

Wall Heating with the BEKA Pre-fabricated Unit

1 Generals

Because of the high thermal insulation of modern buildings, the offices and residential houses have comparatively low heat requirements. In many cases, they must be cooled during long periods of the year to maintain comfortable room temperatures. A low cost solution to save energy is the use of a BEKA wall heating / wall cooling system. With the use of BEKA pre-fabricated units, heating and cooling surfaces can be arranged simply and economically in the dry-built version.

Due to the combined function of the wall surface, investments for the necessary building installations can be minimized.

2 System description

The BEKA pre-fabricated unit is fixed to the supporting structure, like any other standard dry-built board, according to the dry-built directions. The supply lines, pre-fabricated to the required sizes are laid into the wall cavities. The pre-fabricated units are connected to the supply lines through flexible hoses.

3 Cold water / heating water technology

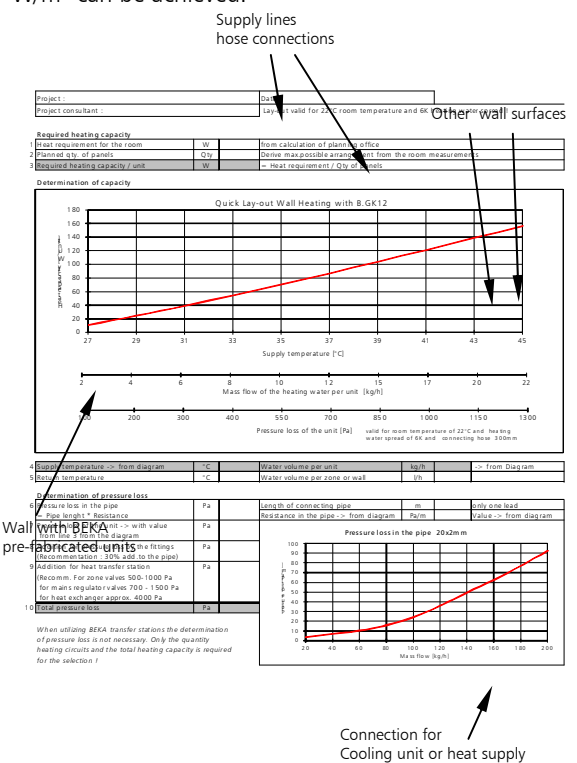
The BEKA pre-fabricated units are connected to the supply and return piping of the heat or cold-water source, room for room or zone for zone. Connection is recommended by BEKA storey distributor unit.

For the heating water generation, different techniques and constructions can be utilised.

The economic advantages of a cooling ceiling are influenced mostly by the fact that the wall will deliver high heating/cooling capacity already with supply temperatures, which are only slightly above / below the room temperature. This allows the use of alternative energy sources such as heat pumps or solar technologies. Even with the use of standard equipment, decisive energy saving can be achieved, since already small temperature differences in the supply temperatures compared to the ones of the room

(for heating: Supply temperature below 40°C) will achieve considerable heating capacities of 110 W/m².

For cold-water cooling similar advantages are obtained. The supply temperatures must be restricted to minimum of 16°C to avoid condensation, in every case. At room temperature of 27°C, cooling capacities of approximately 65 W/m² can be achieved.



4 Installation

Basically, the standard installation instructions are valid for all installations. All components used in the piping for the BEKA pre-fabricated units must be made of non-corrosive materials. Plastic materials, copper, brass and red brass are permitted. Other materials may cause sludge and thus, malfunction of the system.

5 Regulating technology

The regulating technology secures both the desired comfort and necessary system reliance.

For the wall heating, room temperature control is required, which regulates the supply temperature of the desired room temperature. Supply temperatures above 45°C must be avoided because of danger that excessive surface temperatures could dry-out the plasterboards!

For wall cooling, room temperature regulation, dew point protection and regulation of the supply temperature of the cold water is required.

Supply temperatures below 16°C must be avoided that the dew point will not be reached!

6 System dimensioning

Wall heating/cooling ceilings with BEKA pre-fabricated units are dimensioned according to the following layout table. The supply temperature determined in the water circuit, taken at the side of the cooling unit or heat source, is regulated with the water temperature upstream to the heat exchanger.

7 Installation preparation

As for the installation of the BEKA pre-fabricated units, the standards for dry-built construction and the manufacturer's recommendations must be stuck to.

It is recommended using distortion-resistant sheet-metal profiles for the supporting construction of the suspended ceiling. The spacing of the bracing profiles to each other must amount to 600 mm.

The selected supporting profiles and mode of fixing must have to meet the dry-built specifications.

The BEKA pre-fabricated units are delivered in standard sizes of 2600 mm x 600 mm. The active surface area amounts to 1.2 m². Capillary tubes are not located above 2100 mm of height. This area serves the tailoring to length of the BEKA pre-fabricated units related to the room height. At the border area, inactive panels are

fitted. The BEKA pre-fabricated units are pre-drilled for fixing to the sub-constructions.

The fixing screws may only be located at the given positions, otherwise damages may be caused to the integrated capillary mats.

Before starting work, a wall pattern must be drawn up as a working and positioning layout. All panels, their dimensions and positioning of the supply lines must be recorded. On the wall pattern, all areas must be marked, which will be left uncovered for installation purposes of inner walls, light fixtures and other wall installations. Furthermore, the installation position for the BEKA pre-fabricated units with integrated dew point sensors must be recorded.

The Polypropylene pipes are connected by thermal welding; the welding specification DVS 2207-11 of the Deutschen Verband für Schweißtechnik e.V must be obeyed. The surrounding temperature (at the time of welding) must be above 5°C. The pre-heating temperatures, welding and setting times must be kept according to specified values for the responding pipe sizes.

8 Tools , materials

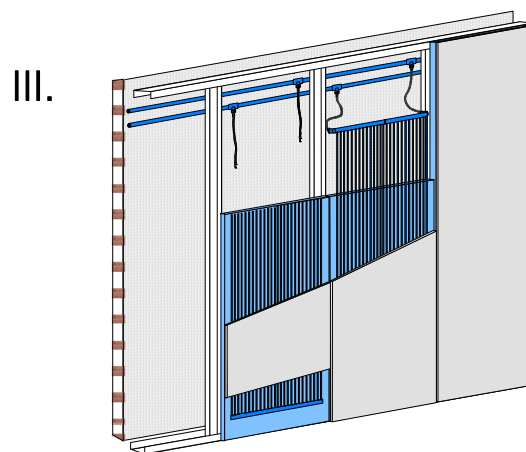
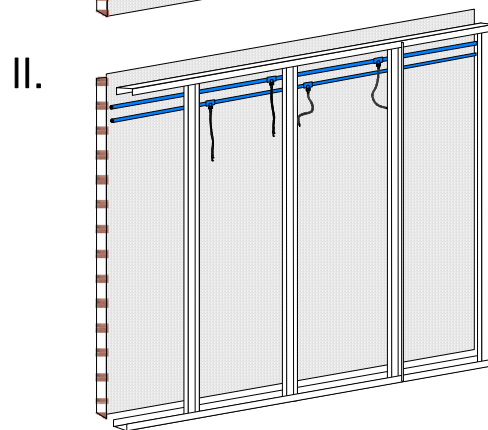
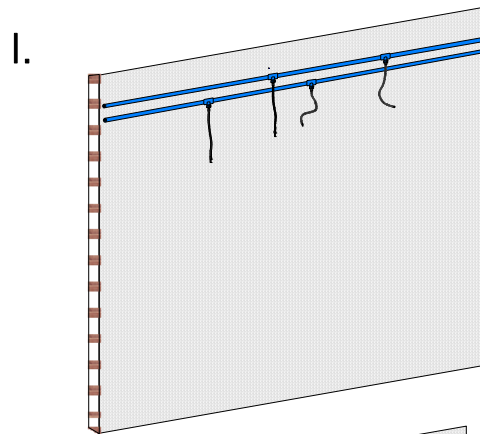
For the processing of the BEKA pre-fabricated units the standard dry-built tools and materials can be used, such as:

- CW profile
- UW - profile
- Sound insulation tape
- Dowels and screws
- Dry-wall screws, 55 mm long
- Knives for tailoring and edge planer
- Screw driver
- Spatula
- Filler
- Hand-held grinder

A hand-held welding tool with a sleeve welding device is used for welding the supply lines to the cold water circuit. Alternatively, compression fittings may be used instead.

9 Installation steps at the wall

- The connection lines are installed at the raw wall at a height of approx. 2100 mm and fixed with pipe clamps according to installation instructions. The supply lines are connected by means of thermal welding or compression fittings.
- The U- and stud profiles are aligned and fixed to the raw wall in the appropriate manner according to manufacturer's specifications. The spacing between the stud profiles is set to 600 mm. Additional stud profiles at the border area and for the inactive (tailored) panels have to be arranged to the wall pattern according to dry-built guidelines.
- The BEKA pre-fabricated unit is fitted to the stud construction according to the wall pattern.
- The flexible connecting hoses are plugged into the quick-action couplings.
- The pre-fabricated unit is aligned to the stud construction according to the drilled-hole pattern
- The dry-wall screws inserted into the drilled holes and fastened until a secure fixing to the sub-construction is established.
- Take pretest with compressed air at 10 bar for 1 hour.
- Take final test with water at 10 bar for 4 hours. The pressure at rest of 3 bar must be kept until start of operation.
- Fill gaps, smoothen and grind.



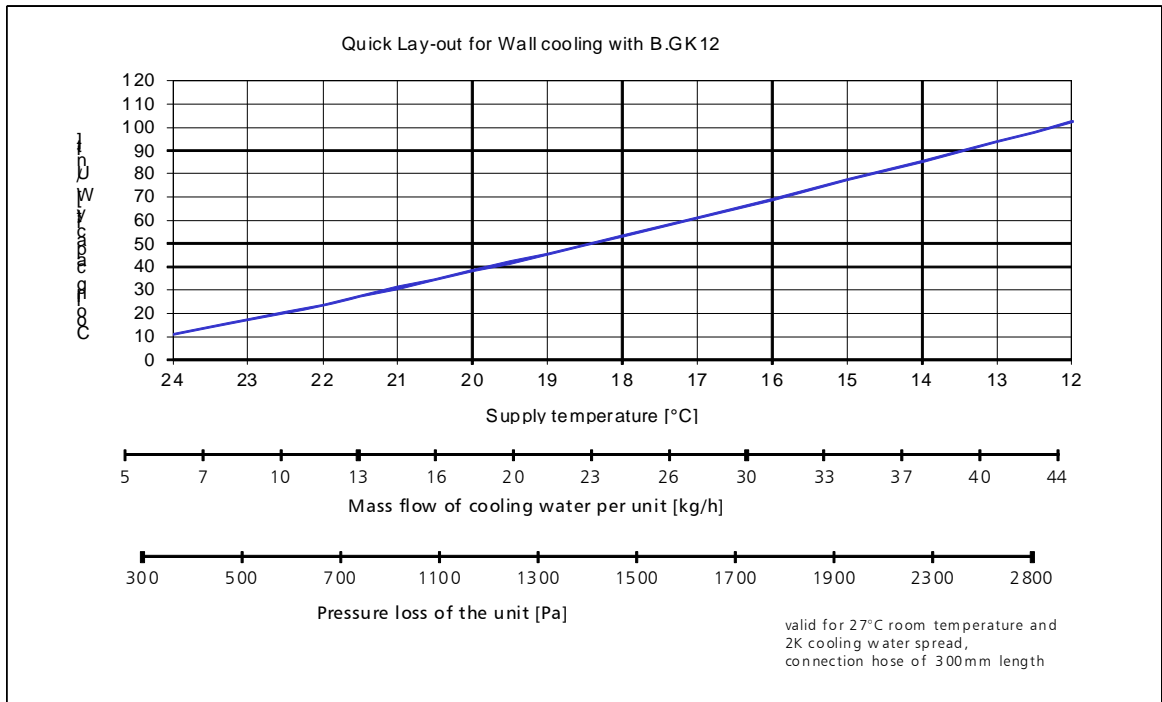
10. Layout for a wall cooling with the BEKA pre-fabricated unit B.GK12

Project:	Date:
Project consultant:	Lay-out valid for room temp. of 27°C and 2K cooling water spread!

Required cooling capacity

1 Cooling load	W	Calculation from planning office
2 Planned qty of panels	Qty.	max. possible arrangement derived from room dimensions
3 Required cooling capacity per unit	W	= cooling load / qty of panels

Determination of capacity



4 Supply temp. -> from diagram	°C	Water volume per unit	kg/h	-> from diagram
5 Return temperature	°C	Water volume per zone or wall	ltr/h	

Determination of pressure loss

6 Pressure loss in the piping = pipe length * resistance	Pa	Length of connecting pipe	m	only 1 pipeline
7 Pressure loss of the unit -> values of line 3 from diagram	Pa	Resistance in pipe -> from diagram	Pa/m	value -> diagram
8 Add for pressure loss through fittings (recomm: 30% addition to pipe)	Pa	<p style="text-align: center;">pressure loss in pipe 20x2mm</p>		
9 Add for heat exchange unit recomm: for zone valves 500-1000 Pa for mains regulator valves 700 - 1500 Pa for heat exchanger approx. 4000 Pa	Pa			
10 Total pressure loss	Pa			

If BEKA heat exchanger units are used, pressure loss determination can be omitted. Only the number of cooling circuits and the total cooling capacity is required for the selection.

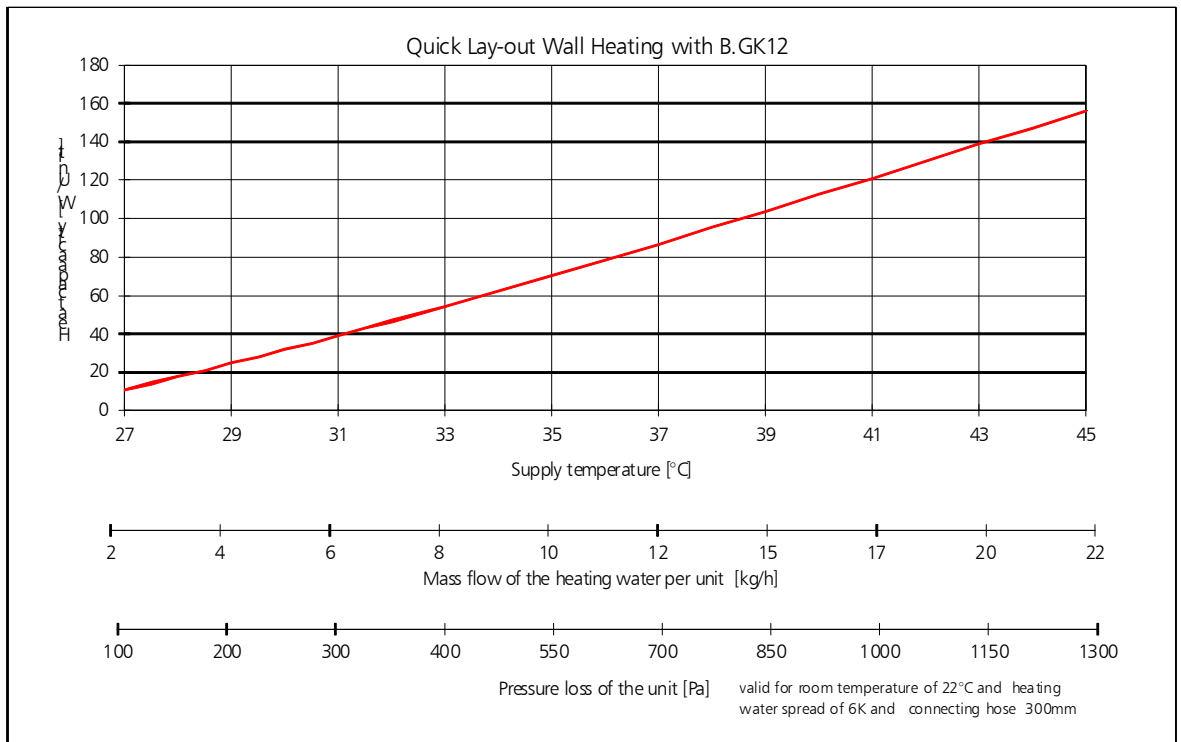
11. Layout for wall heating with BEKA pre-fabricated unit B.GK12

Project :	Date :
Project consultant :	Layout valid for 22°C room temperature and 6K heating water spread !

Required heating capacity

1 Heat requirement for the room	W	from calculation of planning office
2 Planned qty. of panels	Qty	Derive max.possible arrangement from the room measurements
3 Required heating capacity / unit	W	= Heat requirement / Qty of panels

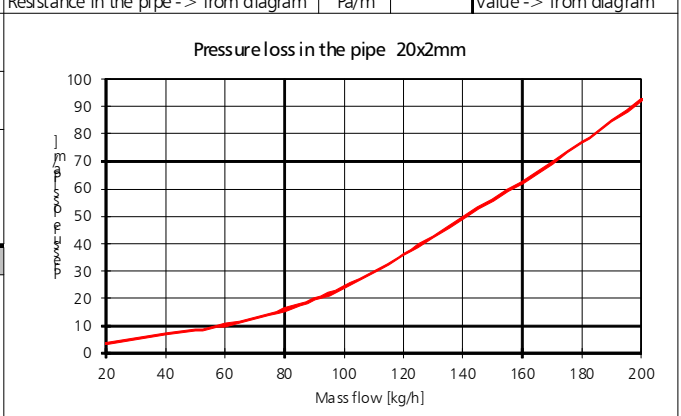
Determination of capacity



4 Supply temperature -> from diagram	°C	Water volume per unit	kg/h	-> from Diagram
5 Return temperature	°C	Water volume per zone or wall	l/h	

Determination of pressure loss

6 Pressure loss in the pipe = Pipe length * Resistance	Pa	Length of connecting pipe	m	only one lead
7 Pressure loss of the unit -> with value from line 3 from the diagram	Pa	Resistance in the pipe -> from diagram	Pa/m	Value -> from diagram
8 Addition for pressure loss by the fittings (Recommendation : 30% add. to the pipe)	Pa			
9 Addition for heat transfer station (Recomm. For zone valves 500-1000 Pa for mains regulator valves 700 - 1500 Pa for heat exchanger approx. 4000 Pa)	Pa			
10 Total pressure loss	Pa			



When utilizing BEKA transfer stations the determination of pressure loss is not necessary. Only the quantity heating circuits and the total heating capacity is required for the selection !

12. Technical specification

Design:

12.5 mm plasterboard
Capillary tube mat with capillary diameter 3.35x0.5 mm (Polypropylene)
30 mm extruded foam (heat conductivity 0.035 W*K; Fire proofness class B1)

Masses:

17.8 kg/m² (empty)
18.4 kg/m² (filled)

Size:

Width: 600 mm
Length: 2600 mm
Active area 1.2 m²
Upper tailoring area 500 mm
Pre-drilled for fixing at a stud distance of 600 mm

Cooling capacity:

58 W/m² (DIN 4715)
=70 W/unit

Heating capacity:

130 W/m²
= 156 W/unit

Operating conditions:

Temperature-stable with permanent operation up to 45°C
Operation pressure 3 to 4 bar
Test pressure maximum 10 bar over 10 hours

Application / mode of Installation

Cooling and heating walls, dry-built version
Connection through BEKA quick-action coupling system
Installation according to the dry-built guidelines

Delivery:

Finished dry-built units are delivered, lying on pallets.