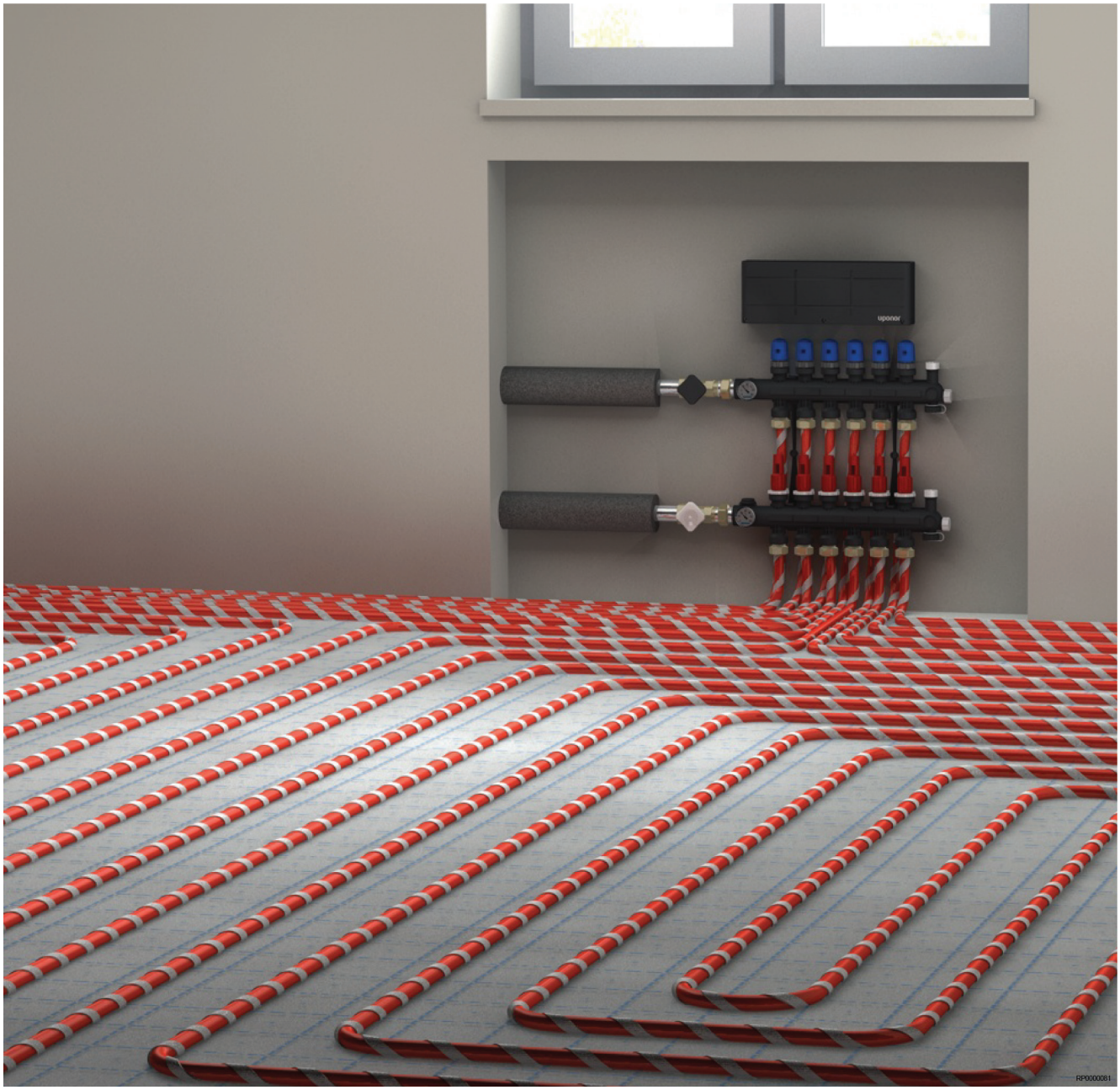
Uponor Klett Twinboard

EN Technical information



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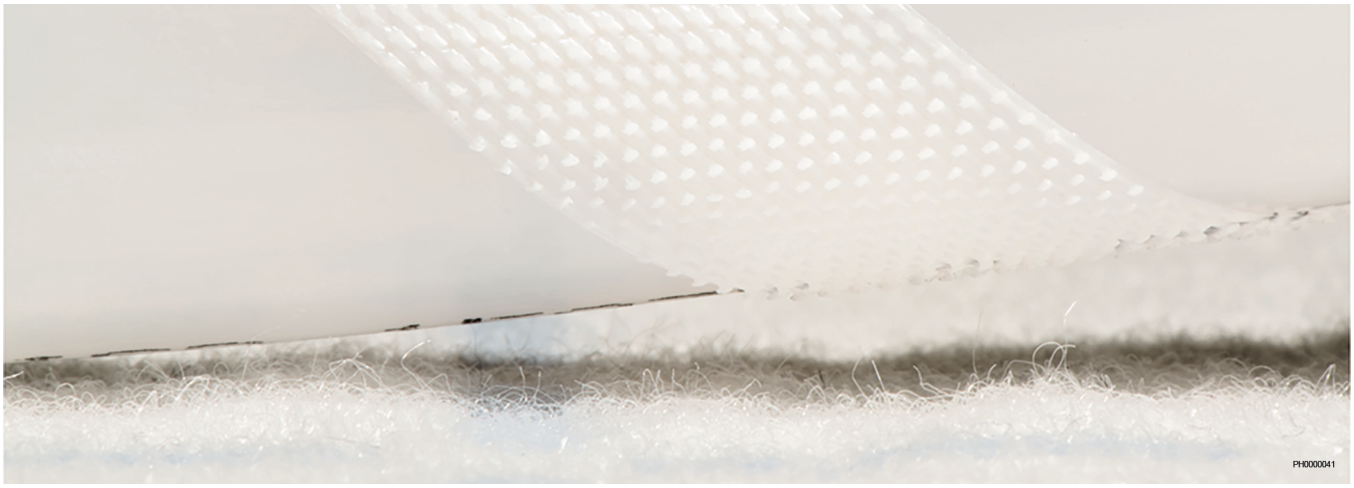
1 System description



The Uponor Klett Twinboard system with the hollow-chamber panel is ideally suited for the use on existing insulation, trades can work independently and scheduling becomes easier. An installation on solid ground is also possible provided that the floor is level. Always consider individual needs and local regulations regarding for example impact noise insulation.
The panel is ready laminated with loop foil and the compatible pipes wound with hook tape. This hook-and-loop system makes the pipes fast and easy to lay. That way a single person can manage the installation easily. No specialist tools are necessary.
The panels are extremely stable and suitable for all types of screed as long as it meets the requirements of DIN 18560.

Note

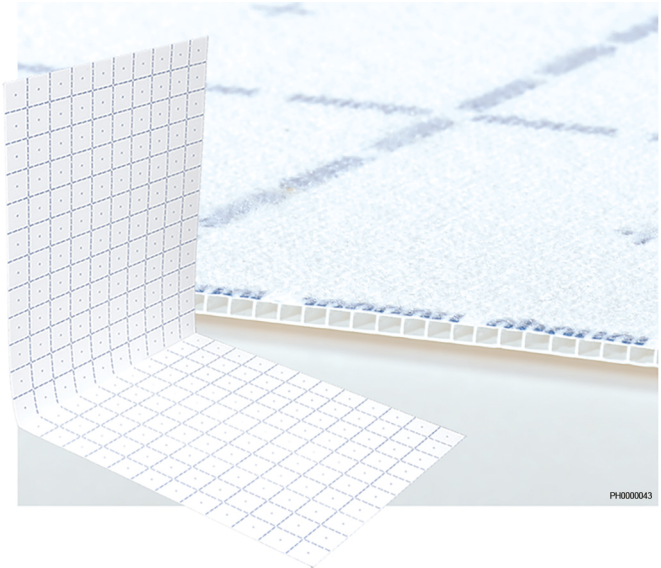
Floorings on top of screeds should always meet a thermal resistance of $R\lambda, B \leq 0.15\ m^2K/W$ and should be approved by the manufacturer for use with underfloor heating installations.

1.1 Components

Uponor Klett pipe types

Uponor Klett Comfort Pipe PLUS 14 x 2.0 mm/16 x 2.0 mm
or Uponor Klett MLCP RED 16 x 2.0 mm composite pipes

Uponor Klett Twinboard panel

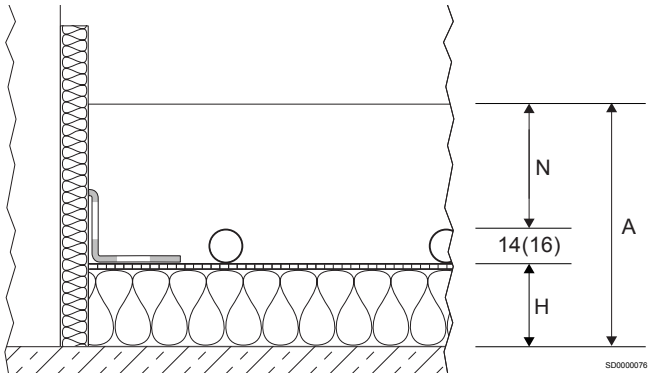


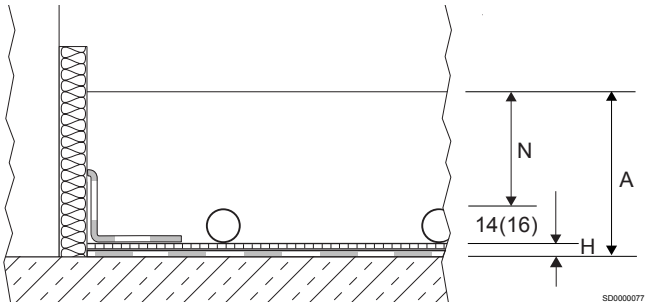
Even though only 3 mm thick and very light weight, the hollow-chamber panel made of polypropylene is very stable. The ready laminated loop foil with grid markings on the panel makes laying the pipes easy. If pipes need to be moved in the process, the panel surface is strong enough to pull them up again without causing damage.

2 Planning/design

2.1 Screeds

The choice of load distribution layer must be based on the actual structural conditions of the building. When planning the construction, pay attention to the maximum thermal load capacity of the distribution layer.





Knauf FE22 / N440

Pipe dimensions 14 mm and 16 mm				
Total construction hight A [mm]	**Total screed hight [mm]**	**Screed layer above pipe N [mm]**	**Payload : Single load [kN] / Area load [kN/m²]**	**Floor insulation h [mm/ kPa]**
37 / 39 (3+ 14/16 +20)	34 / 36 (14/16 +20)	> 20	≤ 3 / 2	---
42 / 44 (3+ 14/16 +25)	39 / 41 (14/16 +25)	> 25	≤ 4 / 3	---
54 / 56 (3+ 14/16 +25)	39 / 41 (14/16 +25)	> 25	≤ 2 / 1	Knauf Mineral wool TP-GP 12-1
H+ 14/16 +N	34 / 36 (14/16 +20)	> 20	≤ 3 / 2	Knauf Woodfiber 10 - 20mm in flooring quality
	39 / 41 (14/16 +25)	> 25	≤ 2 / 1	EPS 60/100, 80/150, 120/200 or 160/300
	39 / 41 (14/16 +25)	> 25	≤ 3 / 2	EPS 20/100, 30/150, 40/100, 40/200, 50/150, 60/300, 80/200 or 100/300

Lafarge Agilia Themo

Pipe dimension 16 mm				
Total construction hight A [mm]	**Total screed hight [mm]**	**Screed layer above pipe N [mm]**	**Payload [kN/m²]**	**Floor insulation H [mm/ kPa]**
39 (3+ 16 +20)	36 (16 +20)	> 20	≤ 5	EPS-EN 13163-T(0)-L(3)-W(3)-S(5)-P(10)-BS50-DS(N)5-SD30-CP2; EPS-EN 13163-T(0)-L(3)-W(3)-S(5)-P(10)-BS50-DS(N)5-SD20-CP2

Saint Gobain Weber Weberfloor radiante

Pipe dimension 16 mm				
Total construction hight A [mm]	**Total screed hight [mm]**	**Screed layer above pipe N [mm]**	**Payload [kN/m²]**	**Floor insulation h [mm/ kPa]**
33 (3+ 16 +14)	30 (16 +14)	14 > 10	≤ 5	EPS-EN 13163-T(0)-L(3)-W(3)-S(5)-P(10)-BS50-DS(N)5-SD30-CP2; EPS-EN 13163-T(0)-L(3)-W(3)-S(5)-P(10)-BS50-DS(N)5-SD20-CP2

Saint Gobain Weber Weberfloor industrial floor type dur

Pipe dimension 16 mm				
Total construction hight A [mm]	**Total screed hight [mm]**	**Screed layer above pipe N [mm]**	**Payload [kN/m²]**	**Floor insulation h [mm/ kPa]**
29 (3+ 16 +10)	26 (16 +10)	> 10	≤ 5	EPS-EN 13163-T(0)-L(3)-W(3)-S(5)-P(10)-BS50-DS(N)5-SD30-CP2; EPS-EN 13163-T(0)-L(3)-W(3)-S(5)-P(10)-BS50-DS(N)5-SD20-CP2

2.2 Dimensioning tables

The values in the dimensioning tables are based on the following key figures:

$R_{\lambda, ins}$ = 0.75 m²K/W, θ_u = 20 °C, 130 mm massive concrete floor, spread = 3-30 K, maximum heating circuit length = 150 m maximum pressure drop per heating circuit including 2 x 5 m connecting line Δp_{max} = 250 mbar

For other flow temperatures, thermal resistance values, etc. refer to the dimensioning diagrams.

Pipe 14 mm

		$\theta_{V,des}$ = 55.5 °C[1)]		$\theta_{V,des}$ = 50 °C		$\theta_{V,des}$ = 45 °C	
$\theta_{F,m}$ [°C]	q_{des} [W/m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [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**	**14.0**	15	11.5	**10**	**5.5**
26.1	65	**25**	**19**	20	12.5	**10**	**9**
25.7	60	**30**	**20.5**	25	13.0	**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**	**42.0**	30	35	**30**	**24.5**

[1)] At $\theta_{V, des}$ > 55.5 °C the heat flow density limit and thus the maximum floor surface temperature of 29 °C (33 °C for bathrooms) is exceeded.

(θ_i = 20 °C, $R_{\lambda,B}$ = 0.15 m²K/W)

Pipe 14 mm bathrooms

		$\theta_{V,des}$ = 55.5 °C[1)]		$\theta_{V,des}$ = 50 °C		$\theta_{V,des}$ = 45 °C	
$\theta_{F,m}$ [°C]	q_{des} [W/m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [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**

[1)] At $\theta_{V, des}$ > 55.5 °C the heat flow density limit and thus the maximum floor surface temperature of 29 °C (33 °C for bathrooms) is exceeded.

(θ_i = 24 °C, $R_{\lambda,B}$ = 0.02 m²K/W)

Pipe 16 mm

		$\theta_{V,des}$ = 54.9 °C[1)]		$\theta_{V,des}$ = 50 °C		$\theta_{V,des}$ = 45 °C	
$\theta_{F,m}$ [°C]	q_{des} [W/m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [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**

[1)] At $\theta_{V, des}$ > 54.9 °C the heat flow density limit and thus the maximum floor surface temperature of 29 °C (33 °C for bathrooms) is exceeded.

(θ_i = 20 °C, $R_{\lambda,B}$ = 0.15 m²K/W)

Pipe 16 mm bathrooms

		$\theta_{V,des}$ = 54.9 °C[1)]		$\theta_{V,des}$ = 50 °C		$\theta_{V,des}$ = 45 °C	
$\theta_{F,m}$ [°C]	q_{des} [W/m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [m²]	T [cm]	$AF_{max.}$ [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**

[1)] At $\theta_{V, des}$ > 54,9 °C the heat flow density limit and thus the maximum floor surface temperature of 29 °C (33 °C for bathrooms) is exceeded.

(θ_i = 24 °C, $R_{\lambda,B}$ = 0.02 m²K/W)

2.3 Dimensioning diagrams

According to DIN EN 1264 bathrooms, showers, toilets and the like are excluded when determining the design flow temperature.

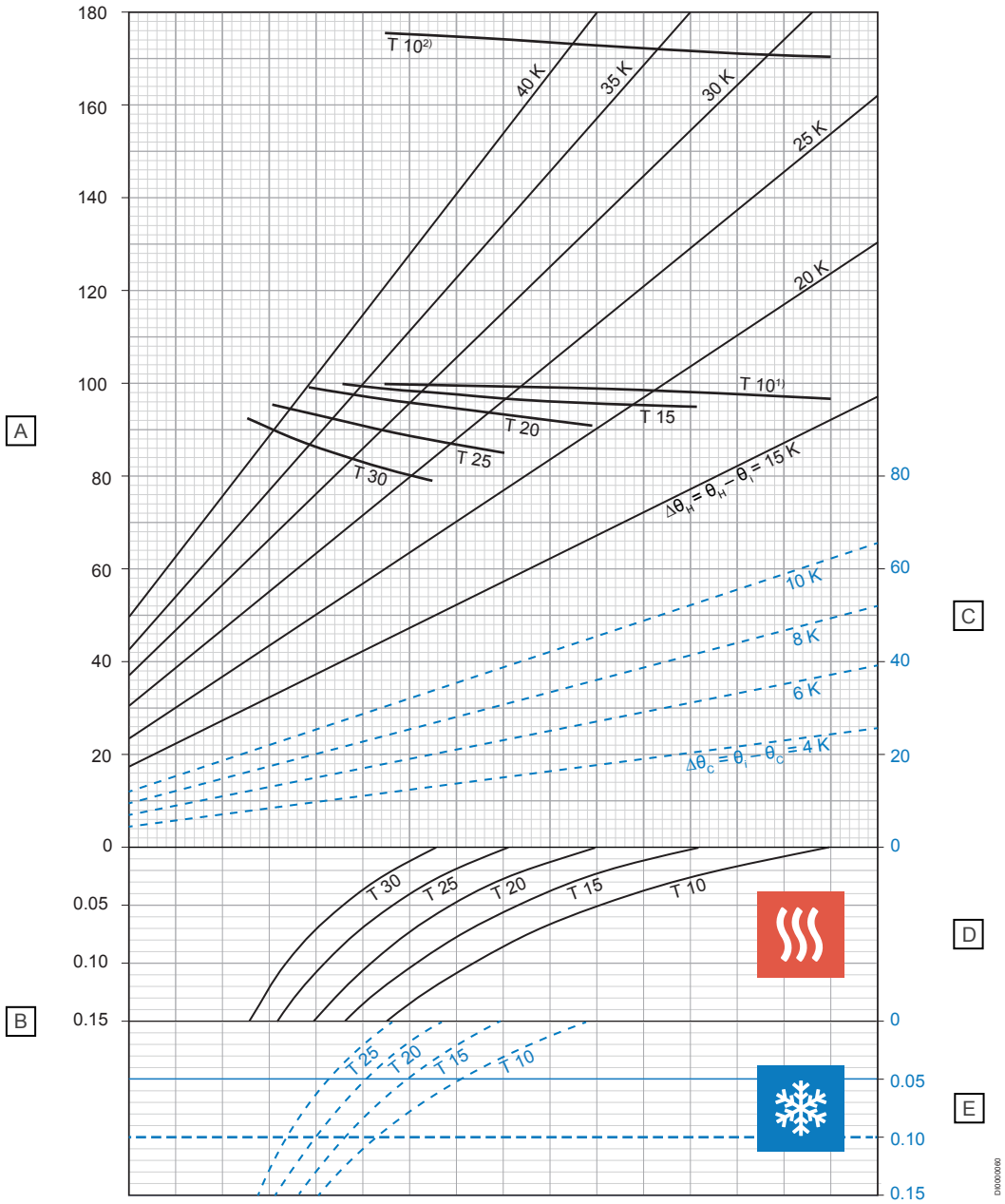
The limit curves must not be exceeded.

$\triangle\theta_{H, g}$ is found through the limit curve for the occupied zone with the smallest pipe spacing.

The design supply water temperature maximum must be: $\theta_{V, des} = \triangle\theta_{H, g} + \theta_i + 2.5$ K.

In cooling mode the supply water temperature depends on the dew point temperature, therefore a humidity sensor has to be installed.

Uponor Klett Comfort Pipe PLUS 14 x 2.0 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

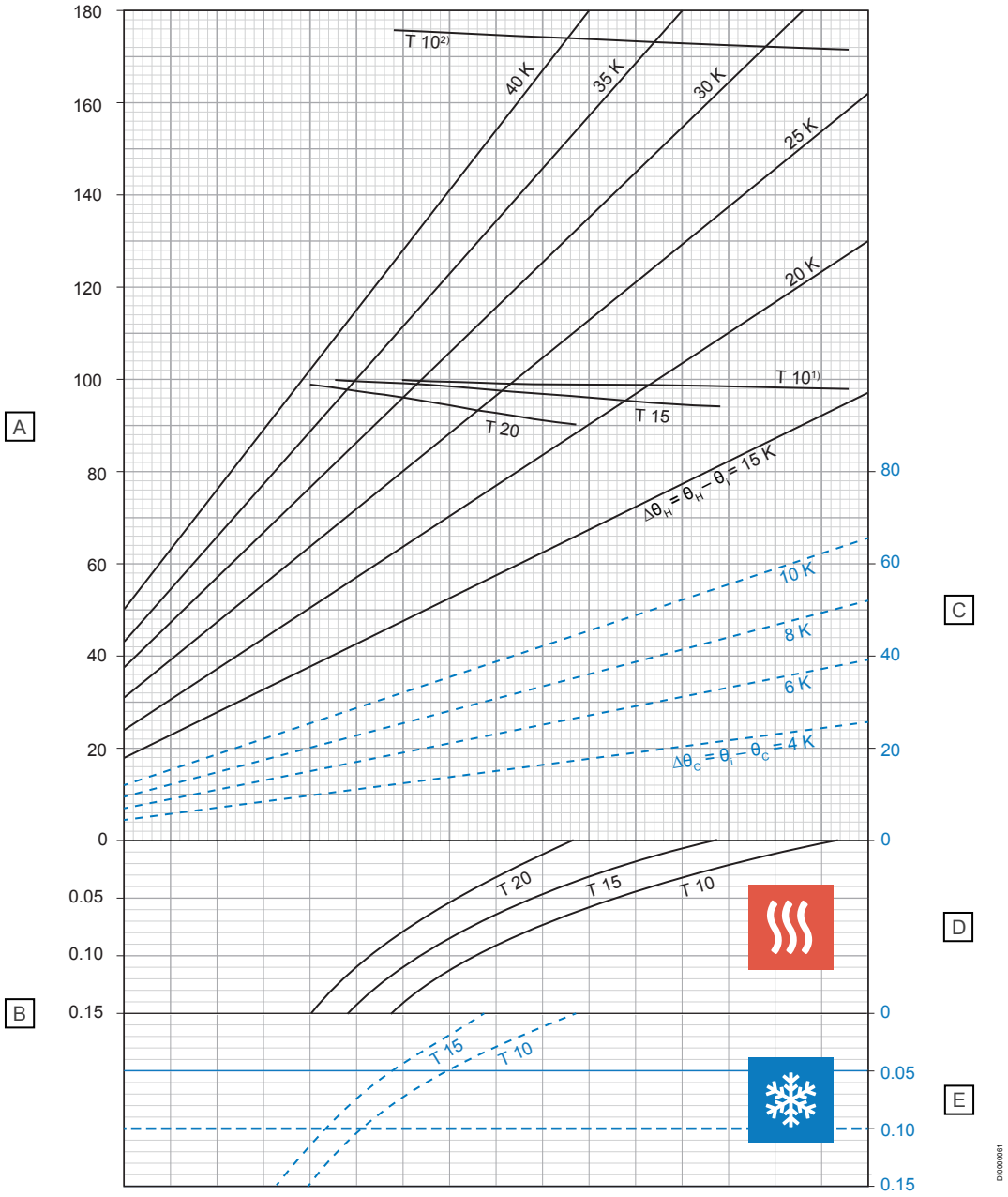
[2] Limit curve valid for θ_i 20 °C and $\theta_{F,max}$ 35 °C

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 2.0 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	15.6
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

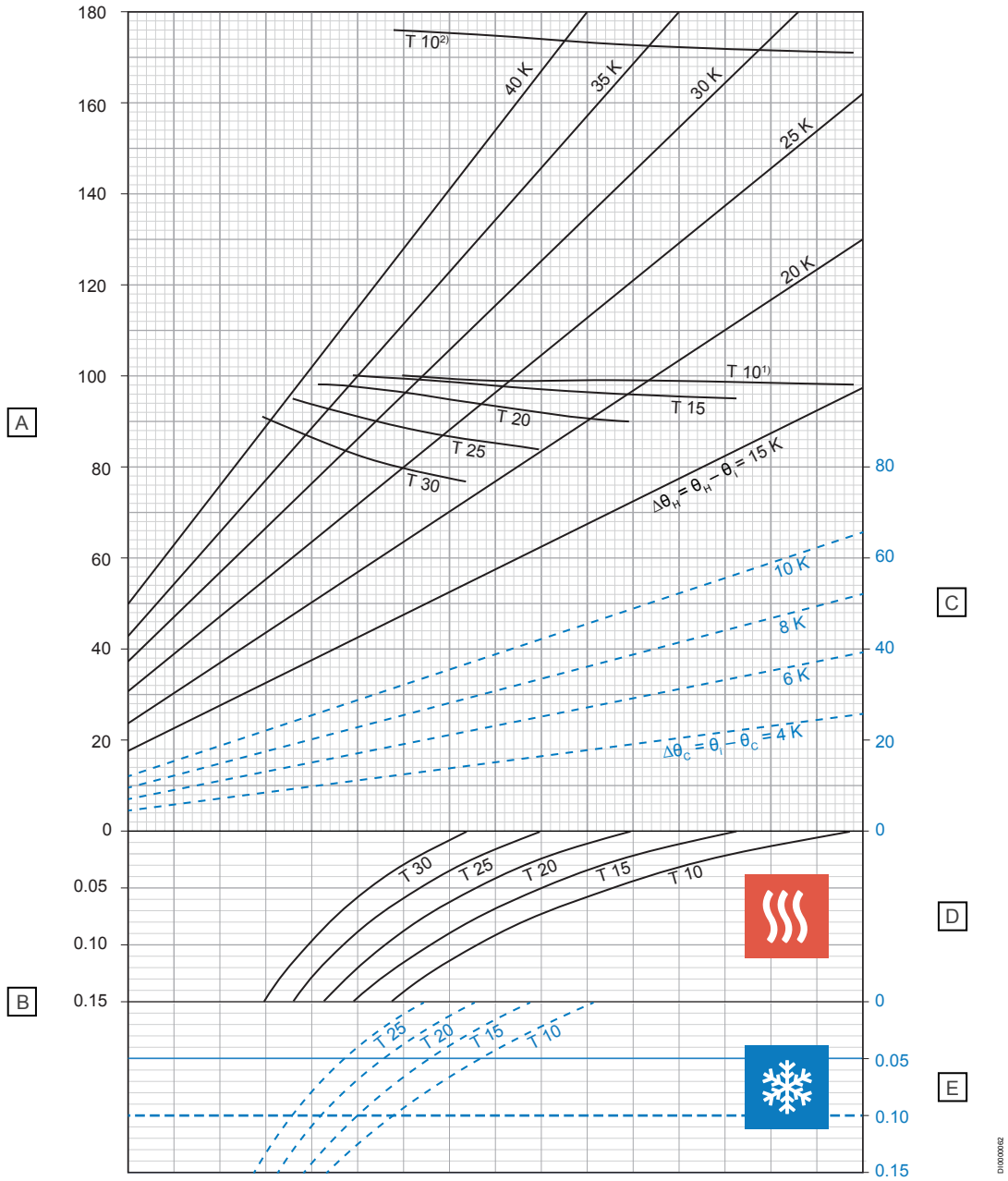
[2] Limit curve valid for θ_i 20 °C and $\theta_{F, max}$ 35 °C

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 16 x 2.0 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	15.5
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

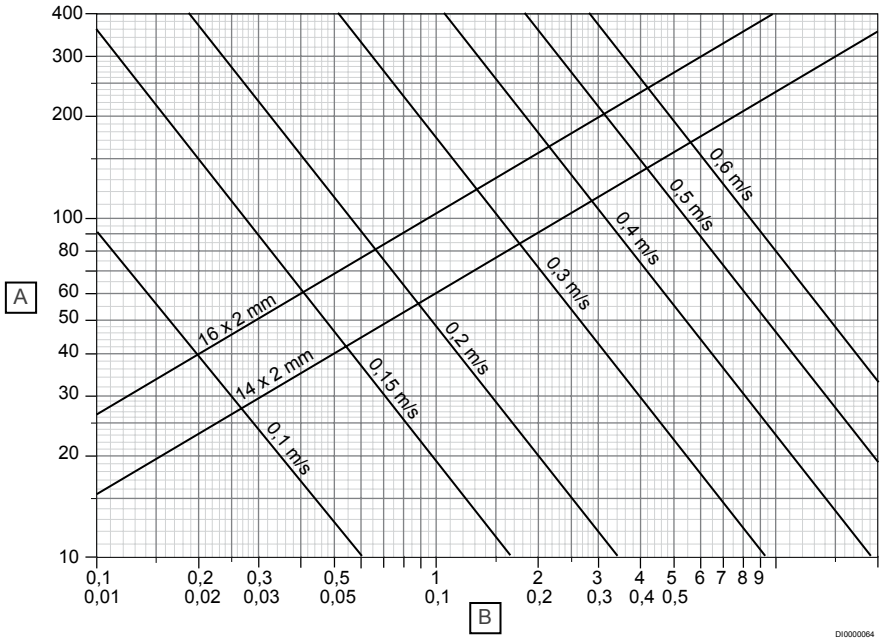
E - Cooling

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)

2.4 Pressure drop diagrams

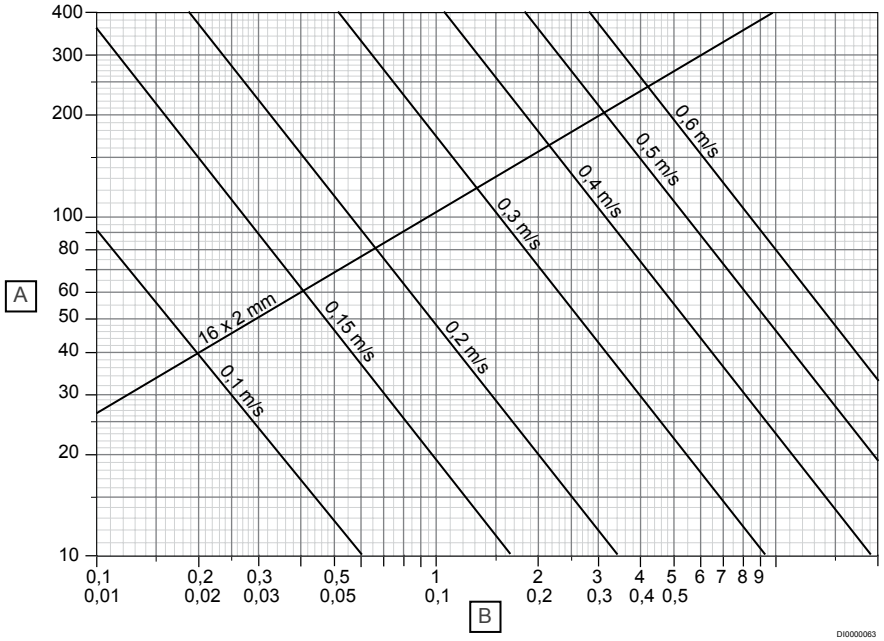
Uponor Klett Comfort Pipe PLUS



Determine the pressure losses with the aid of the diagram.

Item	Description
A	Mass flow rate [kg/h]
B	Pressure gradient R

Uponor Klett MLCP RED



Determine the pressure losses with the aid of the diagram.

Item	Description
A	Mass flow rate [kg/h]
B	Pressure gradient R

2.5 Service and support

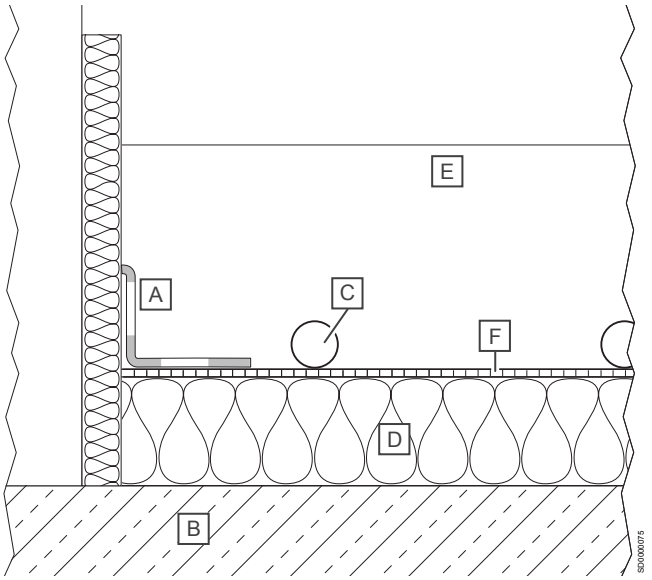
Uponor offers various service and support during the planning process of a new underfloor heating system.

	Service and support
	**Design software and individual planning support for radiant heating and cooling applications**
	**Planning manuals and information brochures**
	**Tendering support**
	**Declaration of Performance (DoP) online** www.uponor.com/services/download-centre IC0000060
	**BIM database for Revit**
	**Download center with documentation** www.uponor.com/services/download-centre IC0000060

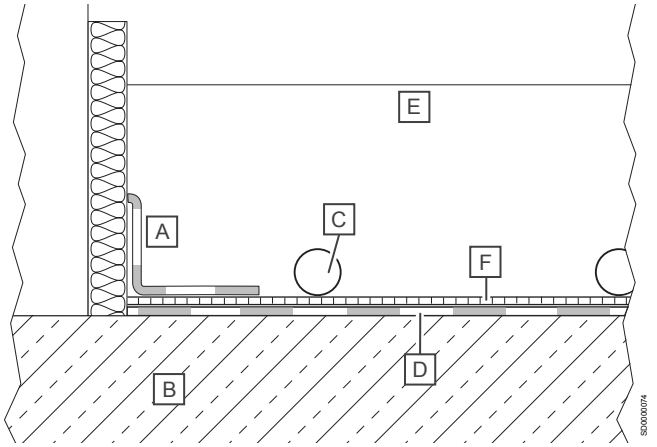
3 Installation

3.1 Construction examples

Construction with insulation



Construction without insulation

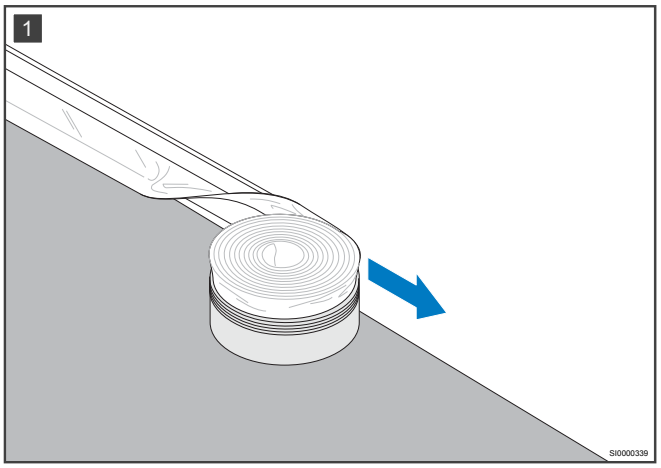


Item	Description
A	Edging strip
B	Concrete floor
C	Pipe
D	Insulation / Vapour barrier foil
E	Load distribution layer
F	Uponor Klett Twinboard

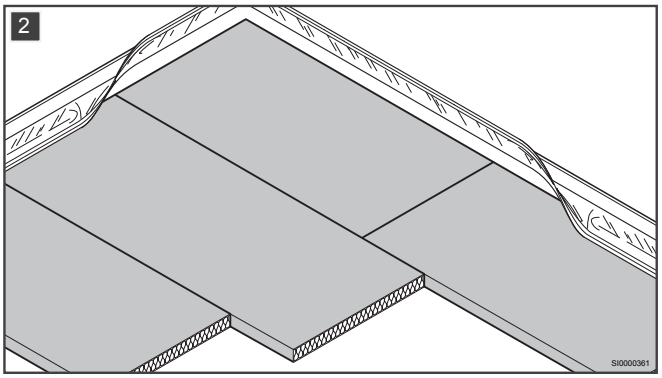
3.2 Installation in brief

Note

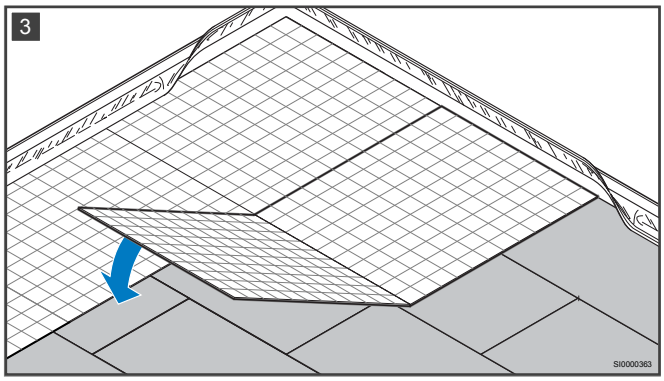
Installation must be performed by a competent person in accordance with local standards and regulations.



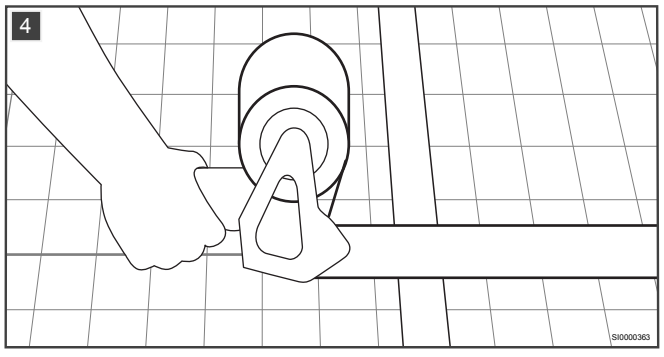
1 Edging strip installation



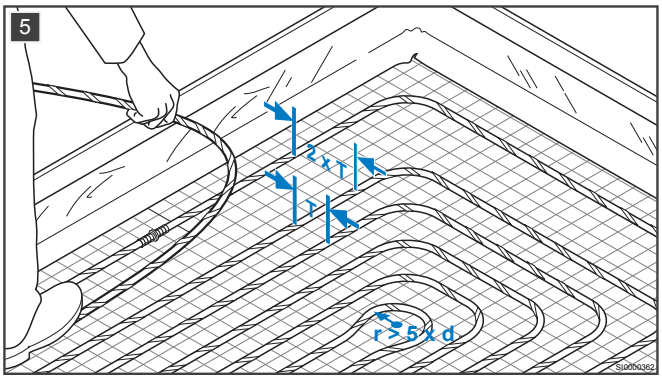
2 Laying insulation (if necessary) or vapour barrier foil



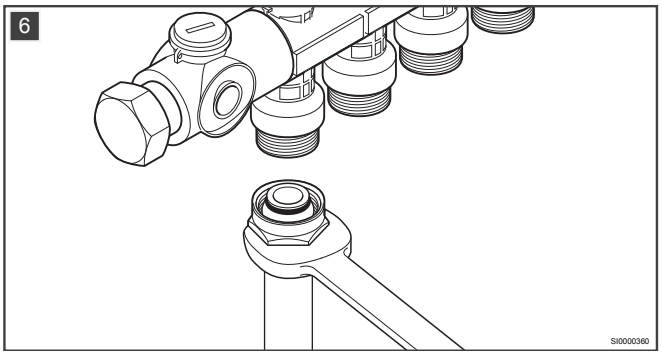
3 Laying the Uponor Klett Twinboard panels



4 Joining the Uponor Klett Twinboard panels with tape



5 Laying the pipe



6 Connecting the Uponor Klett Twinboard system to the manifold

4 Technical data

4.1 Uponor Klett Comfort Pipe PLUS

Description	Value
Pipe dimension	14 x 2.0 mm and 16 x 2.0 mm
Pipe length	240; 640 m
Material	PE-Xa, 5-layer pipe
Colour	White outer layer with 2 blue longitudinal stripes
Marking	Logo: Uponor Comfort pipe PLUS 14x2.0 EN ISO 15875 C PE-Xa Oxygen diffusion tight/DIN 4726 DIN CERTCO 3V372 AENOR 001/006217 Class 5/6 bar KOMO K79614 ATG 3027 IIP-307-UNI MPA-DA (Country code, Material code pipe,Material code evoh,Machine,Year,Month,Date) Made in (country)
Manufactured	According to EN ISO 15875
DIN CERTCO registration	3V372
Area of application	Class 4 + 5 / 6 bar (EN ISO 15875)
Max. operating temperature	90 °C (EN ISO 15875)
Short term operating temperature	100 °C (EN ISO 15875)
Pipe jointings	Uponor screw connection, Uponor Q&E technology
Weight	0.079 kg/m
Water content	0.079 l/m
Oxygene tightness	According to ISO 17455 / DIN 4726
Density	0.934 g/cm³
Material class	B2 / E (DIN 4102 / EN 13501 respectively)
Min. bending radius	8 x ∅ free-hand bending 5 x ∅ supported bending (70 mm)
Pipe roughness	0.0005 mm
Ideal installation temperature	> 0 °C
UV protection	Opaque cardboard (store remaining quantities in the cardboard box)
Approved water additive	Uponor anti-freeze agent GNF, material class 3 (DIN 1988, part 4)

4.2 Uponor Klett MLCP RED composite pipes

Description	Value
Material (multi-layer composite pipe)	PE-RT - adhesive - aluminium with longitudinal safety overlap - adhesive - PE-RT, SKZ controlled, oxygen-tight according to DIN 4726.
Max. operating temperature	60 °C
Max. operating pressure	4 bar

Supplied in reels for use as radiant heating pipe, connected with press fittings or compression fittings.

4.3 Uponor Klett Twinboard

Description	Value
Material	Full-surface hook-and-loop ("Klett") fixation board made from 3 mm poly-propylene twin-wall sheet with printed grid markings
Max. payload	5 kN/m² as per EN 1991-1:2010-12, application areas as per table 6.1: A1-A3; B1-B3, C1-C5, D1-D2, and T1-T2. Tested and certified for 50 years lifetime by KIWA TBU
Thermal resistance	$R_{\lambda,ins}$= 0.014 m²K/W
Material class	B2 (according to DIN EN 13501-1)
Fire behaviour	Class E (according to DIN EN 13501-1)
Grid marking	100 x 100 mm
System type	Wet UFH system
Load distribution layer	Cement or anhydried screed
Dimensions	2.400 x 1.000 x 3 mm, folded to 1.200 x 1.000 x 6 mm
Area	2.4 m²/panel
Weight	1.9 kg/panel 0.8 kg/m²

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Production: Uponor/DCO

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