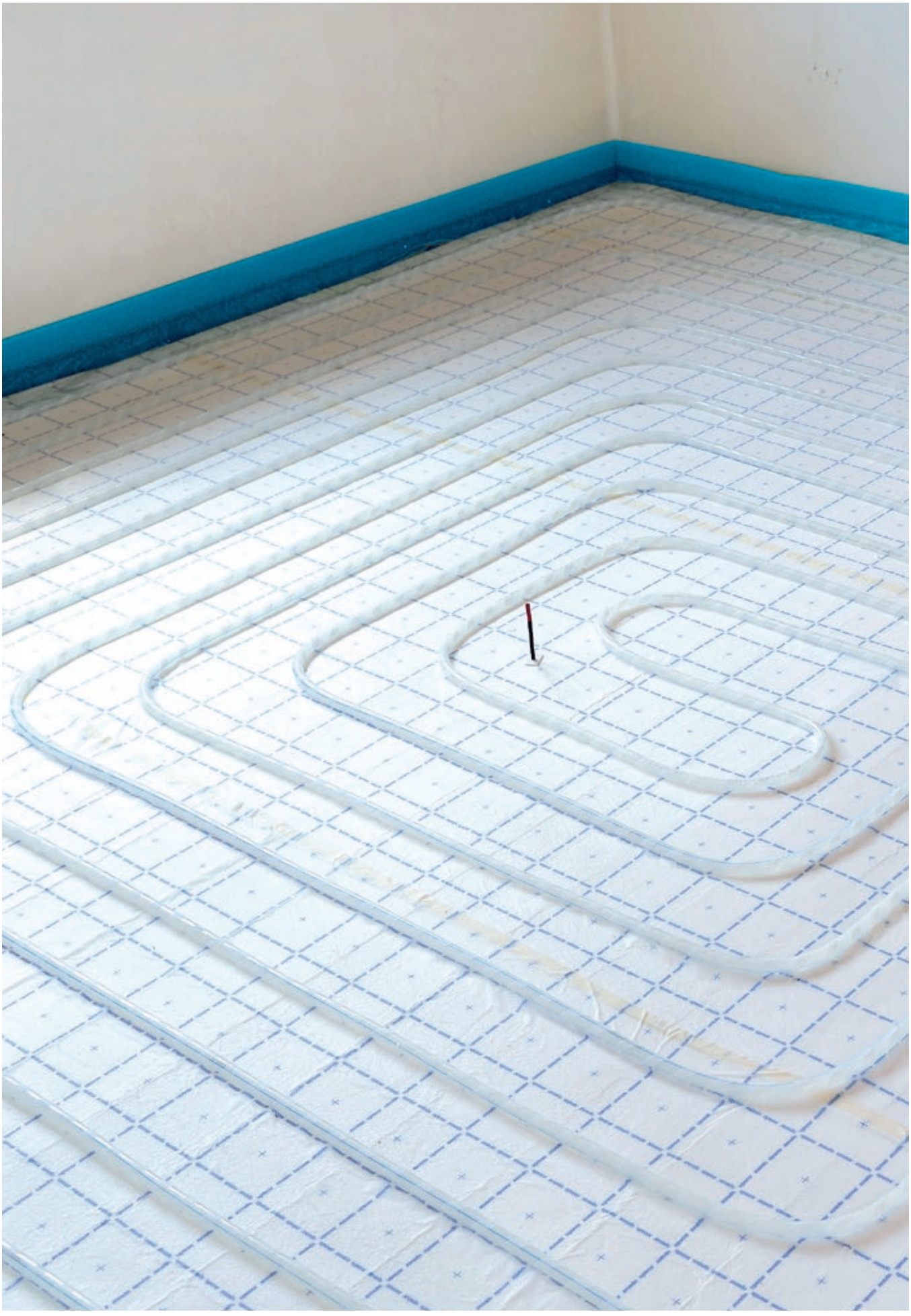
Uponor Klett underfloor heating/cooling

Technical information





Uponor Klett underfloor heating/cooling

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Uponor Klett wet UFH installation system

System description

Uponor Klett is a system for fast and easy laying of underfloor heating and cooling pipes. The oxygen-tight pipes are supplied spiral wound with hook tape. A suitable loop foil is laminated onto the corresponding insulation panel. 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.

The printed installation grid provides orientation during installation. Special tools are not required. Another advantage of the system: The Uponor Klett pipes can be combined with the standard system components of the Uponor portfolio.

Uponor Klett wet UFH installation system

- Ultra-fine hook and loop fixation for greater retention force
- Fast installation without special tools
- Fast and easy installation by a single person
- 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
- Composite pipe Klett MLCP RED, PE-Xa pipes Klett Comfort Pipe PLUS
- Easy installation even in rooms out of square
- Also available as Uponor Twinboard for installation on existing insulations
- Uponor Klett Silent 30-3 for a sustainable heating and cooling system with favourable impact sound characteristics

Main components

Uponor Klett panel roll WLS 032

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

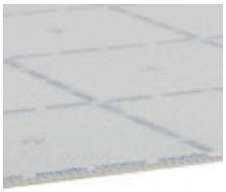
- Installation area 1 m x 10 m (10 m²)
- With integrated heat and impact sound insulation according to EN 13163 as well as insulation layer coverage.
- Available in dimension 25-2

Uponor Klett panel roll EXTRA

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

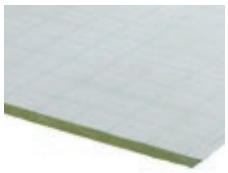
Uponor Klett panel roll DEO

- Installation area 1 m x 10 m (10 m²)
- With integrated heat insulation according to EN 13163 as well as insulation layer coverage.
- Available in ND 26



Uponor Klett Twinboard

- 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

- 30 mm Klett installation panel from mineral fibre insulation for optimised impact sound insulation and low installation heights
- Installation area 1.2 m x 1 m (1.2 m²)
- Thermal resistance $R_{\lambda,ins}$ = 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 Comfort Pipe PLUS

- PE-Xa pipe spiral wound with hook tape
- Highly flexible and load-bearing 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

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

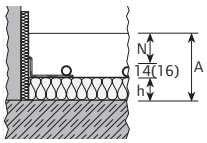
Uponor jointing technology

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

Floor constructions

Floor construction Uponor Klett 35-3

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.

Thermal insulation requirements	Insulation combination	Insulation layer thickness h [mm]	Thermal resistance of insulation $R_{\lambda,ins}$ [m² K/W]	Impact sound reduction factor of flooring[1] $\Delta L_{w,R}$ (VMR) [dB]	Structural height A CT+VD 450/ VD 550N N≥45 mm [mm]	Structural height A CAF[2] N≥35 mm [mm]
Apartment ceiling separating heated rooms						
EN 1264-4		KP/KR 35-3 = 35 = 35	0.778	29	≥ 94 (96)	≥ 84 (86)

CT = cement screed
CAF = anhydride liquid screed
N = minimum screed thickness
Td = outer design temperature
VM = impact sound reduction factor

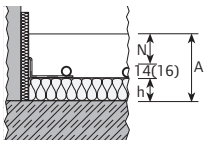
[1] *With a screed mass per unit area ≥ 70 kg/m².*
[2] *Screed thickness depends on manufacturer*

Floor construction Uponor Klett Silent 30-3

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 im-pact 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.

Thermal insulation requirements	Insulation combination	Insulation layer thickness h [mm]	Thermal resistance of insulation $R_{\lambda,ins}$ [m² K/W]	Rated impact sound reduction ΔL_w [dB]	Structural height A (2.0 kN/m²)		Structural height A (5 kN/m²)	
					CT+ VD 450/ VD 550N N≥30 mm [mm]	CAF[4] N≥35 mm [mm]	CT+ VD 450/ VD 550N N≥45 mm [mm]	CAF[2] N≥65 mm [mm]
Apartment ceiling separating heated rooms								
EN 1264-4		Klett Silent 30-3 = 30 = 30	0.86	31 dB (with 48 mm CT covering)[4] 29 dB (with 30 mm CAF covering)[4]	≥ 74 (76)	≥ 79 (81)	≥ 89 (91)	≥ 109 (111)

CT = cement screed
CAF = anhydride liquid screed
N = minimum screed thickness
Td = outer design temperature

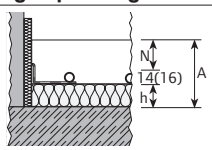
[1] Consider additional construction height for sealing of building according to DIN 18195. Ground water level ≥ 5 m
[2] Measurement and evaluation of Uponor Klett Silent for proof of sound insulation suitability has been conducted by accredited testing laboratories or a suitable certification body. The measured values enable evaluation as per the standard while considering the insulation materials and screeds actually used.

Floor construction Uponor Klett 30-2

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.

Thermal insulation requirements	Insulation combination	Insulation layer thickness h [mm]	Thermal resistance of insulation $R_{\lambda,ins}$ [m² K/W]	Impact sound reduction factor of flooring[1] DIN 4109 $\Delta L_{w,R}$ (VM$_R$) [dB]	Structural height A (2.0 kN/m²)		Structural height A (5 kN/m²)	
					CT+ VD 450/ VD 550N N≥30 mm [mm]	CAF[4] N≥35 mm [mm]	CT+ VD 450/ VD 550N N≥45 mm [mm]	CAF[2] N≥65 mm [mm]
Apartment ceiling separating heated rooms								
EN 1264-4		KP/KR 30-2 = 30 = 30	0.75	28	≥ 74 (76)	≥ 79 (81)	≥ 89 (91)	≥ 109 (111)

CT = cement screed
CAF = anhydride liquid screed
N = minimum screed thickness
Td = outer design temperature
VM = impact sound reduction factor

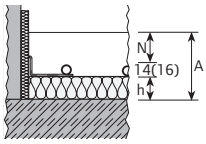
[1] With a screed mass per unit area ≥ 70 kg/m².
[2] Screed thickness depends on manufacturer

Floor construction Uponor Klett WLS 032 – 25-2

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.

Thermal insulation requirements	Insulation combination	Insulation layer thickness h [mm]	Thermal resistance of insulation $R_{\lambda,ins}$ [m² K/W]	Impact sound reduction factor of flooring[1] DIN 4109 ΔLw,R (VMR) [dB]	 Structural height A		 Structural height A	
					CT+ VD 450/ VD 550N N≥30 mm [mm]	CAF[4] N≥35 mm [mm]	CT+ VD 450/ VD 550N N≥45 mm [mm]	CAF[2] N≥65 mm [mm]
Apartment ceiling separating heated rooms								
EN 1264-4		KP/KR 25-2 = 25 = 25	0.78	26	≥ 69 (71)	≥ 74 (76)	≥ 84 (86)	≥104 (106)

CT = cement screed
CAF = anhydride liquid screed
N = minimum screed thickness
Td = outer design temperature
VM = impact sound reduction factor

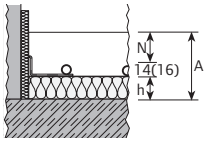
[1] *With a screed mass per unit area ≥ 70 kg/m².*
[2] *Screed thickness depends on manufacturer*

Floor construction Uponor Klett 25-2

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.

Thermal insulation requirements	Insulation combination	Insulation layer thickness h [mm]	Thermal resistance of insulation $R_{\lambda,ins}$ [m² K/W]	Impact sound reduction factor of flooring[1] DIN 4109 $\Delta L_{w,R}$ (VM$_R$) [dB]	Structural height A (2.0 kN/m²)		Structural height A (5 kN/m²)	
					CT+ VD 450/ VD 550N N≥30 mm [mm]	CAF[4] N≥35 mm [mm]	CT+ VD 450/ VD 550N N≥45 mm [mm]	CAF[4] N≥65 mm [mm]
Apartment ceiling separating heated rooms								
EN 1264-4		KP/KR 25-2 = 25 = 25	0.6	26	≥ 69 (71)	≥ 74 (76)	≥ 84 (86)	≥104 (106)

CT = cement screed
CAF = anhydride liquid screed
N = minimum screed thickness
Td = outer design temperature
VM = impact sound reduction factor

[1] *With a screed mass per unit area ≥ 70 kg/m².*
[2] *Screed thickness depends on manufacturer*

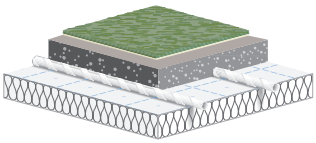
Design data

Uponor Klett design tables (for heating)

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

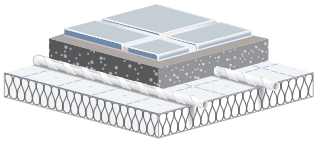
Uponor Klett design tables for cement screed load distribution layer: nominal thickness 45 mm, thermal conductivity 1.2 W/mK

Dim. 14



ϑ_i = 20 °C, $R_{\lambda,B}$ = 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



ϑ_i = 24 °C, $R_{\lambda,B}$ = 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
30.5	70	10	14	10	14	10	14
≤ 30.1	≤ 65	10	14	10	14	10	14

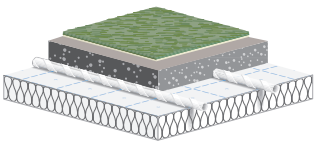
The information in these design tables are based on the following basic data:

$R_{\lambda,ins}$ = 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.

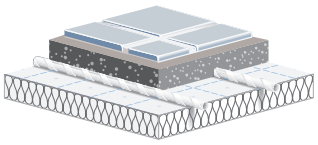
Uponor Klett design tables
for cement screed load distribution layer:
nominal thickness 45 mm, thermal conductivity 1.2 W/mK

Dim. 16



ϑ_i = 20 °C, $R_{\lambda,B}$ = 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



ϑ_i = 24 °C, $R_{\lambda,B}$ = 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

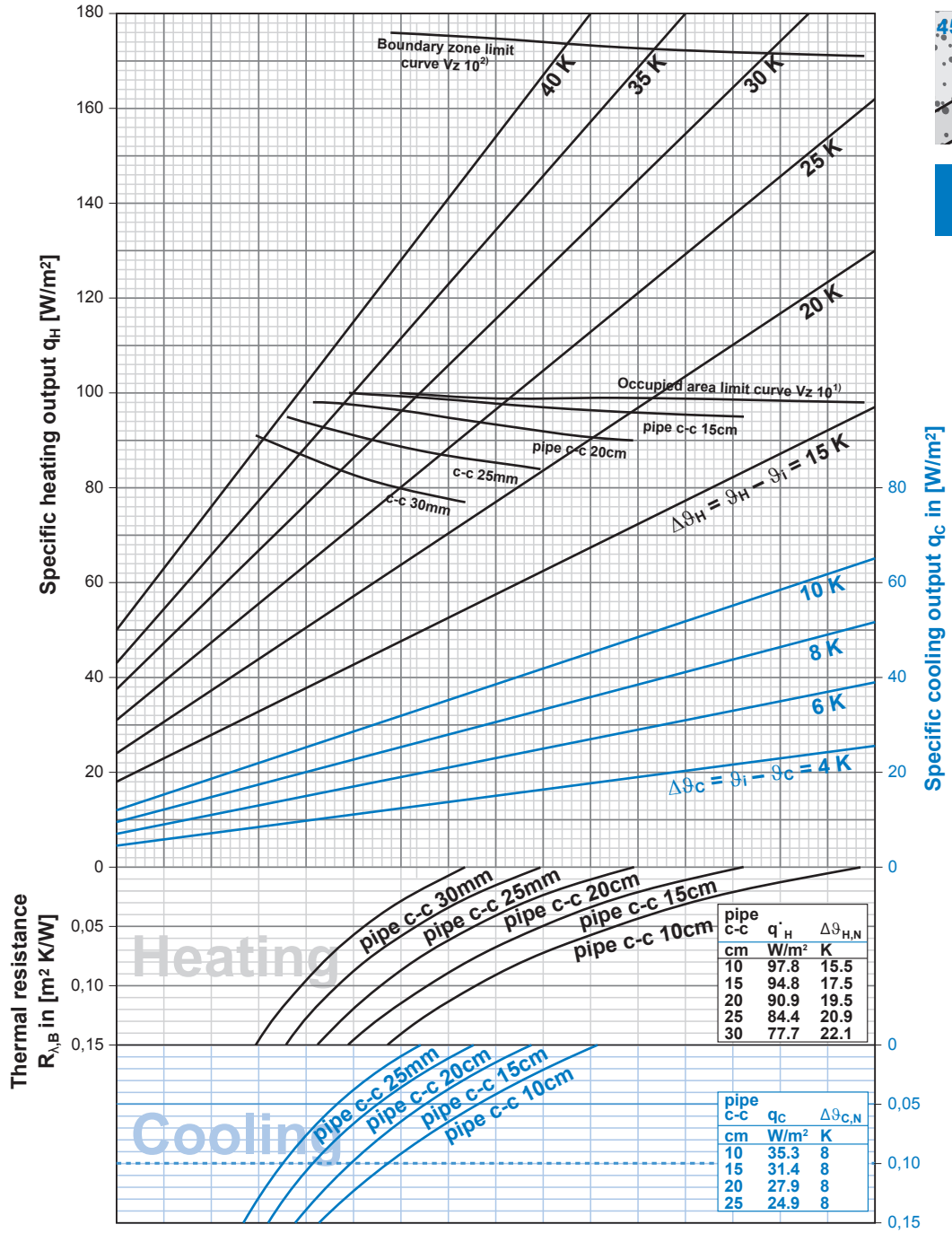
The information in these design tables are based on the following basic data:

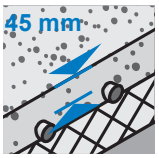
$R_{\lambda,ins}$ = 0.75 m²K/W, ϑ_u = 20 °C, concrete ceiling 130 mm, spread = 3 – 30 K, max. heating circuit length = 150 m, max. pressure loss per heating circuit incl. 2 x 5 m connection line Δp_{max} = 250 mbar.
In case of other supply temperatures, thermal resistances or basic data, please use design 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 design charts

Heating design chart for Uponor Klett and Klett MLCP RED 16 x 2 mm with cement screed load distribution layer and VD 450/550N ($s_ü$ = 45 mm with $\lambda_ü$ = 1.2 W/mK)





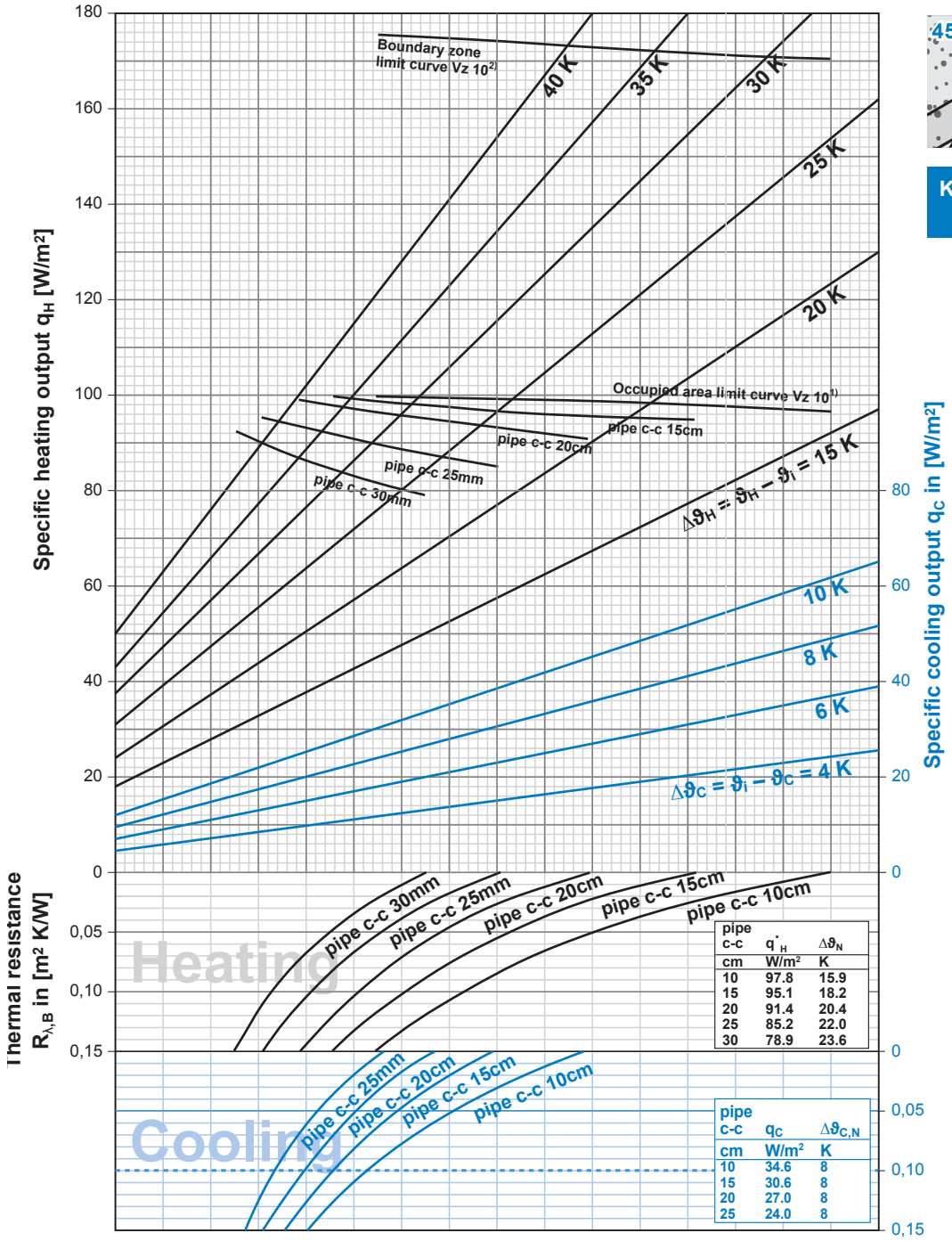
DIN Geprüft
7F 342-F

Klett MLCP RED 16 x 2 mm

[1] *Limit curve applies to ϑ_i 20 °C and $\vartheta_{F,\,max}$ 29 °C as well as to ϑ_i 24 °C and $\vartheta_{F,\,max}$ 33 °C*
[2] *Limit curve applies to ϑ_i 20 °C and $\vartheta_{F,\,max}$ 35 °C*

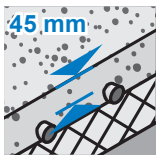
Note: According to EN 1264, bathrooms, showers, toilets, etc. are not covered by the determination procedure for the designed supply temperature. The limit curves must not be exceeded.
The designed supply temperature must not exceed the value: $\vartheta_{V,\,des} = \Delta\vartheta_{H,\,g} + \vartheta_i + 2.5$ K.
$\Delta\vartheta_{H,\,g}$ is determined by the occupied area limit curve to the smallest installation distance.
In case of cooling, the supply temperature must be controlled to remain above the dew point temperature; a humidity sensor is to be incorporated.

Heating design chart for Uponor Klett and Klett Comfort Pipe PLUS 14 x 2 mm with cement screed load distribution layer and VD 450/550N ($s_{ü}$ = 45 mm with $\lambda_{ü}$ = 1.2 W/mK)



pipe c-c	q_H	$\Delta\vartheta_N$
cm	W/m²	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

pipe c-c	q_C	$\Delta\vartheta_{C,N}$
cm	W/m²	K
10	34.6	8
15	30.6	8
20	27.0	8
25	24.0	8



DIN Geprüft
7F 235-F

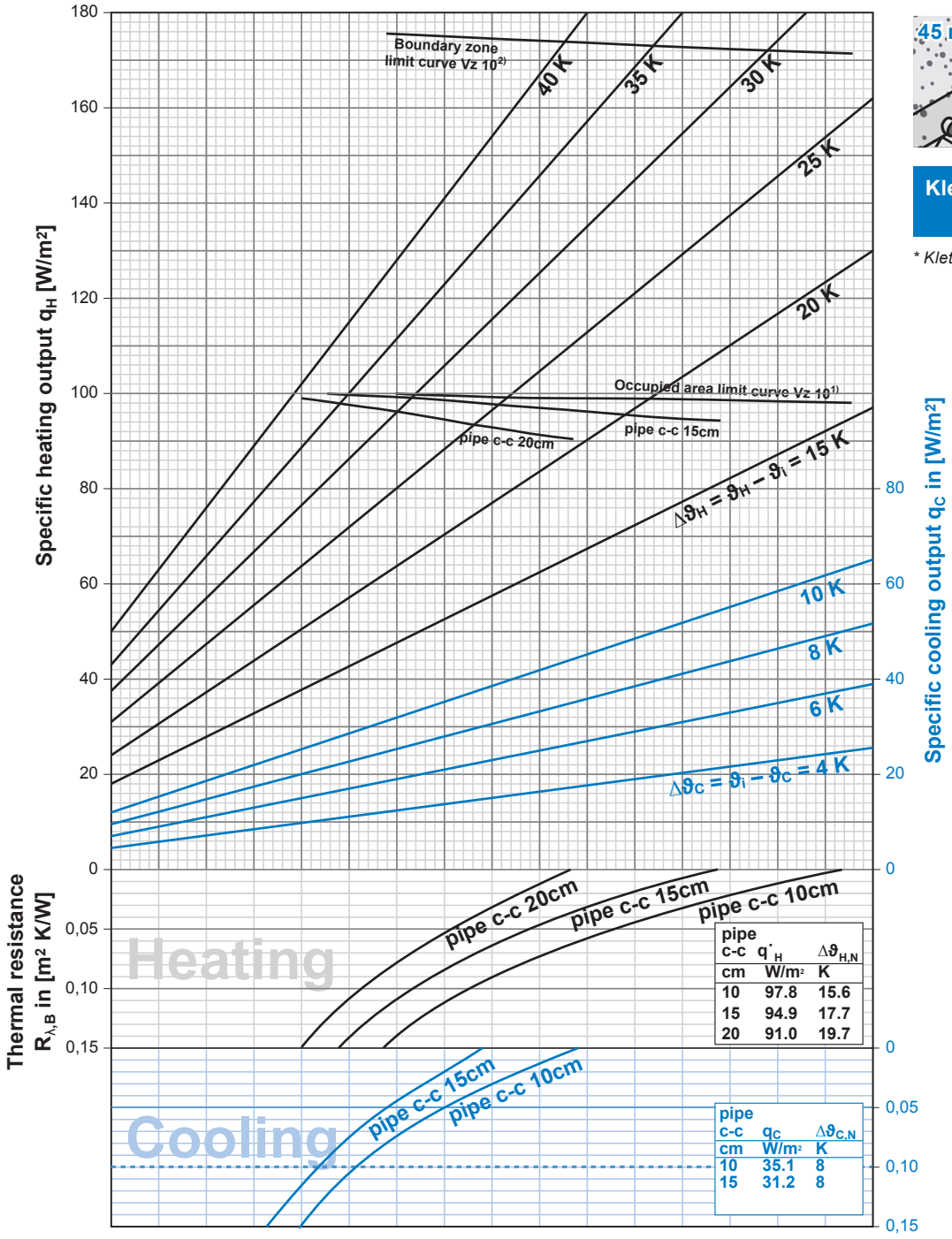
Klett Comfort Pipe PLUS 14 x 2 mm

[1)] Limit curve applies to ϑ_i 20 °C and $\vartheta_{F,\,max}$ 29 °C as well as to ϑ_i 24 °C and ϑ_F, max 33 °C
[2)] Limit curve applies to ϑ_i 20 °C and $\vartheta_{F,\,max}$ 35 °C

Note: According to EN 1264, bathrooms, showers, toilets, etc. are not covered by the determination procedure for the designed supply temperature. The limit curves must not be exceeded.
The designed supply temperature must not exceed the value: $\vartheta_{V,\,des} = \Delta\vartheta_{H,\,g} + \vartheta_i + 2.5$ K.
$\Delta\vartheta_{H,\,g}$ is determined by the occupied area limit curve to the smallest installation distance.
In case of cooling, the supply temperature must be controlled to remain above the dew point temperature; a humidity sensor is to be incorporated.

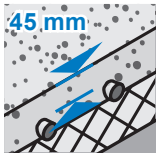
Uponor Klett Silent design charts

Heating design chart for Uponor Klett, Klett Silent, Klett Twinboard, and Klett Comfort Pipe PLUS 16 x 2 mm with cement screed load distribution layer and VD 450/550N
($s_ü$ = 45 mm with $\lambda_ü$ = 1.2 W/mK)



pipe c-c	$\dot{q}_H$	$\Delta\vartheta_{H,N}$
cm	W/m²	K
10	97.8	15.6
15	94.9	17.7
20	91.0	19.7

pipe c-c	q_C	$\Delta\vartheta_{C,N}$
cm	W/m²	K
10	35.1	8
15	31.2	8



DIN Geprüft
7F 468-F *

Klett Comfort Pipe PLUS 16 x 2 mm

** Klett Silent*

[1] Limit curve applies to ϑ_i 20 °C and $\vartheta_{F,\,max}$ 29 °C as well as to ϑ_i 24 °C and ϑ_F, max 33 °C
[2] Limit curve applies to ϑ_i 20 °C and $\vartheta_{F,\,max}$ 35 °C

Note: According to EN 1264, bathrooms, showers, toilets, etc. are not covered by the determination procedure for the designed supply temperature. The limit curves must not be exceeded.
The designed supply temperature must not exceed the value: $\vartheta_{V,\,des} = \Delta\vartheta_{H,\,g} + \vartheta_i + 2.5$ K.
$\Delta\vartheta_{H,\,g}$ is determined by the occupied area limit curve to the smallest installation distance.
In case of cooling, the supply temperature must be controlled to remain above the dew point temperature; a humidity sensor is to be incorporated.

Installation

Laying pipes becomes a cakewalk

Uponor Klett can be installed astoundingly 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.

Please also refer to our detailed installation instructions.

Installation of Klett panel and pipe

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.

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.

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.

The Uponor Klett door pipe connection facilitates laying of pipe. It is clamped into the door opening and arrested. Now the Klett pipe from the Uponor Multi pipe winder outside of the room can be inserted without touching the floor.

Connection to the manifold

The Uponor Klett pipe is cut to the correct length using the Uponor pipe cutter.

Unwind the hook tape about 10cm and cut it off using a cutter knife.

Then attach the Uponor Vario screw connection consisting of cap nut, supporting body and clamp ring on the end of the pipe.

The last step is to tighten the screw connection using a spanner.

Technical data

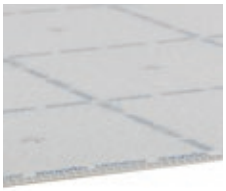
Uponor Klett	Panel roll EXTRA			
	25 – 2	30 – 2	30 – 3	35 – 3
Dimensions	10,000 x 1,000 x 25 mm	10,000 x 1,000 x 30 mm	10,000 x 1,000 x 30 mm	10,000 x 1,000 x 35 mm
Material	EPS	EPS	EPS	EPS
Max. traffic load [G]	5 kN/m²	5 kN/m²	4 kN/m²	4 kN/m²
Thermal resistance [$R_{\lambda,ins}$]	0.56 m²K/W	0.75 m²K/W	0.67 m²K/W	0.75 m²K/W
Dynamic stiffness [s´]	30 MN/m³	25 MN/m³	15 MN/m³	15 MN/m³
Rated impact sound reduction [$\Delta L_{w,R}$]	26 dB	27 dB	29 dB	29 dB
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			

Uponor Klett	Panel roll WLS 032 – 25-2
Dimensions	10,000 x 1,000 x 25 mm
Material	EPS with added graphite
Max. traffic load [G]	5 kN/m²
Thermal resistance [$R_{\lambda,ins}$]	0.78 m²K/W
Dynamic stiffness [s´]	30 MN/m³
Rated impact sound reduction [$\Delta L_{w,R}$]	26 dB
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

Uponor Klett	Panel roll DEO ND 26
Dimensions	10,000 x 1,000 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

Uponor Klett	Panel Silent 30-3
Short designation according to EN 13162	MW EN 13162 T6(T+)-SD20-CP3 (30-3)
Dimensions	1,200 x 1,000 x 30 mm
Material, insulation	Mineral fibres
Max. traffic load [G]	5 kN/m^2
Thermal resistance [$R_{\lambda,ins}$]	0.86 m^{2}K/W
Compressibility	3 mm
Dynamic stiffness [s´]	20 MN/m^3
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	> 1,000 °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.*



Uponor Klett	Twinboard foldable panel
Dimensions	2,400 x 1,000 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
Foil grid	100 x 100 mm
Type of system	Wet system
Load distribution layer	Cement screed or anhydrite screed

	Uponor Klett Comfort Pipe PLUS 14 x 2.0 mm	Uponor Klett Comfort Pipe PLUS 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; 640 m	240; 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	90 °C (EN ISO 15875)	90 °C (EN ISO 15875)
Short-term operating temperature	100 °C (EN ISO 15875)	100 °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. to ISO 17455; DIN 4726	acc. to ISO 17455; DIN 4726
Density	0.934 g/cm³	0.934 g/cm³
Material class	Class B2 und class E, DIN 4102 / EN 13501	Class B2 und 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

Uponor composite pipe Klett MLCP RED 16 x 2 mm	
coils to be used as surface heating pipe, connection with screw connection or press-fit connectors.	
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

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