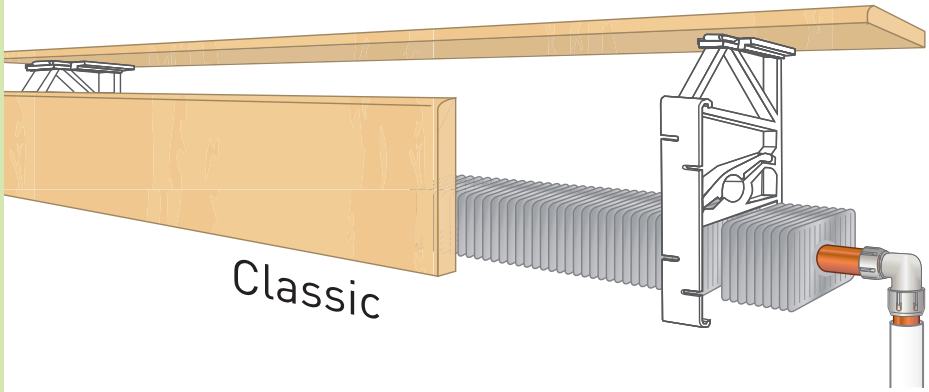
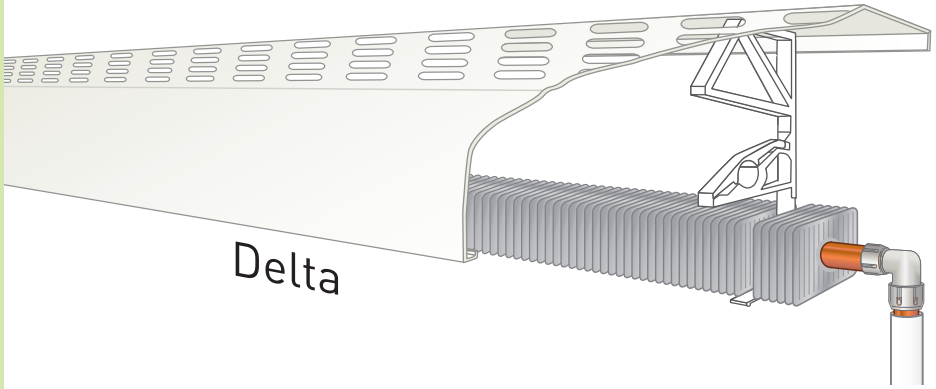
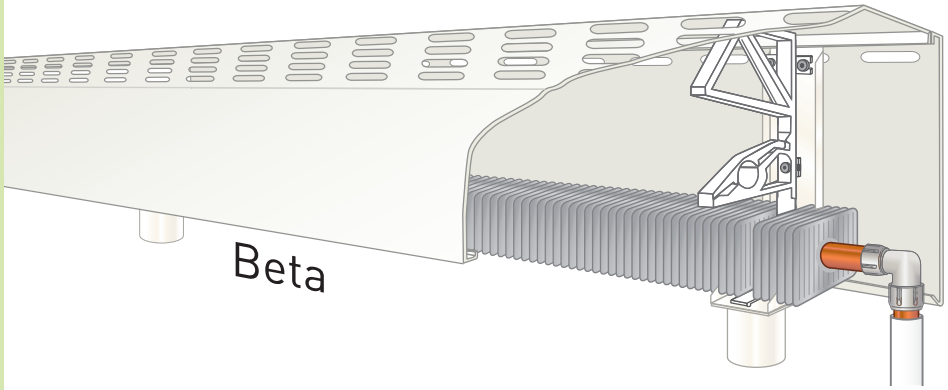
INDIVIDUAL HEATING

Classic, Delta & Beta skirting heating systems

Planning







VARIOTHERM

HEATING. COOLING. COMFORT.

Design manual

e21317

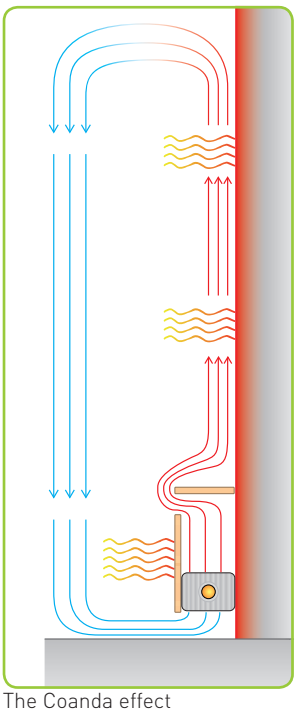
1. Principles

1.1 What does a veil have to do with skirting heating?

A veil has a simple function: it shields. The same applies to the hot air veil created by the Variotherm skirting heating, which covers cold walls within a short period of time. The veil then blocks the cold radiating from the walls, while simultaneously warming them. When this happens, a feeling of cosiness starts spreading throughout the room, replacing the cold. The heated walls give off radiant, long-wavelength infrared heat, which warms the room. Radiant heat is particularly pleasant, since it, like solar heat, is similar to our body's natural warmth. Radiant heat is the traditional form of heat, such as given off by tiled stoves. It is healthy and natural!

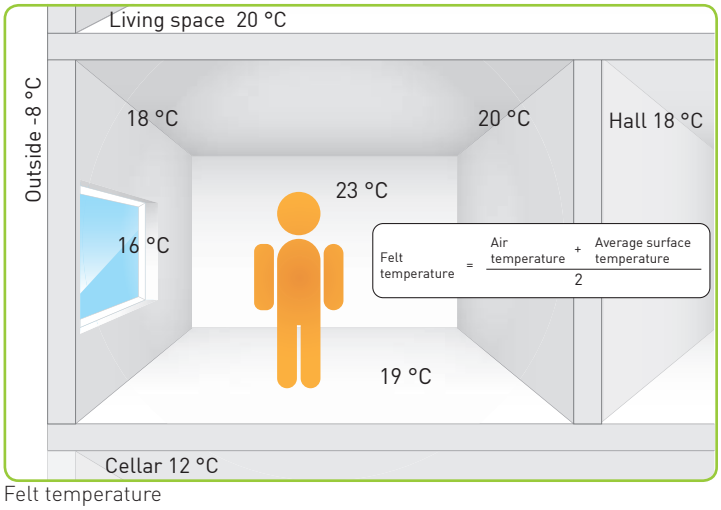
1.2 The Coanda effect

The Coanda effect is the physical requirement for the skirting heater's effect: at the beginning of the 20th century, physicist Henri Coanda discovered that rising hot air always follows cold surfaces (such as exterior walls) as it moves upward. When air currents exit slits at a certain angle and distance, the current will bend towards the surface due to the created turbulences and the lower pressure on one side. The air current will "stick" to it as long as certain requirements (distances and current thickness) are met. The low pressure area around the secondary air introduced by the current across a surface is crucial for this effect. If this secondary air cannot continue to flow, the current will draw itself into this area, or follow the wall. This law of physics is the reason why the Variotherm skirting heaters work in such an outstanding way. Skirting heating systems have another benefit thanks to the Coanda effect: because only a small amount of air is moved during heating, hardly any dust is stirred up. A blessing for your respiratory tract!



The Coanda effect

1.3 Cosiness



Felt temperature

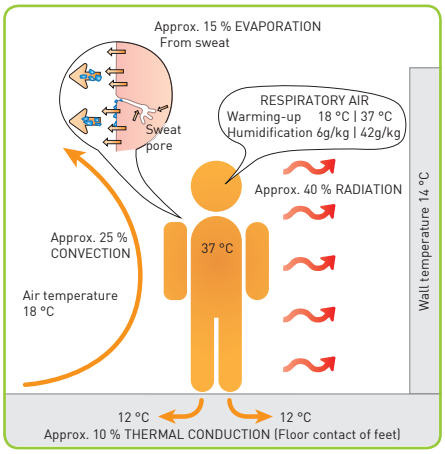
Cosiness is created not just by a specific, individually desired and actually present air temperature. The temperature of all surfaces enclosing the room is of equal importance. The felt temperature is roughly consistent with the arithmetic mean of both temperatures.

What makes people feel cosy? People feel cosy when the following basic 'thermal cosiness' equation holds:

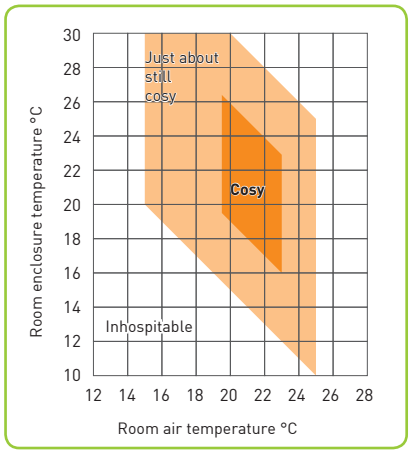
Heat production = heat loss

In this context, it is important that heat loss from the human body is as evenly distributed in all directions as possible. We feel uncomfortable if too much heat is lost in one particular direction (cold surfaces, droughts) or heat loss is prevented in one direction (hot surfaces or vapour-tight, thick clothing).

The lower the inside air temperature is, the warmer the surrounding surfaces (wall surfaces, floor and ceiling, as well as doors and windows) must be to ensure cosiness.

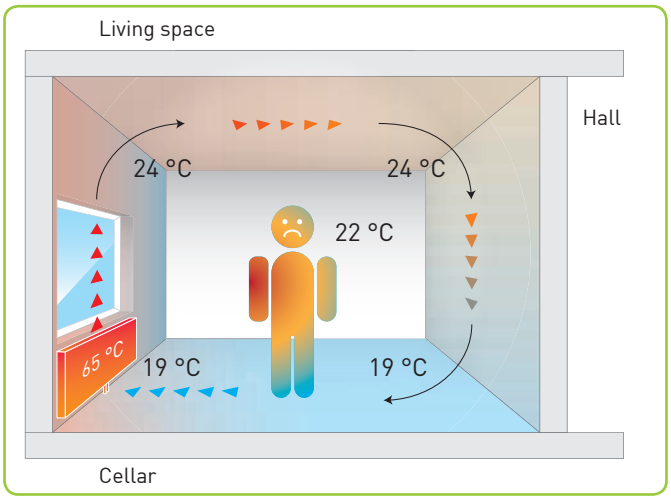


Human heat balance

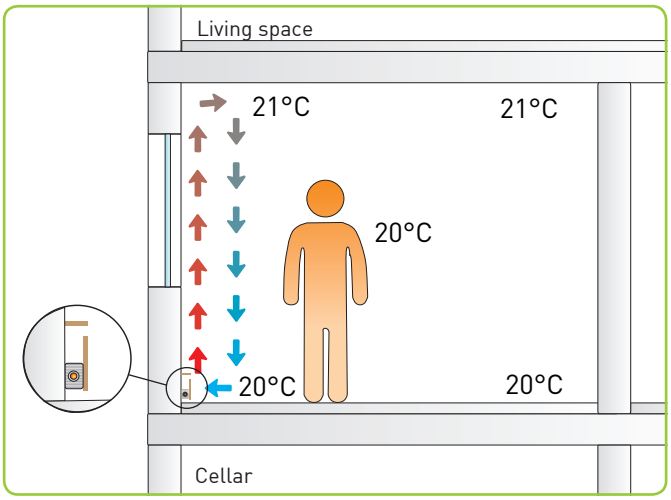


Zone of cosiness

Compared to other heating systems, skirting heating increases cosiness. The installation of a skirting heating system along an exterior wall, especially under windows, can largely cancel out the unpleasant effects from the radiation exchange between your body and cold exterior walls and windows. You can set the room temperature lower than you would with convection heating without worrying about discomfort, since the hot air veil raises the felt air temperature.



Convection heating:
Heated air rises quickly and returns to the floor as cold air.
> Unbalanced temperature distribution, stirred dust caused by circulating air, 'dry air'



Variotherm skirting heating system:
The even heating of floor and walls creates a cosy warm envelop in the entire room.
> Healthy room climate, hardly any dust stirred up, no overheated floor, no overheated ceiling, 'very cosy'

1.4 Energy savings

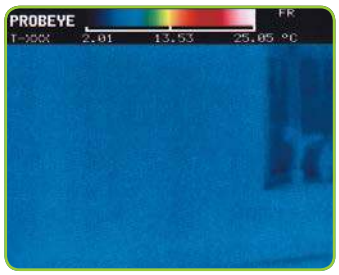
Energy losses are minimised with a lowered room air temperature along with the increased cosiness. The approximate cost savings per 1 °C lower room air temperature are 6%. Additionally, the low room air temperature has the great physiological advantage of significantly increasing the absorption of oxygen for the human body.

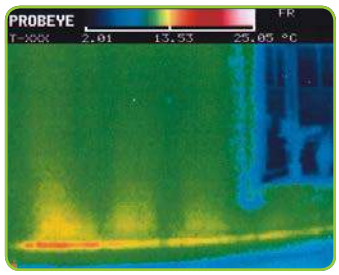
At the same time, the relative humidity increases and makes for healthier air that is also easier to breathe. Compared with other hot water heating systems, skirting heating systems run with the lowest amount of water. They are therefore the fastest and most precise hot water heating systems.

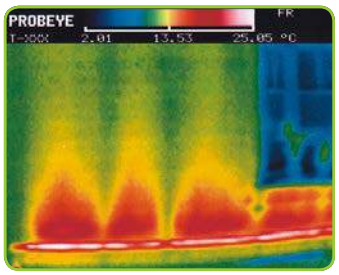
1.5 How the skirting heating system functions

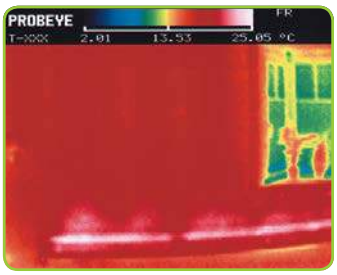
The goal of skirting heating systems is to maintain the right wall temperature. This is why they are installed along the entire length of the outside wall when possible. The air flows from bottom to top through the skirting heating system and then selects the area right next to the wall as a channel to ascend along due to the higher temperature difference (see also Coanda effect, section 1.2), On its way up, it continuously gives off its heat to the wall before stratifying within the room air. The heated wall surface turns into a heat radiating surface. This allows for a cosy indoor temperature with low temperature differences within the room, and between outside and interior wall surfaces.

These infrared images show the rapid effect of Variotherm skirting heating systems. A veil of warm air is developed in just a few minutes. It blocks off the cold and heats the wall.

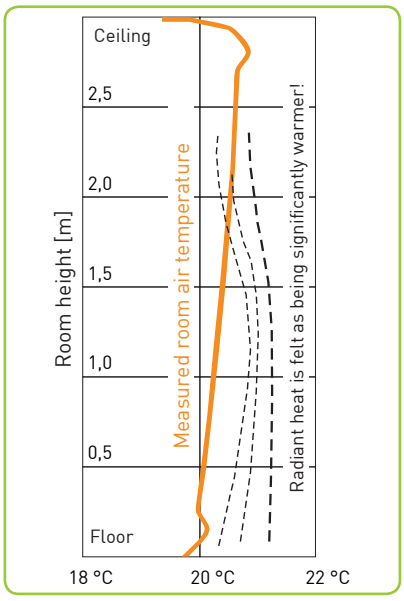








1.6 Temperature curve



The image shows the variation in temperature within the room of a home heated with a Variotherm skirting heating system, as measured by a calibrated temperature probe. It is easy to see that there is little difference in temperature between the floor and the ceiling. The dashed lines indicate the apparent radiant heat as measured by the probe. It is significantly higher than the actual room air temperature. This proves that cosiness is already achieved at lower, energy-saving room air temperatures.

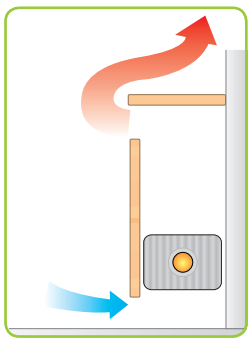
1.7 Areas of application

Skirting heating systems are suitable for new homes and renovations. They can be installed in conventional 2-pipe systems or manifold systems. When renovating, existing rising lines can be used for supply. In any case, another ace of skirting heating systems comes to bear. The cladding can be used to elegantly 'hide' the required heating pipes (and electrical cables). Humid walls prone to mould formation can be renovated with skirting heating systems. Thanks to the temperate walls along the entire height of the room, the relative humidity even in poorly ventilated corners does not reach critical values any more (extreme cases need to be considered from case to case). Owing to their low construction heights, skirting heating systems are very suitable for low windows (low parapet height). Hotel rooms, and rooms in cellars that are used less often, can be used again in a shorter amount of time. Skirting heating systems meet these criteria due to their low latency and homogeneous heat dissipation. Depending on the design, rooms are heated to a cosy level within 15 to 30 minutes.

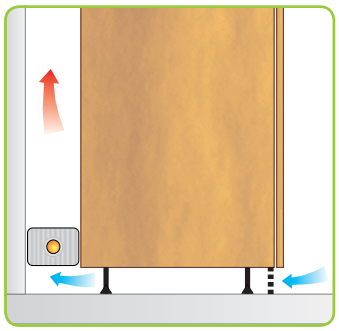
1.8 Variotherm skirting heating system and furniture

How do the required installation lengths of the skirting heating system match the planned furnishing? Skirting heating systems are installed on the exterior walls where furniture is not supposed to be placed (or at least not without any problems). Tall furniture would limit natural light. Placement possibilities are also limited by windows and curtains. In rooms with large wardrobes, cupboards or shelves, Variotherm skirting heating systems can be integrated into them. In case of less well-insulated homes, it is not recommended to place furniture along the exterior walls due to mould formation. When planned ahead in time, skirting heating systems can also be integrated in niches. Variotherm skirting heating systems can be installed on the lower part of the wall, in plinths or in niches.

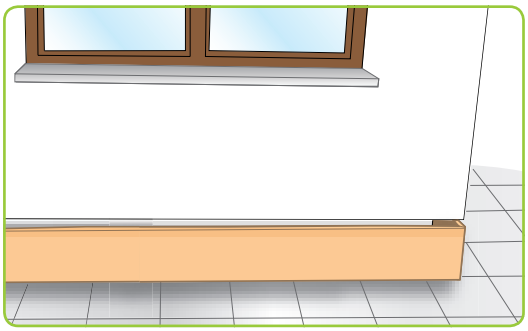
Furniture can then be placed as desired. With parquet floors and wood panelling, the skirting heating system can be encased in wood.



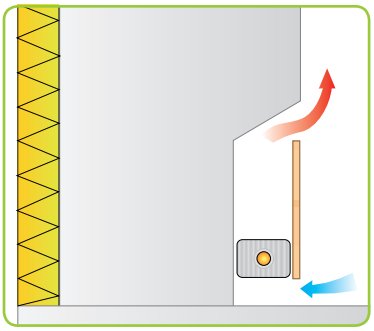
The Coanda effect



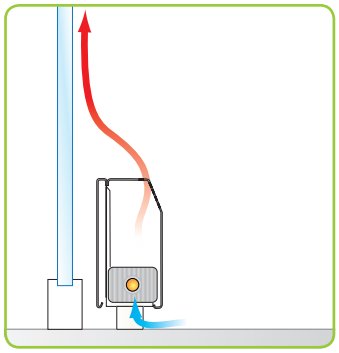
Kitchen installation



Skirting heating system in the wall construction

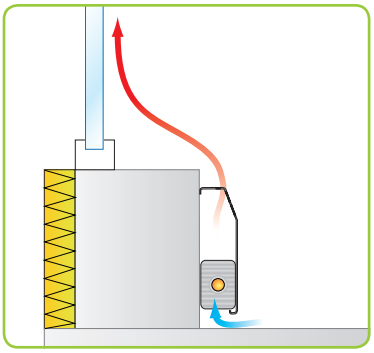


Skirting heating system in the wall construction - section



Skirting heating system in front of glass surfaces

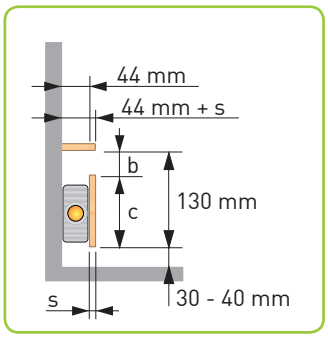
Skirting heating system below glass surfaces



Skirting heating system below glass surfaces - section

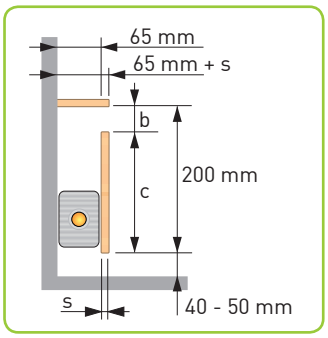
2. Skirting heating types

2.1 Classic skirting heating types for wooden cladding (provided by the customer)



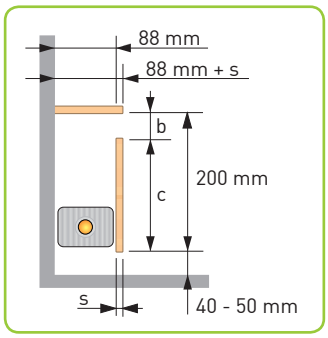
Mini Classic skirting heating system

b ... 25 mm
c ... 105 mm
s ... min. 15 mm (e.g. wooden multi-layer board)



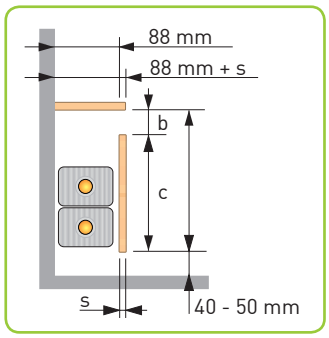
Ia Classic skirting heating system

b ... 37 mm
c ... 163 mm
s ... min. 15 mm (e.g. wooden multi-layer board)



IIa Classic skirting heating system

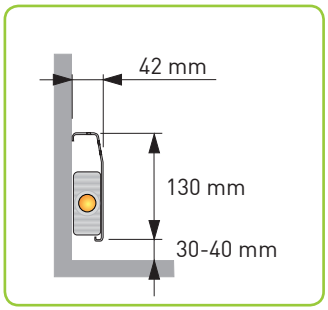
b ... 37 mm
c ... 163 mm
s ... min. 15 mm (e.g. wooden multi-layer board)



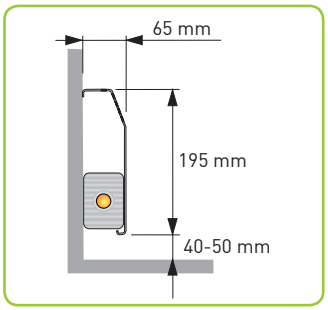
IIIa Classic skirting heating system

b ... 37 mm
c ... 163 mm
s ... min. 15 mm (e.g. wooden multi-layer board)

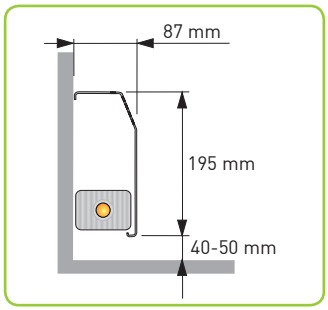
2.2 Delta skirting heating types with metal cladding



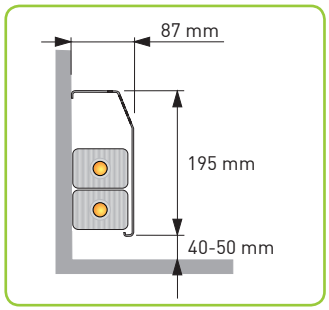
Mini Delta skirting heating system



Ia Delta skirting heating system

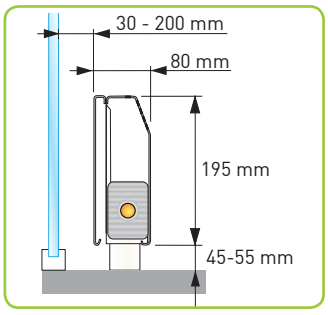


IIa Delta skirting heating system

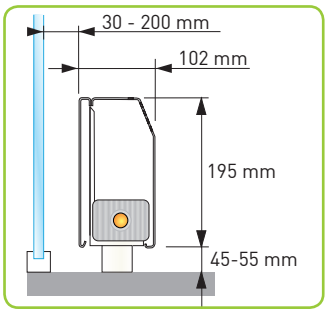


IIIa Delta skirting heating system

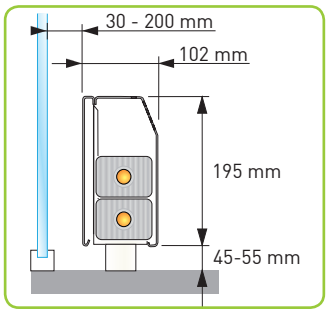
2.3 Skirting heating Beta (free-standing) with metal cladding



Ia Beta skirting heating system

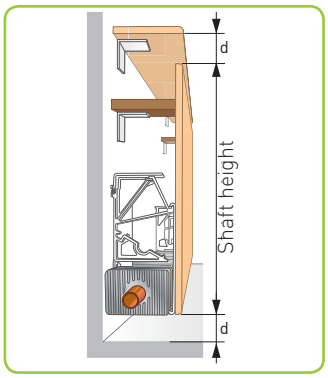


IIa Beta skirting heating system



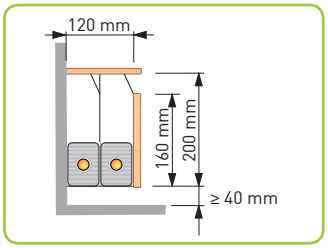
IIIa Beta skirting heating system

2.4 Classic skirting heating types for wooden cladding (provided by the customer)

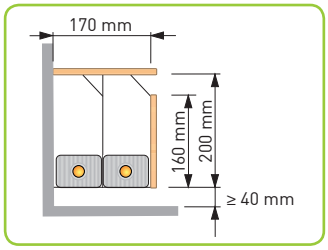


Change in shaft height

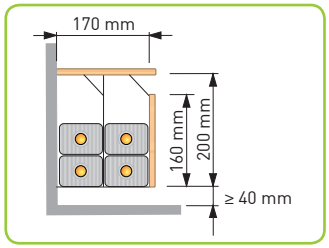
If the shaft height changes (= lower edge of the heating element to the upper edge of the front cladding) an additional fastening must be provided to secure the cladding (provided by the customer).



Skirting heating system IVa Classic with wooden brackets



Skirting heating system Va Classic with wooden brackets



Skirting heating system VIa Classic with wooden brackets

3. System description

3.1 The heating element

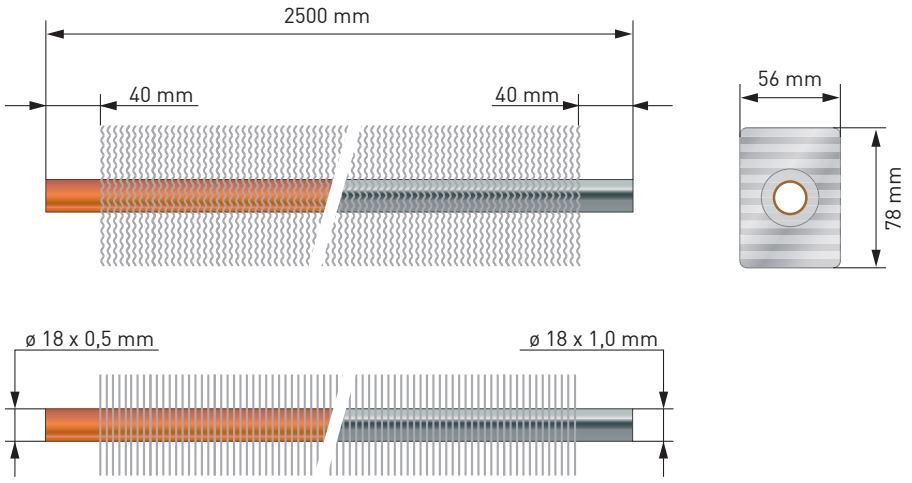
The core pieces of the Variotherm skirting heating system are the heating elements. They consist of a coper pipe ø 18 x 0.5 mm (DIN EN 12449) or a stainless steel pipe ø 18 x 1 mm (material 1.4521, DIN EN 10312/ DIN EN 10236-2) with aluminium louvres 56 x 78 mm or 35 x 78 mm (mini). The special manufacturing process results in a connection between the pipe and the aluminium louvres with an unsurpassed performance.

The heating elements are delivered packaged in boxes with a length of 2.5 m. They must be protected against damage or unintentional bending of the louvres.

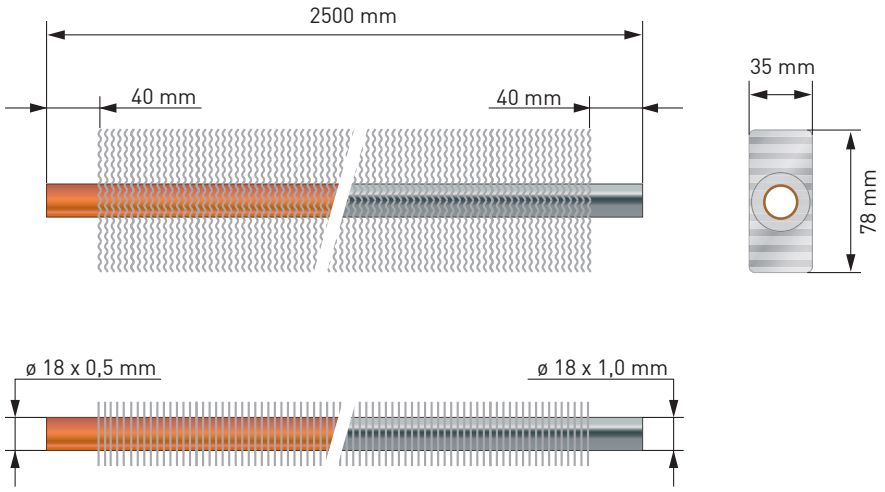
For longer heating elements, they are pressed together using 18 mm fittings (couplings, brackets, etc.). Copper pipes can also be soldered.

Pipe material	Support sleeve	Viega		Sanha	
		Press fitting	Press-fitting jaws	Press fitting	Press-fitting jaws
Copper	Yes	Profipress Sanpress	V18	Press fitting series 6000/8000	SA18
Stainless steel	No	-	-	Press fitting series 8000/9000/80000	SA18

Table of suitable press fittings



Standard heating element



Mini heating element

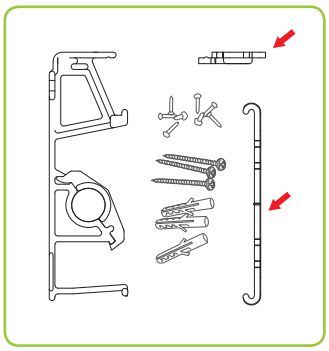
3.2 The skirting heating system bracket

The brackets for the Classic and Delta skirting heating systems consist of glass fibre reinforced plastic. For the Classic skirting heating system, a mounting plate and a mounting base are supplied for each bracket (red arrows), to allow the cladding provided by the customer to be attached to the bracket. The brackets are mounted on the wall at a spacing of approx. 600-800 mm, the clearance to the adjacent wall is about 200 mm.

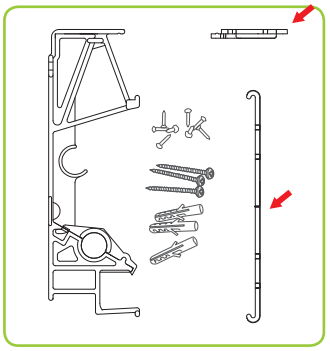
The Beta skirting heating system uses consoles consisting of an adapter, base and plastic bracket. The consoles are mounted on the floor at a spacing of approx. 400-600 mm.

Affixing material is supplied with all brackets as standard.

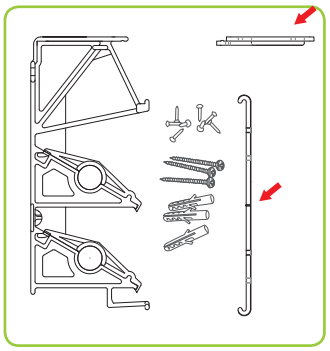
Classic bracket sets:



Mini Classic bracket set

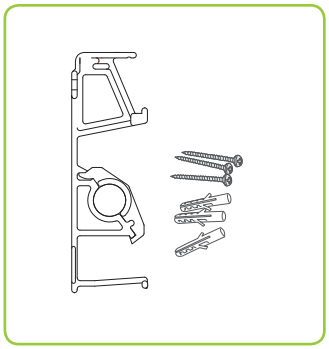


Ia Classic bracket set

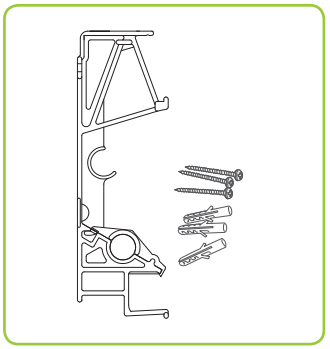


IIa + IIIa Classic bracket set

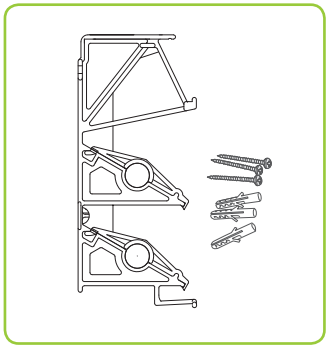
Delta bracket sets:



Mini Delta bracket set

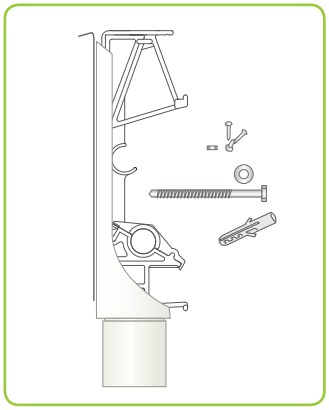


Ia Delta bracket set

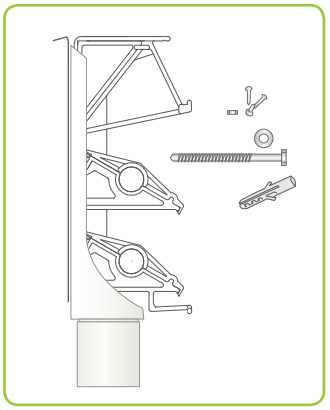


IIa + IIIa Delta bracket set

Beta bracket sets:



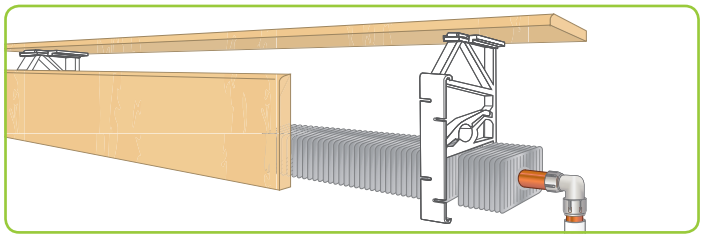
Ia Beta console



IIa + IIIa Beta console

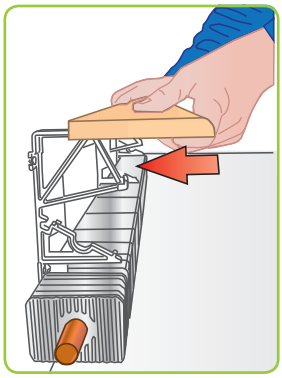
3.3 The cladding

Classic skirting heating cladding:

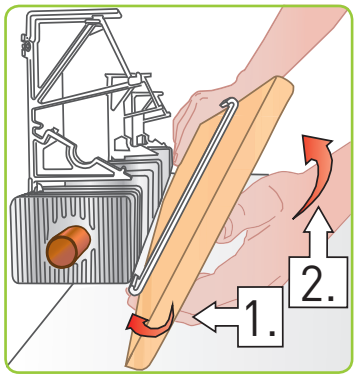


Section of Classic skirting heating system - wooden cladding (provided by the customer)

The cladding of the Classic heating elements is provided by the customer (for example with wood). This allows the cladding to be optimally adapted to the furniture and the floor. For dimensioning, see page 7, section 2.2



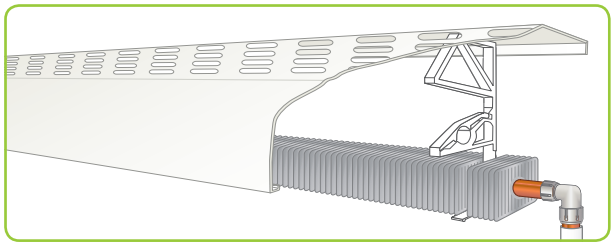
The brackets for the Classic skirting heating system are each supplied with a mounting base (above) and...



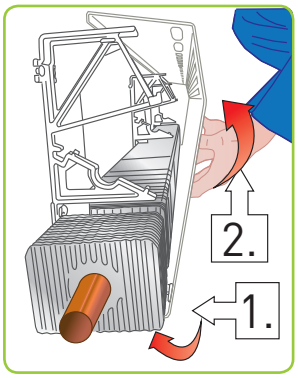
...a mounting plate (front). They can be used to easily remove the wooden cladding at a later point in time.

Delta skirting heating cladding:

The metal cladding is included with the Delta skirting heating. The elegant steel sheet (1 mm) cladding is powder-coated in white by default (RAL 9001). Other RAL colours and colour effects (for example metallic) are available upon request.

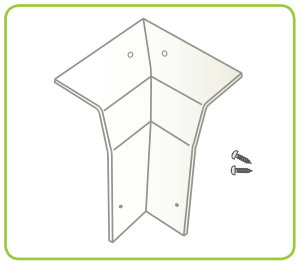


Section of Delta skirting heating system - metal cladding

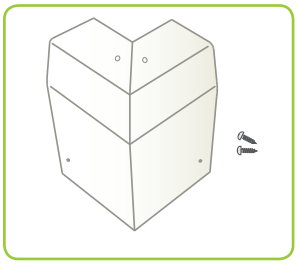


The metal cladding of the Delta skirting heating is clicked into place below and then on top.

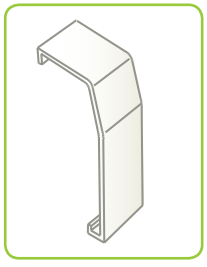
The programme is rounded off with the formed parts for 90° inside and outside corners, connecting elements for butt joints and left or right end caps.



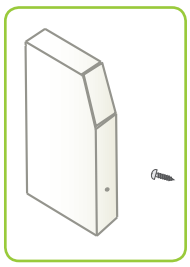
Inside corner 90°



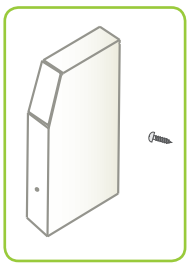
Outside corner 90°



Connecting elements

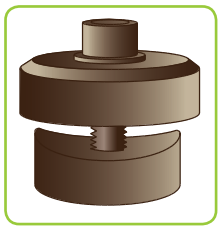


End cap left



End cap right

The formed parts are attached with the supplied screws. Use the Variotherm paint pen to paint the screw heads after mounting.



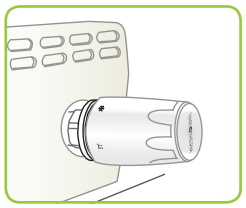
Round hole punch

For the flow valves, punch a hole into the Delta cladding in the axis of the valve head using the appropriate round hole punch. The thermostat head will later protrude through this hole.

Hole diameter required:

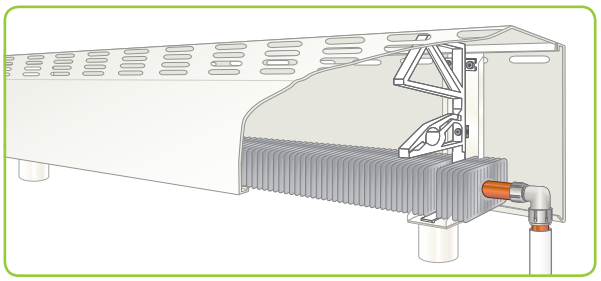
ø 40 mm for mini

ø 55 mm for Ia, IIa + IIIa and valves with servomotors



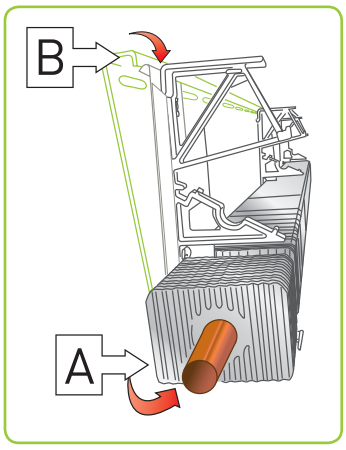
Example

Beta cladding

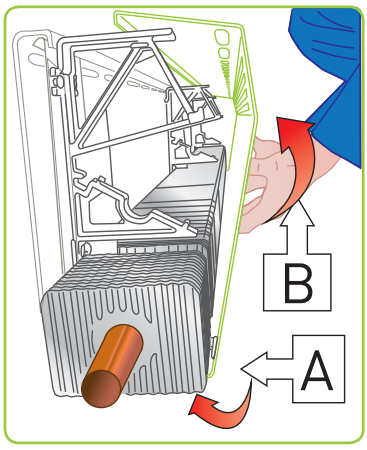


Section of Beta skirting heating system - metal cladding

The metal cladding is included with the Beta skirting heating. This consists of the front cladding and a rear wall. The elegant steel sheet (1 mm) cladding is powder-coated in white by default (RAL 9001). Other RAL colours and colour effects (for example metallic) are available upon request.

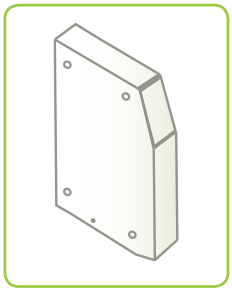


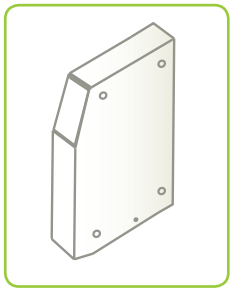
Snap the rear wall into place.



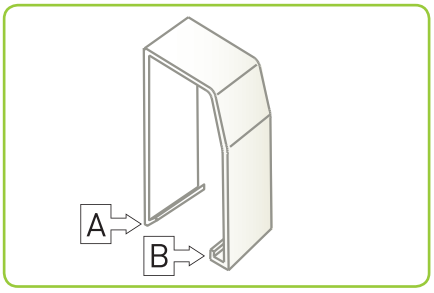
The front cladding of the Delta skirting heating is clicked into place below and then on top.

The programme is rounded off with the formed parts for connecting elements for butt joints and left or right end caps.

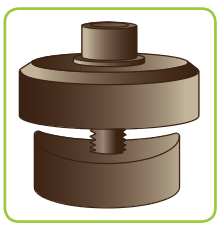




The end caps on the left/right are attached afterwards.

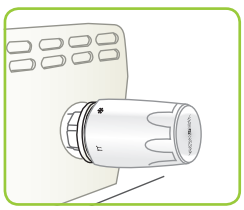


First, insert the connectors for the joints of the cladding at A, then click them into place at B.



Round hole punch

For the flow valves, punch a hole into the Beta cladding in the axis of the valve head using the appropriate round hole punch. The thermostat head will later protrude through this hole.
Hole diameter required:
ø 55 mm for Ia, IIa + IIIa, and valves with servomotors

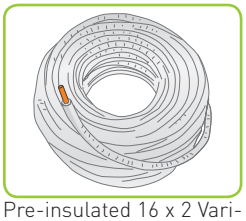


Example

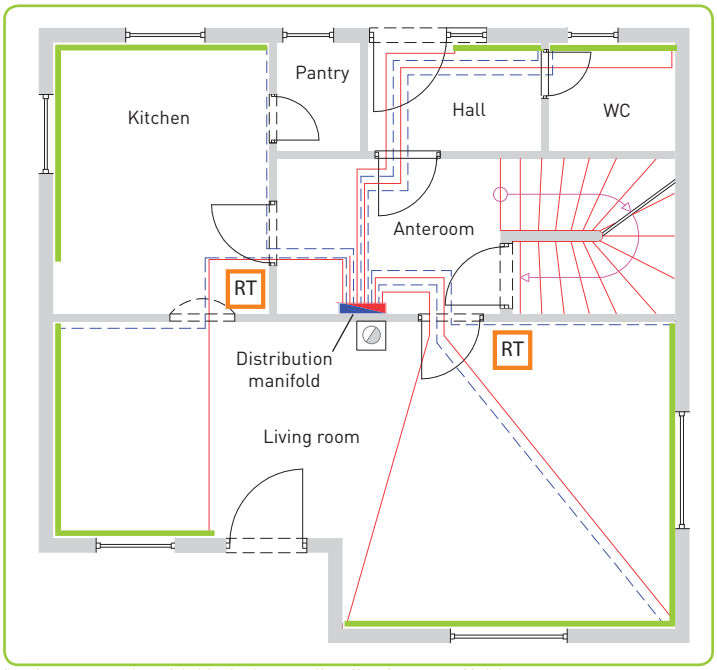
4. Hydraulic connection of the heating elements

4.1 Manifold system

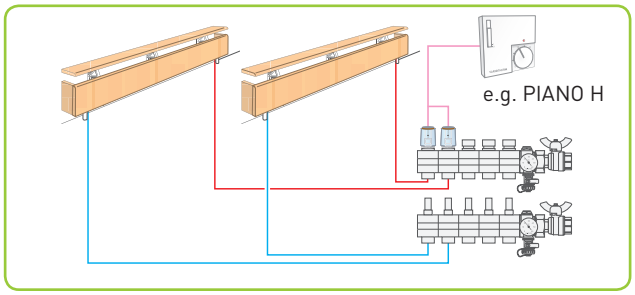
For installations with manifold systems, first lay the pre-insulated Variomodular pipes from the manifold to the skirting heating and back, and then connect them to the manifold via a screw fitting. The Variomodular pipe should be routed endlessly (i.e. without additional connection points) from the manifold to the skirting heating. The pipe is positioned near the skirting heating with the installation bracket.
Electronic room thermostats and servomotors are used to control the room temperature.

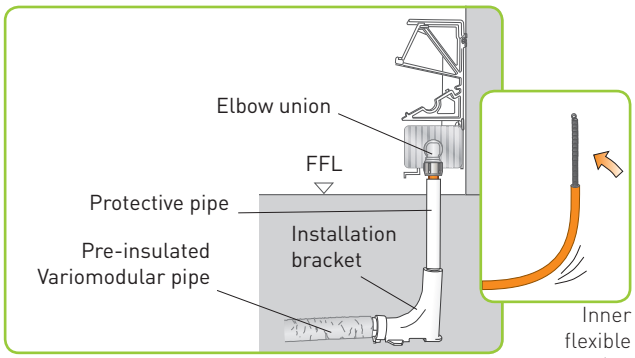


Pre-insulated 16 x 2 Variomodular pipe

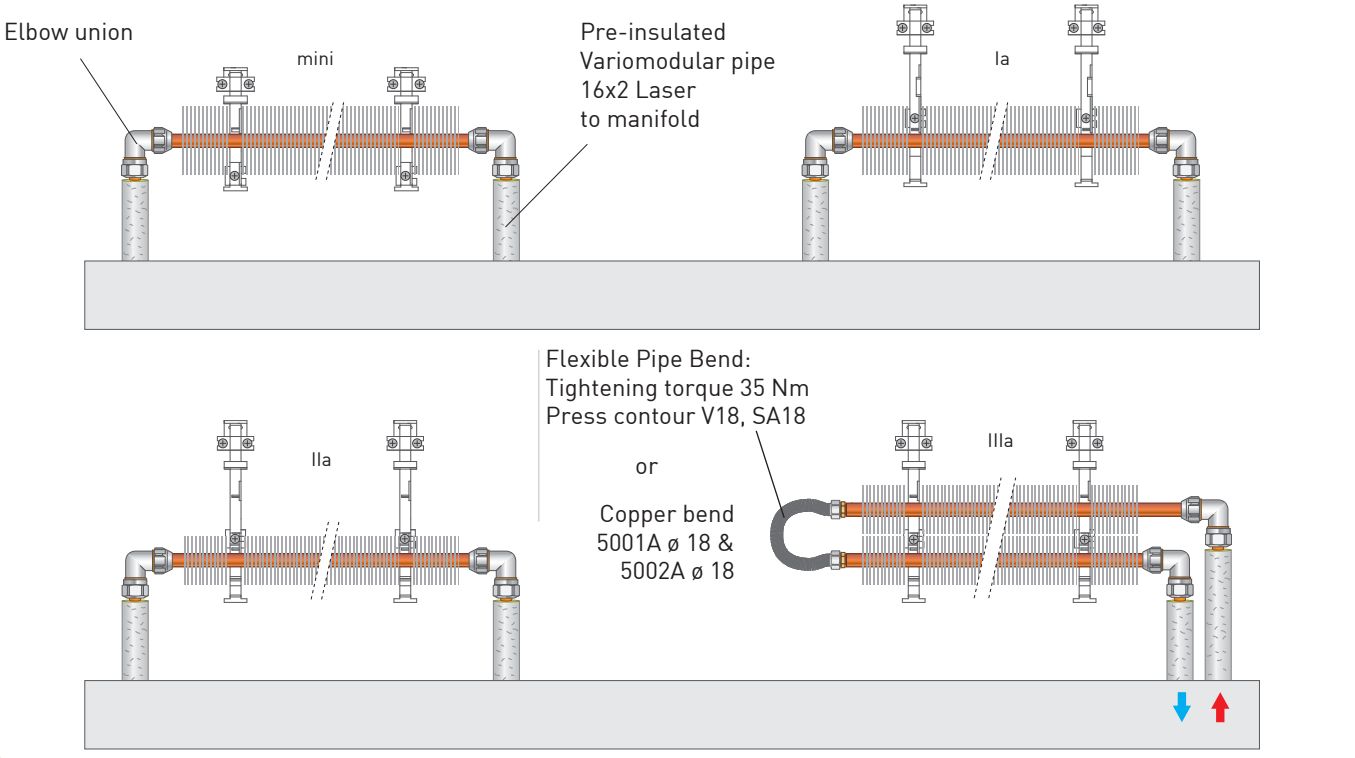


Laying example with Variotherm distribution manifold

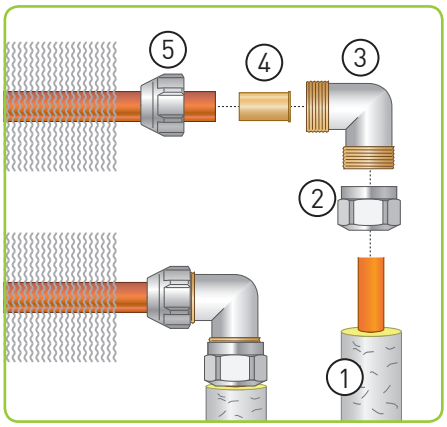




Inner flexible spring

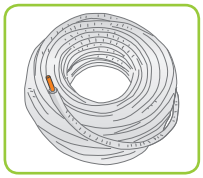


FLOW and RETURN



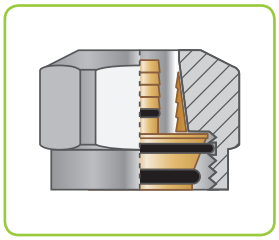
(1) Pre-insulated 16 x 2 Variomodular pipe
(2) 3/4“EUROx16 clamping screw fitting
(3) 3/4“EURO 90° bracket
(4) 18 x 17 mm support sleeve
(5) 3/4“EUROxCu18 clamping screw fitting

(1) Pre-insulated 16x2 Variomodular pipe Laser



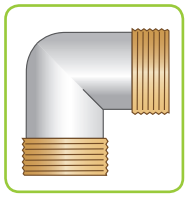
Aluminium multi-layer composite pipe (PE-RT/AL/PE-RT), orange, no oxygen whatsoever, 95 °C, 10 bar
Insulation: Polyethylene soft foam, 6 or 9 mm insulation thickness, fire resistance as per EN 14313: C_L-s1,d0

(2) Clamping screw fitting 3/4”EUROx16:



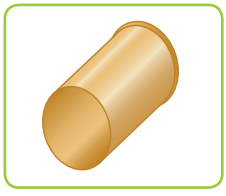
Pre-insulated 16x2 Variomodular pipe on 3/4" Eurocone, nickel-plated, single-piece, with metal clamping ring and galvanic isolation, AF 30, tested according to EN 21003

(3) 3/4“EURO 90° bracket:



nickel-plated, 3/4" Eurocone on 3/4" Eurocone

(4) 18 x 17 mm support sleeve:



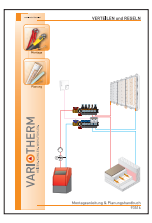
Used for clamping screw fittings and for press-fit connectors at heating elements with copper pipe

(5) 3/4"EUROxCu18 clamping screw fitting:

3/4“ Eurocone on Cu18, nickel plated, with EPDM sealing element, for ø 18 mm copper pipes as per DIN EN 1057 and ø 18 mm stainless steel pipes as per DIN EN 10312, pipe wall thickness ≥ 1 mm (also available for 15 mm pipes)

Deaerator

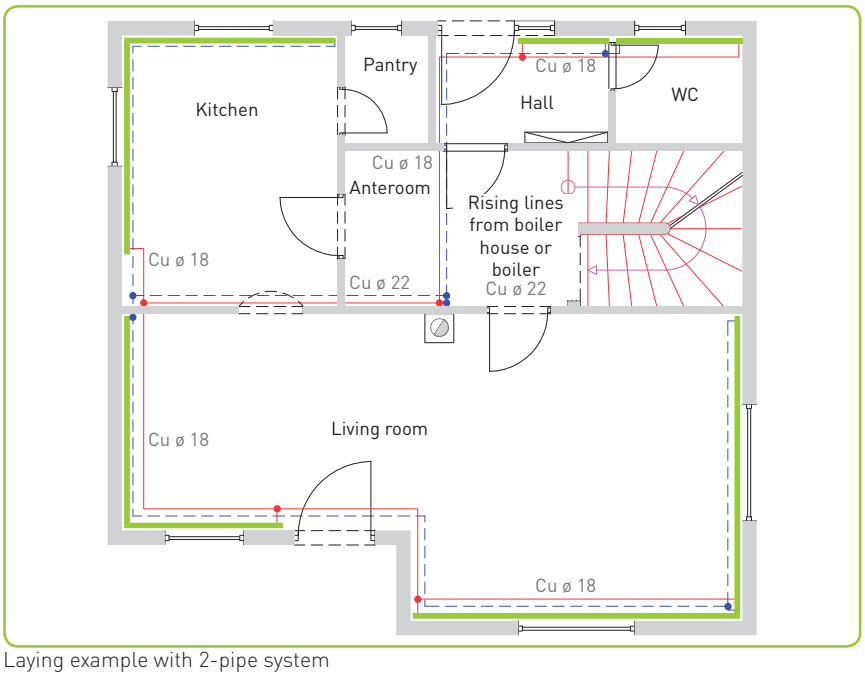
Deaeration is performed by flushing and the deaerators installed on the distribution manifold.



"DISTRIBUTION and CONTROL"

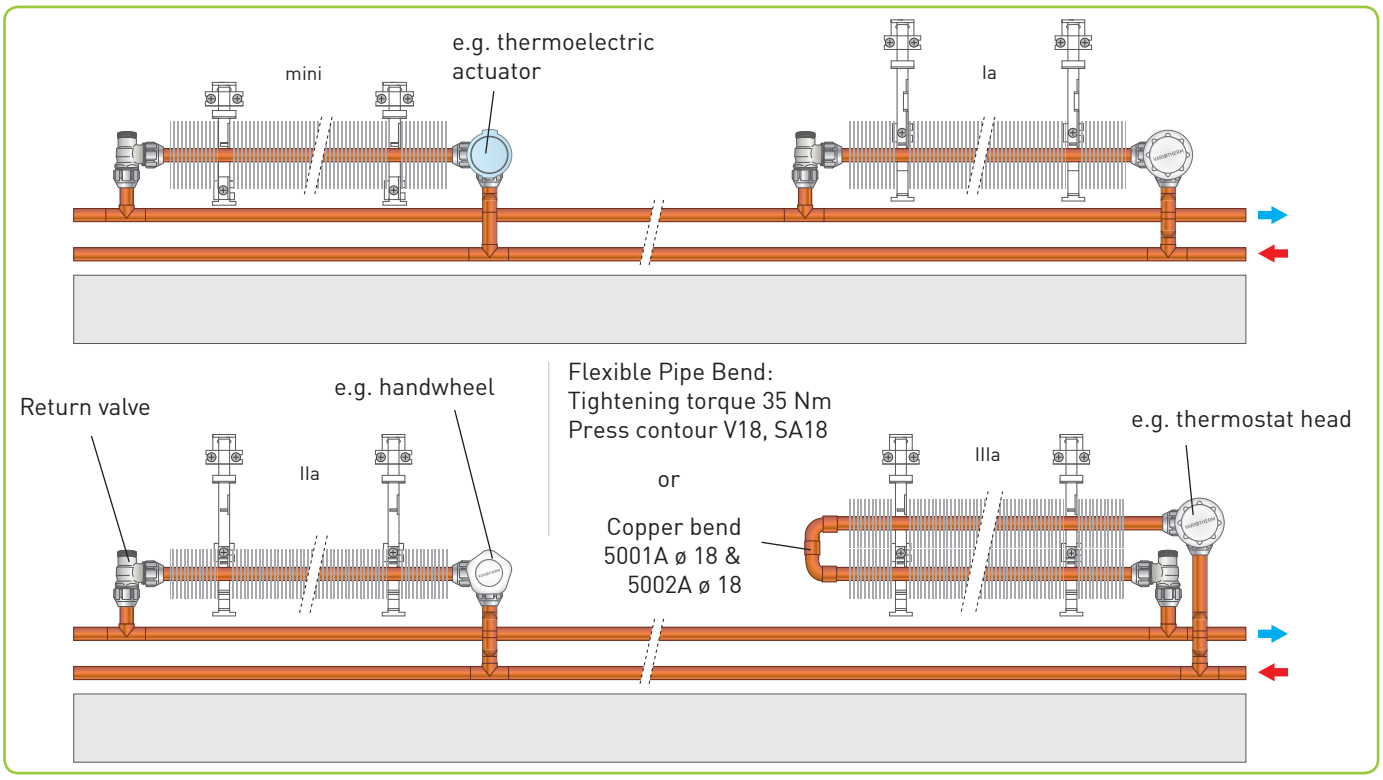
Details regarding the system and heating circuit pipes and the room temperature control are provided in the "DISTRIBUTION and CONTROL" planning and installation instructions.

4.2 2-pipe system

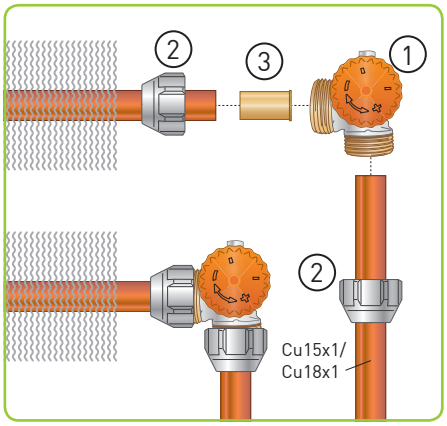


Laying example with 2-pipe system

For installation in the 2-pipe system, flow valves with an integrated deaeration system are used to control the room temperature. The return valves are used to shut off and set the water quantity (hydraulic compensation).



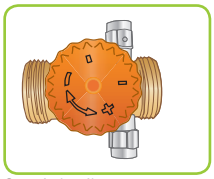
FLOW

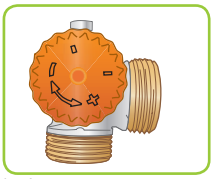


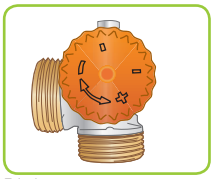
(1) Flow valve (for example left corner)
(2) 3/4"EUROxCu18 or 3/4"EUROxCu15 clamping screw fitting
(3) 18 x 17 mm support sleeve

(1) Flow valve

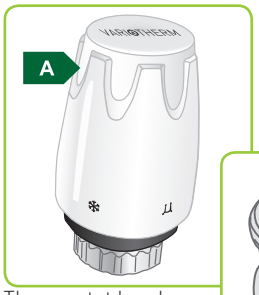
The flow valve with integrated deaeration is available in left, right or continuous versions.
On delivery, there is a protective plastic cap on the valve spindle. This allows the valve to be opened or closed without a valve head. Before mounting the valve head or the handwheel, the protective plastic cap is removed.


Straight flow

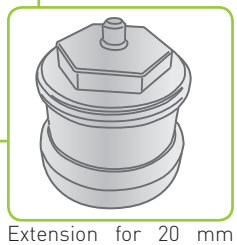

Left corner

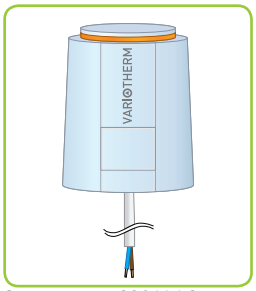

Right corner

Valve heads for flow valves



Thermostat head (Energy Efficiency Class A)


Extension for 20 mm thermostat head, from a cladding thickness of 10 mm for IIa + IIIa Classic



Servomotor 230 V AC closed when power off, First-Open function, plug-in clip function, function display

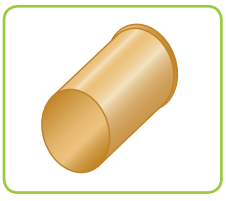

Handwheel


Thermostat head with remote sensor

(2) 3/4"EUROxCu18 clamping screw fitting:

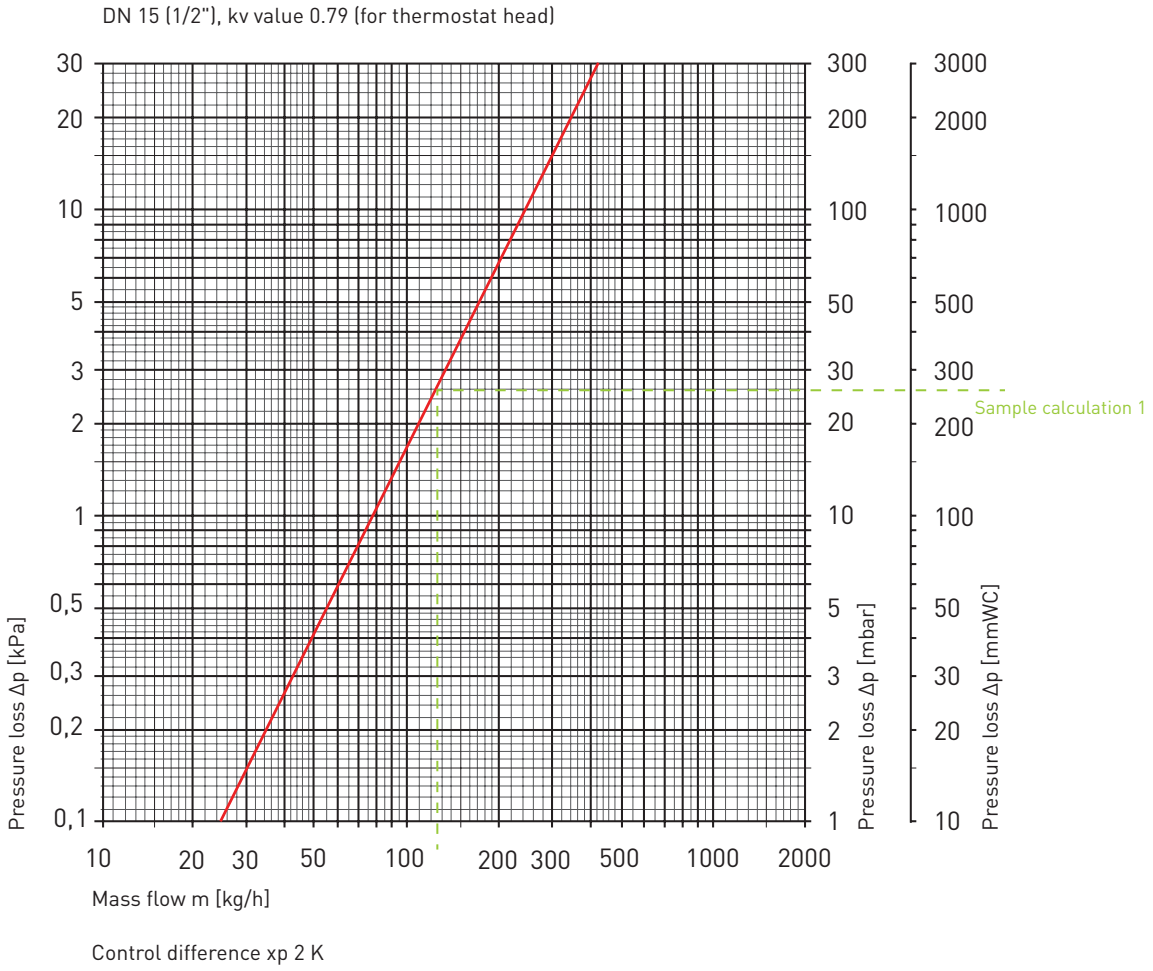
3/4“ Eurocone on Cu18, nickel plated, with EPDM sealing element, for ø 18 mm copper pipes as per DIN EN 1057 and ø 18 mm stainless steel pipes as per DIN EN 10312, pipe wall thickness ≥ 1 mm (also available for 15 mm pipes)

(3) 18 x 17 mm support sleeve:



Used for clamping screw fittings and for press-fit connectors at heating elements with copper pipe

Flow valve characteristic curve



Sample calculation 1:

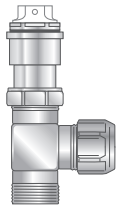
Required: Pressure loss for 1/2" at 2 K control difference

Given: Heat flow Q = 1450 W, temperature spread Δt = 10 K (55/45 °C)

Solution: Mass flow m = Q/(c·Δt) = 1450/(1.163·10) = 125 kg/h

Pressure loss from diagram Δp = 26 mbar / 260 mmWC (0.26 mWC) / 2600 Pa

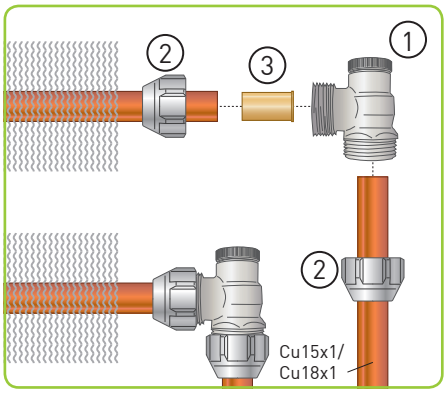
Deaerator



Deaeration elbow

The individual skirting heating systems are deaerated via the flow valves with integrated manual deaeration systems. The deaeration elbow is inserted in the return for valves without integrated deaeration systems.

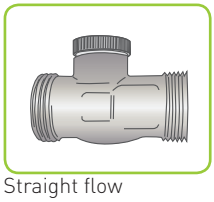
RETURN

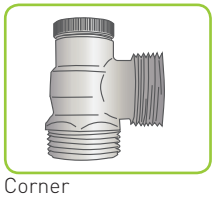


(1) Return valve (corner)
(2) 3/4"EUROxCu18 or 3/4"EUROxCu15 clamping screw fitting (see Flow for description)
(3) 18 x 17 mm support sleeve (see Flow for description)

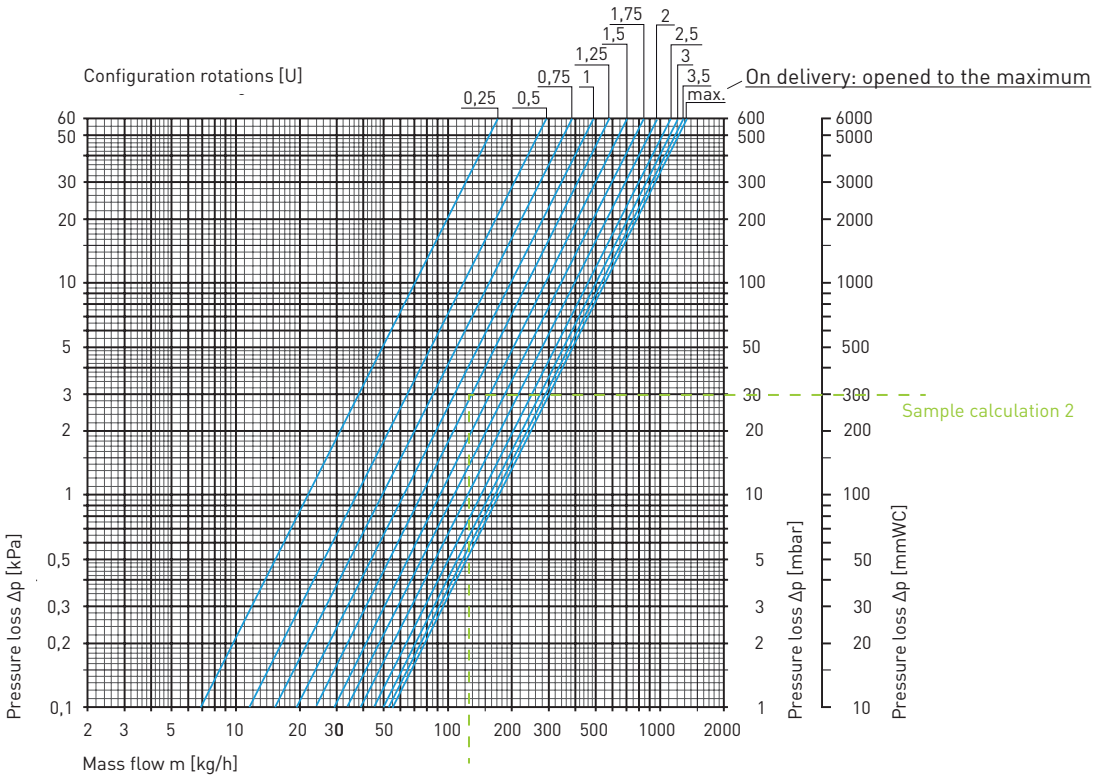
(1) Return valve

The return valve is used for hydraulic compensation and as a shut-off valve if the heating elements have to be dismantled (e.g. for painting). The valve spindle is under the protective cap. The return valve can be closed by rotating it.


Straight flow


Corner

Return valve characteristic curve



Sample calculation 2:

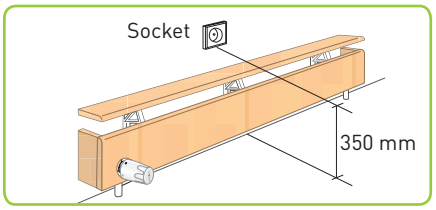
Required: Valve opening (rotations) at a pressure loss via the return valve of Δp = 30 mbar (0.30 mWC, 3000 Pa)
Given: Heat flow Q = 1450 W, temperature spread Δt = 10 K (55/45 °C)
Solution: Mass flow m = 1450/(1.163·10) = 125 kg/h → Open the return valve 1.25 rotations.

5. Dimensioning

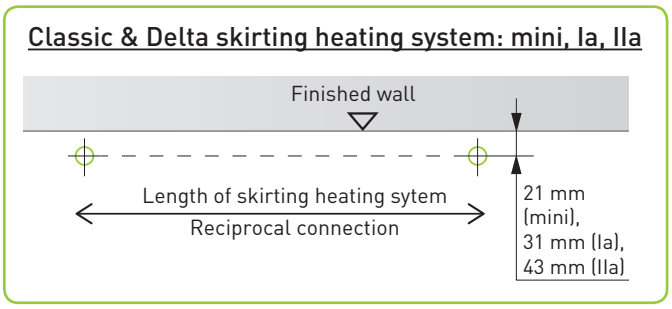
5.1 General planning principles

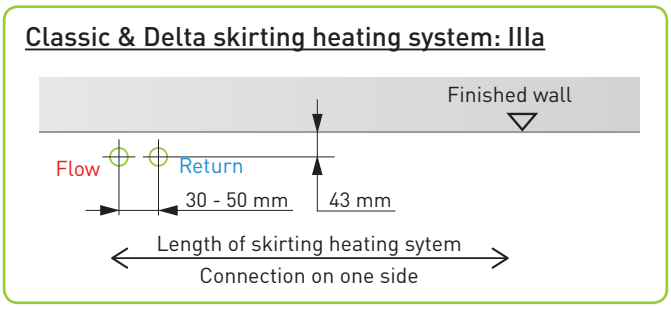
In the planning phase, not only selecting the right heating system is important. Information on building quality - such as room size, ceiling heights, door and window sizes, construction materials and thermal resistance values [...] - are important when determining the heat requirements and the dimensioning of the skirting heating system. During this time, you can also choose various parapet heights below large windows (for a highly effective hot air veil) and niches for installing the heating elements and their cladding.

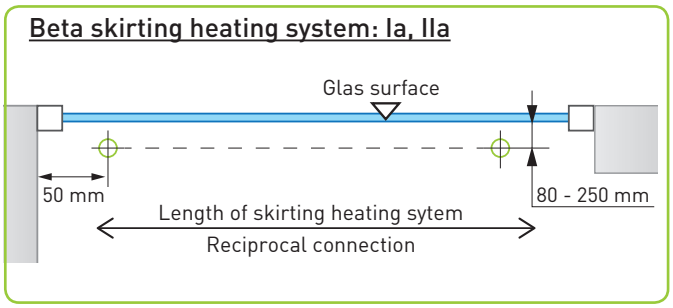
Skirting heating systems are installed in the manifold system with pre-insulated Variomodular pipes or in the 2-pipe system with copper pipes, for example. When planning the sockets, ensure that they are located above the skirting heating. We recommend providing sockets at a height of 350 mm above the finished floor level.

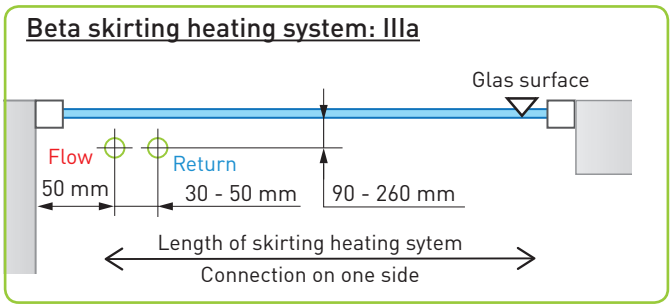


5.2 Positioning of the supply pipe



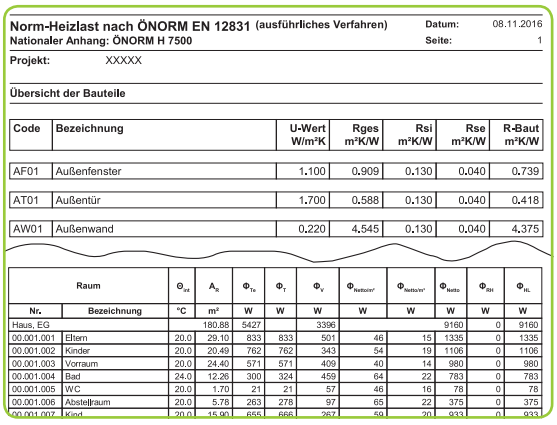






To prevent damage to the heating elements and cladding, they should not be fitted to the painted walls until the flooring is completed. The supply pipes are installed in accordance with the connection spacing shown above.

5.3 Heat load calculation



Norm-Heizlast nach ÖNORM EN 12831 (ausführliches Verfahren) Datum: 08.11.2016
Nationaler Anhang: ÖNORM H 7500 Seite: 1
Projekt: XXXXX

Übersicht der Bauteile

Code	Bezeichnung	U-Wert W/m²K	Rges m²K/W	Rsi m²K/W	Rse m²K/W	R-Baut m²K/W
AF01	Außenfenster	1.100	0.909	0.130	0.040	0.739
AT01	Außentür	1.700	0.588	0.130	0.040	0.418
AW01	Außenwand	0.220	4.545	0.130	0.040	4.375

Raum Nr.	Bezeichnung	°C	m²	W	W	W	W	W	W	W	W
Haus, EG			180,88	5427		3396			9160	0	9160
00.001.001	Eltern	20,0	29,10	833	833	501	46	15	1335	0	1335
00.001.002	Kinder	20,0	20,49	762	762	343	54	19	1106	0	1106
00.001.003	Vorraum	20,0	24,40	571	571	409	40	14	980	0	980
00.001.004	Bad	24,0	12,26	300	324	459	64	22	783	0	783
00.001.005	WC	20,0	1,70	21	21	57	46	16	78	0	78
00.001.006	Abstellraum	20,0	5,78	263	278	97	65	22	375	0	375
00.001.007	Kind	20,0	15,90	655	666	267	59	20	933	0	933

The EN 12831 standard with the respective national annex applies to the heat requirement calculation in heated rooms. Every room is considered individually. For the outside temperature, the locally acquired and standardised outdoor temperature T_{ne} is used. For more details, refer to the applicable standards.

5.4 Laying out the skirting heating

The dimensioning of the skirting heating system depends on

- the flow temperature (depends on the heating system)
- the required performance (new building or renovation)
- the possible installation location (possibly limited by doors and assemblies)

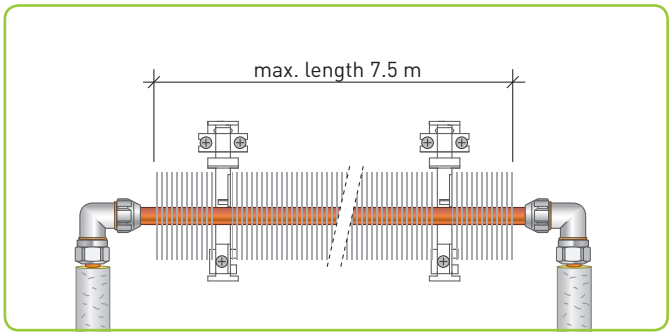
Planning the maximum flow temperature t_v of the heating system is key to a healthy warmth provided by the skirting heating system. We recommend that the set-up temperature does not exceed 60 °C. The louvre temperature will be significantly below the dust carbonisation temperature, which can lead to unhealthy air. Best results are achieved with maximum flow temperatures of 50 to 55 °C.

Recommended maximum length of a heating circuit:

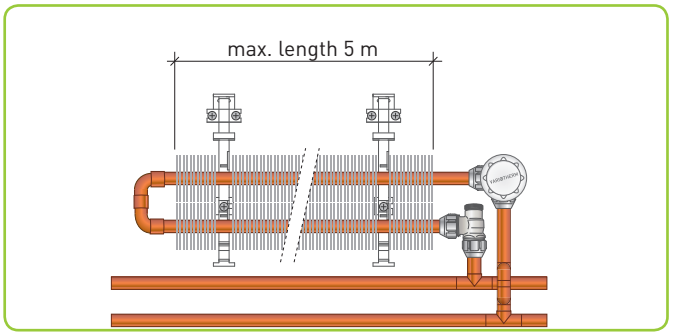
for types

mini, Ia, IIa: 7.5 m (7.5 m heating element)

IIIa: 5.0 m (10 m heating element)



Skirting heating system mini, Ia, IIa



Skirting heating system IIIa

Ideal case:

Optimal radiant heat is achieved when the skirting heating is installed along the entire length of the exterior wall.

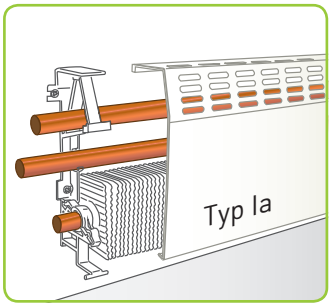
A tip from Variotherm: Fit at least 75 % of the exterior walls with skirting heating.

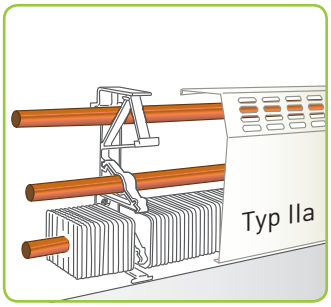
For a ground plan example of the layout for a skirting heating system, see section 4.1 and 4.2.

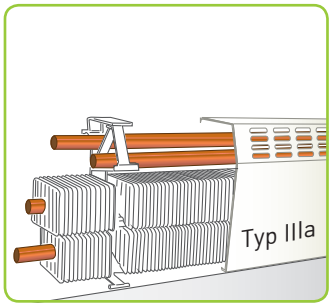
Note: If significantly shorter lengths have come about due to planning, a new calculation should be run with lower flow temperatures or smaller skirting heating types. The lengths mentioned above should be achieved if possible.

Tip for piping:

If necessary (old building with finished floors etc.), additional uninsulated pipes to max. 18 mm external diameter can also be held in the brackets.







5.5 Heat output of the Variotherm skirting heating

Heat output in W/m, in relation to a room temperature of T_r = 20 °C

Type	Flow temperature t_f [°C]											
	Δt (spread) = 5 °C				Δt (spread) = 10 °C				Δt (spread) = 15 °C			
	30 °C	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C	75 °C	80 °C	85 °C
mini	39	45	60	85	112	141	171	204	241	276	312	355
Ia	65	76	100	141	186	235	285	340	401	460	520	567
IIa	92	108	140	197	255	316	385	456	532	611	688	749
IIIa	108	126	168	238	311	390	473	561	657	754	856	938

recommended range

Correction factors for other room temperatures [T_r]

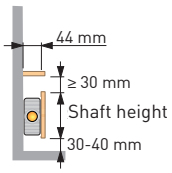
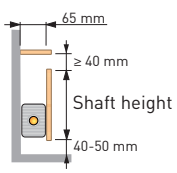
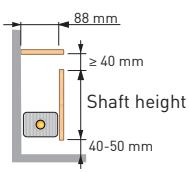
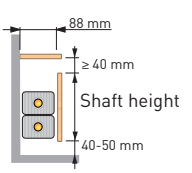
T_r [°C]	15	16	17	18	19	20	21	22	23	24
Factor	1.11	1.09	1.07	1.04	1.02	1.00	0.98	0.95	0.92	0.90

Example: Type IIa, t_v = 55 °C, T_r = 24 °C → 316 W/m * 0.90 = 284 W/m

Heat output in relation to excess temperatures in W/m

Type	Skirting heating excess temperature $\Delta t = \frac{(t_f + t_r)}{2} - T_r$										
	10 °C	15 °C	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
mini	42	52	79	112	141	171	204	248	288	333	369
Ia	70	88	131	186	235	285	340	413	480	543	603
IIa	100	124	183	255	316	385	456	548	636	718	795
IIIa	118	148	221	311	390	473	561	677	788	897	997

Classic skirting heating with larger shaft heights in W/m

Required minimum flow temperature [°C]	mini 		Ia 		IIa 		IIIa 	
	Shaft height [mm]	Excess performance [%]	Shaft height [mm]	Excess performance [%]	Shaft height [mm]	Excess performance [%]	Shaft height [mm]	Excess performance [%]
35	100	0	160	0	160	0	160	0
40	200	13	260	14	260	18	260	17
45	300	24	360	27	360	33	360	32
50	400	33	460	37	460	46	460	46
55	500	41	560	46	560	56	560	57
60	700	52	760	58	760	70	760	73
65	900	58	960	64	960	76	960	82

5.6 Variotherm dimensioning software

Individual heating circuits can be calculated swiftly and easily with Variotherm's dimensioning software – available at *www.variotherm.at/profi.*

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Dimensioning of Variotherm Heating Systems

Building project: John Doe **ZIP:** 2544 **City:** Leobersdorf **Date:** **Processed by:**

No.	Room name	Floor space A [m²]	Maximum length of DCH or SH L [m]	Heating load Q [W]	Supplement heating load Suppl. [%]	Heating load incl. Supplement Q+Suppl. [W]	Room temp. ti [°C]	Heat transfer system	Floor covering FH [d/λ]	Dimensioning temperature tf/tr [°C]	Mathematical Dim.	Unit	Type	Practical No. of circuits	Dim.	Unit	Type	Residual performance	FH to (Ti=20) [°C]	Supply pipe	Supply line length per circuit [m]	Pressure loss per circuit [mWC]	Flow quantity per circuit [kg/h]	Distribution manifold number
	Workroom		3,00	842		842	20	Skirting heating		50/45	3,00	m	HL IIa	1	**3,00**	**m**	**HL IIIa**	208	-			0,04	182	●1
	Bathroom		3,00	355		355	24	Skirting heating		50/45	1,90	m	HL Ia	1	**3,00**	**m**	**HL Ia**	212	-			0,01	98	●1
	Storage 1		1,50	123		123	20	Skirting heating		50/45	0,98	m	HL mini	1	**1,50**	**m**	**HL mini**	66	-			0,00	33	●1
	Storage 2		1,50	168		168	20	Skirting heating		50/45	1,33	m	HL mini	1	**1,50**	**m**	**HL Ia**	147	-			0,00	55	(●1)
	Wellness		10,00	2362		2.362	24	Skirting heating		50/45	9,30	m	HL IIa	2	**5,00**	**m**	**HL IIa**	198	-			0,04	221	●1
	Hall		12,00	3160		3.160	20	Skirting heating		50/45	11,10	m	HL IIa	2	**6,00**	**m**	**HL IIa**	260	-			0,08	295	●1
	Corridor		8,40	1621		1.621	20	Skirting heating		50/45	7,80	m	HL Ia	2	**4,20**	**m**	**HL Ia**	143	-			0,02	153	●1
	Anteroom		1,50	274		274	20	Skirting heating		50/45	1,40	m	HL Ia	1	**1,50**	**m**	**HL IIa**	154	-			0,00	74	(●1)

Summary of the heating systems

Amount	Unit	Heating system	Type	Pipe / Heating element	
	m²	System wall heating	SWHK2		
	m²	System wall heating	SWHK3		
	m²	Modular wall heating	MSW		
	m²	EasyFlex wall heating	EWH77F		
	m²	EasyFlex wall heating	EWHK77		
	m²	EasyFlex wall heating	EWHK115		
	m²	Modular ceiling heating	MSD/MRD		
	m²	Screed floor heating	RA10		
	m²	Screed floor heating	RA15		
	m²	Screed floor heating	RA20		
	m²	Screed floor heating	RA25		
	m²	Screed floor heating	RA30		
	m²	Compact floor heating	RA10		
	m²	Compact floor heating	RA20		
1,5	m	Skirting heating	HL mini	1,5	lfm
12,9	m	Skirting heating	HL Ia	12,9	lfm
23,5	m	Skirting heating	HL IIa	23,5	lfm
3,0	m	Skirting heating	HL IIIa	6,0	lfm
	m	Ducted channel heating	BKH1 mini		
	m	Ducted channel heating	BKH1		
	m	Ducted channel heating	BKH2 mini		
	m	Ducted channel heating	BKH2		
	m	Supply pipe	16x2		
	m	Supply pipe	11.6x1.5		
		Total filling water		**10,0**	**litres**

Summary of pipe length by line

Line	Room	m ø 16	m ø 11,6	Line	Room	m ø 16	m ø 11,6
1	Workroom			14			
2	Bathroom			15			
3	Storage 1			16			
4	Storage 2			17			
5	Wellness			18			
6	Hall			19			
7	Corridor			20			
8	Anteroom			21			
9				22			
10				23			
11				24			
12				25			
13				TOTAL			

Summary of the floor heating surface area

Screed floor heating	m²
Compact floor heating	m²

Summary of loads

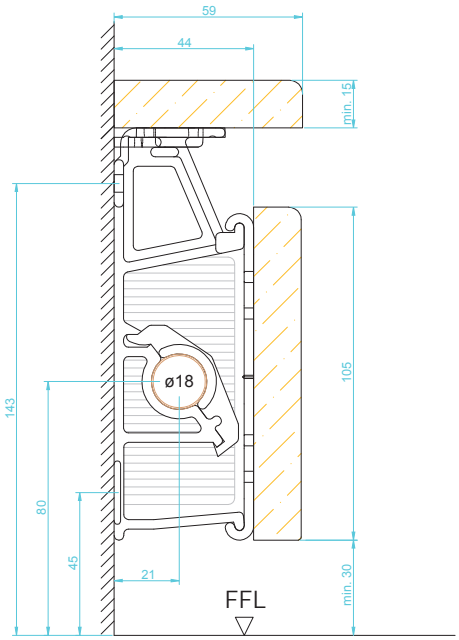
Total heating load	8.905 W
Total installed load	10.293 W

	tf/tr	Number of heating circuits	Flow quantity manifold [kg/h]	Max. pressure loss + 0,1 mWC for manifold [mWC]	Manifold notation according to drawing
Distribution manifold ●1	50/45	9	1780	0,18	
Distribution manifold ●2					
Distribution manifold ●3					
Distribution manifold ●4					
Distribution manifold ●5					
When all distribution manifolds are fed via one pump, the following applies:					
Total flow quantity:			1780	kg/h	
Maximum pressure loss from distribution manifold incl. 0.1mWC for max. opened valve			0,18	mWC	

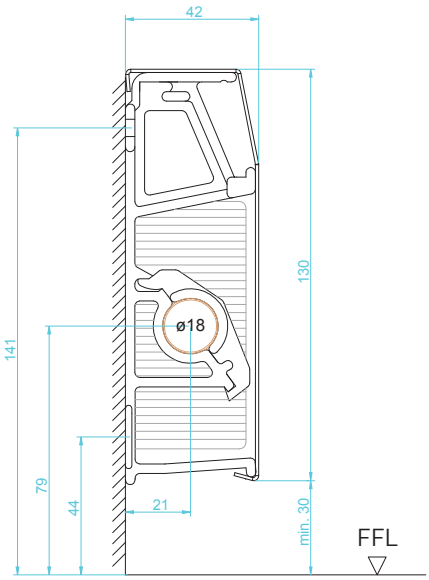
Heating set-up example

6. Dimensions

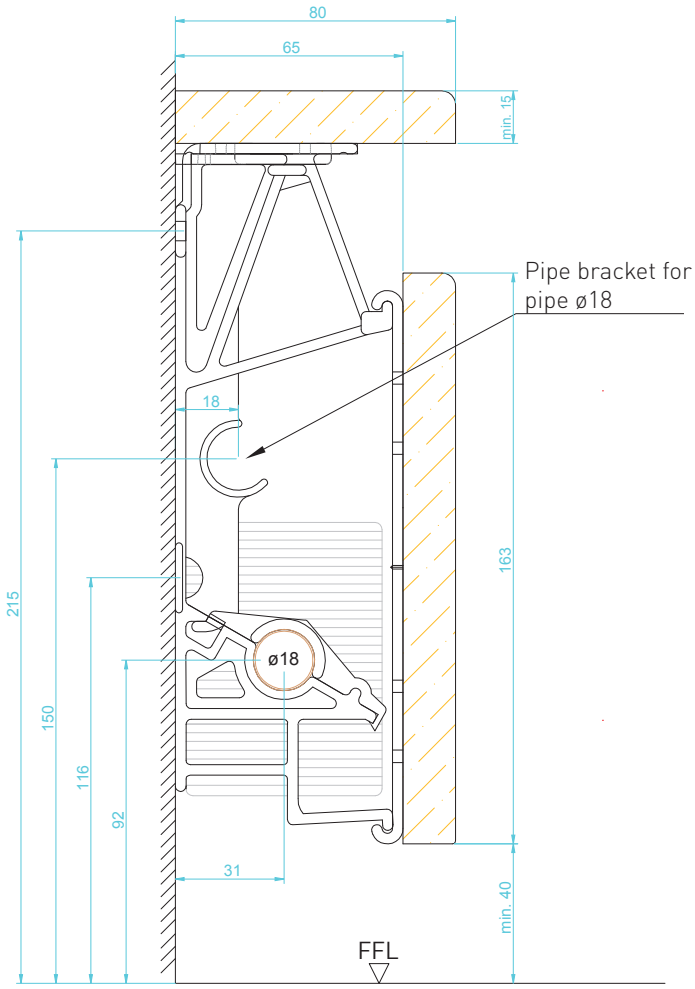
mini Classic



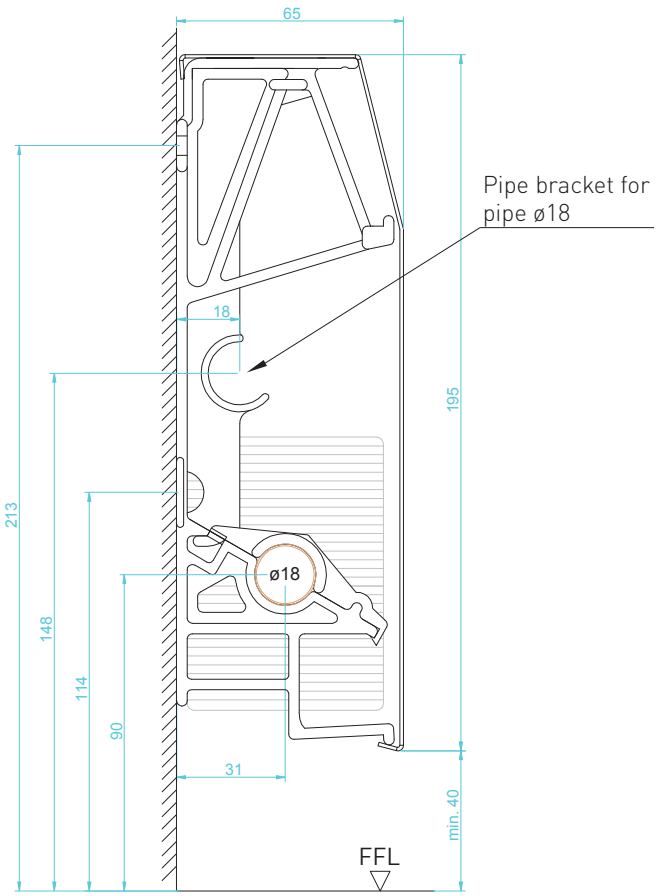
mini Delta



Ia Classic

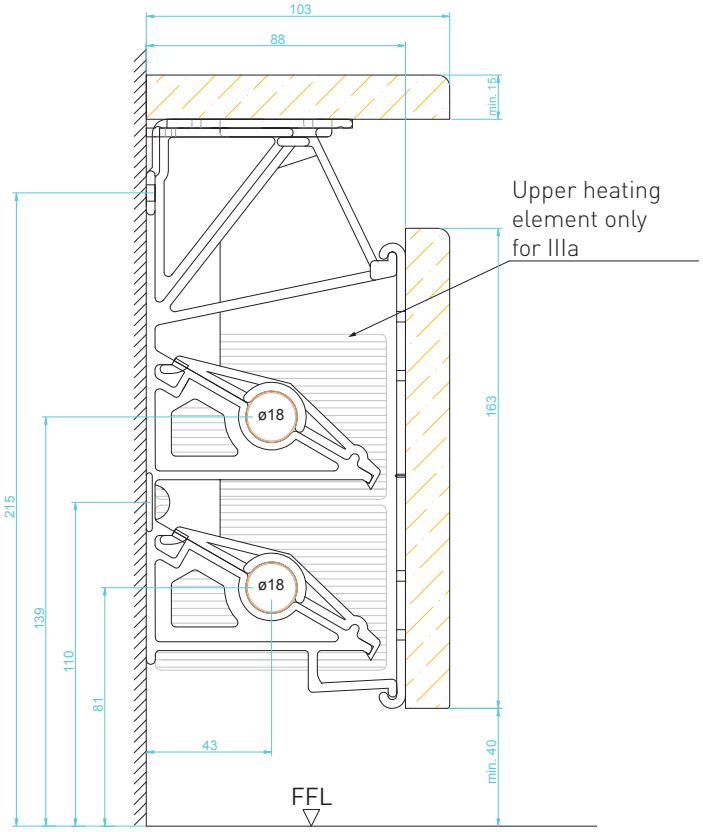


Ia Delta

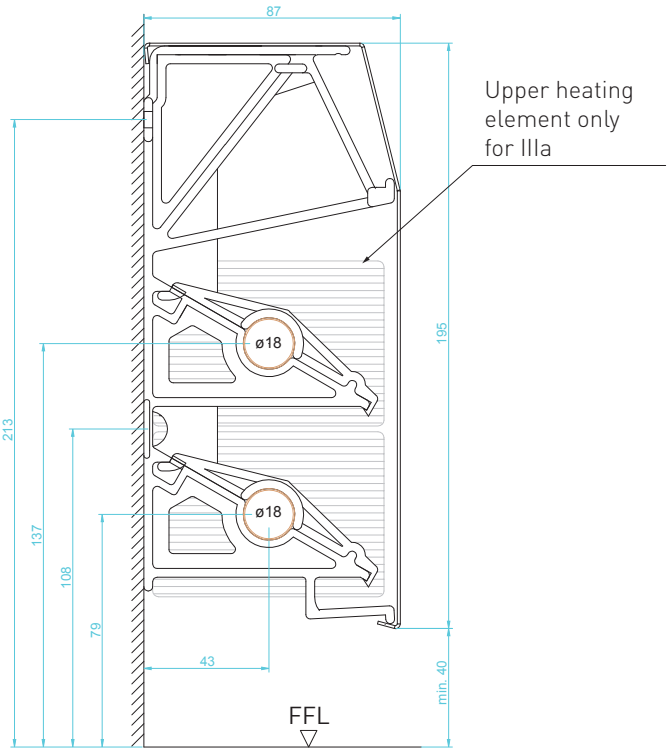


All dimensions in mm

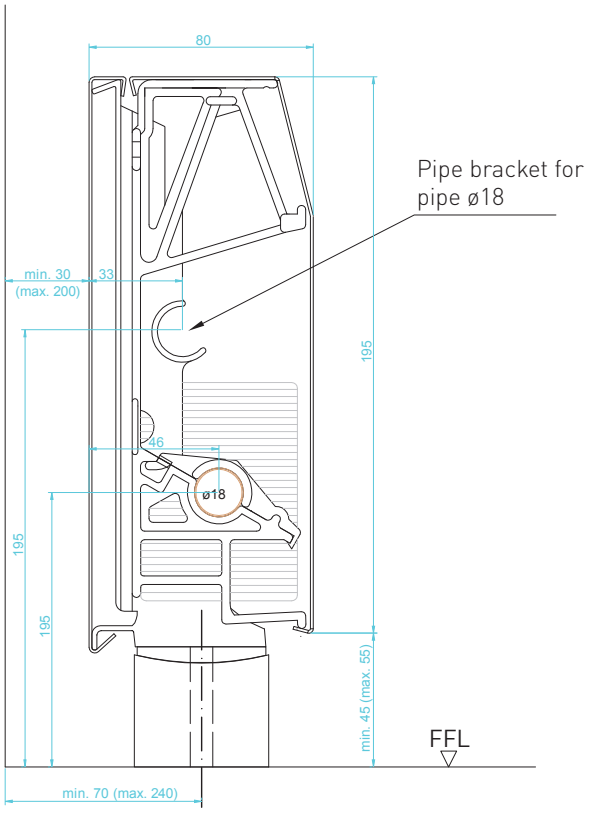
IIa + IIIa Classic



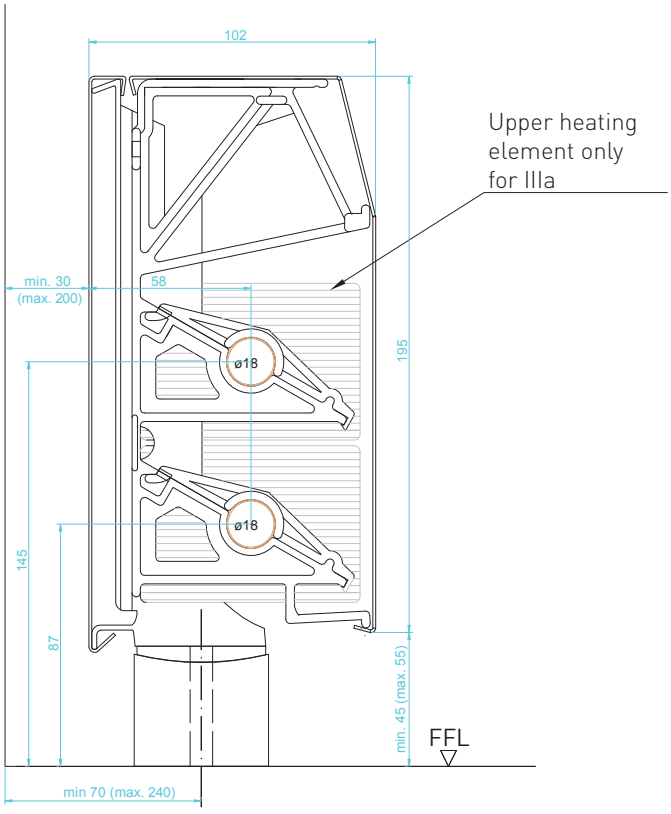
IIa + IIIa Delta



Ia Beta



IIa + IIIa Beta



All dimensions in mm

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