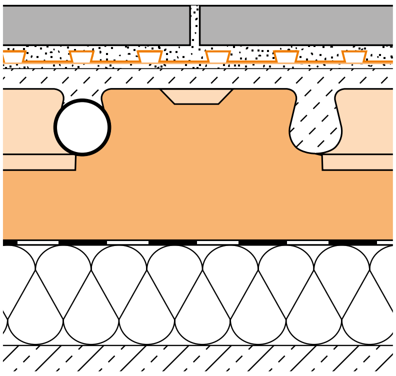
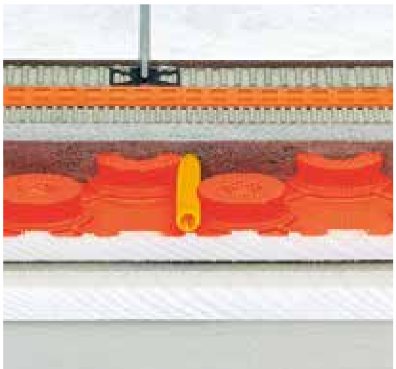
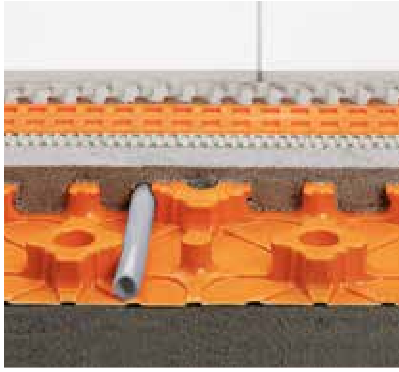
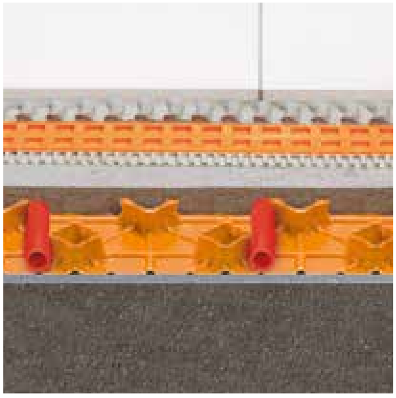
Schlüter®-BEKOTEC-THERM

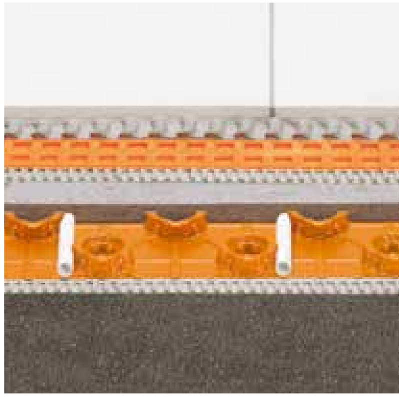
Ceramic thermal comfort floor











Technical Manual

Schlüter® Systems

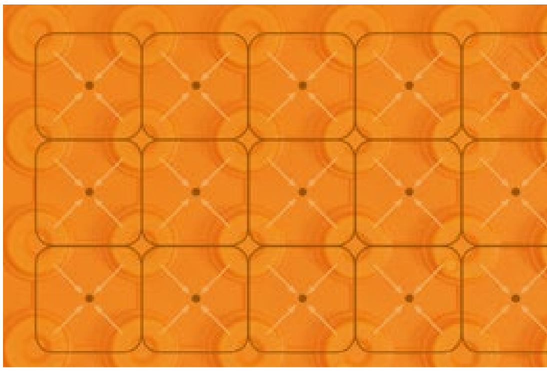
PROFILE OF INNOVATION

Werner Schlüter
SCHLÜTER-SYSTEMS KG

About this manual:

The design principle of the ceramic thermal comfort floor

The innovative Schlüter-BEKOTEC-THERM heating system is referred to as a “ceramic thermal comfort floor,” to emphasise the fact that our company views the heating system of the floor as a system assembly, in which all components, design planning, and construction must seamlessly fit together. After all, to meet the many requirements, the “ceramic thermal comfort floor” must provide insulation, heating, cooling and waterproofing in wet areas, while also absorbing traffic loads and serving as a visually appealing design element.



Reducing stresses in the screed...

....without unpleasant surprises.

The experience of the past has shown how difficult it is to achieve a satisfactory balance between the aspects of construction, physics and heating technology in the overall floor assembly. As a consequence, conventional heated screeds with ceramic and natural stone coverings frequently buckle and form cracks. This is mainly attributable to the fact that screed and ceramics expand and contract at different rates due to their different heat expansion coefficients during temperature changes.
The provisions of the corresponding standards, for example the regulations that specify the thickness of the screed, the position and type of movement joints, the construction of reinforcement inserts, or the maximum residual moisture for tile installation, do not solve the physical problems encountered in construction.
From the perspective of heating technology, the disadvantage of a relatively large mass of screed is that a great amount of heating energy must initially be used and stored. Conventional radiant floor heating systems therefore are slow to respond to temperature changes.

With our integrated BEKOTEC-THERM system we have developed a structure that solves all these problems in one internationally patented assembly. In this regard, the name “BEKOTEC” stands for the technique of the assembly construction and “THERM” for the heating components. BEKOTEC-THERM is based on a thin layer floor assembly of cement or gypsum based screeds which are applied on top of the studded BEKOTEC panels. The stud pattern of the panel reduces stresses in the screed. With the help of Schlüter-DITRA 25, ceramic tiles can be installed as soon as the screed is ready to bear weight. Our THERM components series is a heating technology that is an exact match for BEKOTEC and includes everything from heating pipes to electronic control systems. The relatively small amount of screed and the proximity of the heating pipes to the surface allow for a quick reaction to temperature changes. Thanks to the interconnected air channels of the DITRA 25 matting, heat is distributed evenly below the tiles. This makes BEKOTEC-THERM a quick reacting “ceramic thermal comfort floor” that can be operated with great energy efficiency at very low supply temperatures. Of course, other flooring materials can be installed over the BEKOTEC screed as well.

BEKOTEC-THERM, which is equally suited for new constructions and the refurbishment of older buildings, offers developers many advantages and true added value.

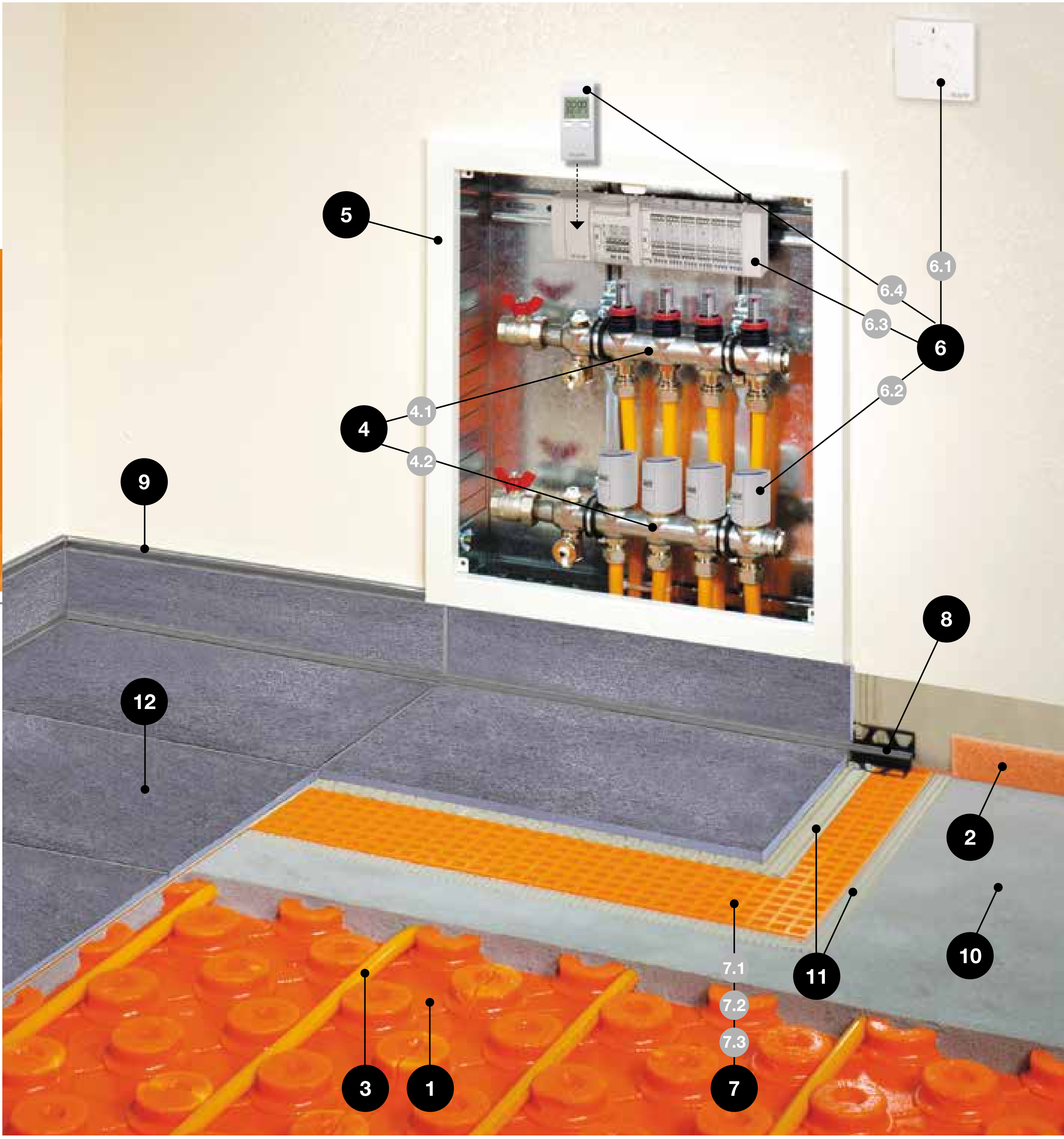
Since the applicable DIN standards, regulations and even legislation tend to make construction work more complicated instead of easier, this manual was written to document the construction steps of installing a BEKOTEC-THERM ceramic thermal comfort floor in a simple and understandable way.

Sincerely,
Schlüter-Systems KG

Schlüter®-BEKOTEC-THERM Ceramic thermal comfort floor

System assembly

This illustration shows the assembly structure of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor with the associated system components. The numbers in the image represent the corresponding products of the system assembly.



Example: Schlüter®-EN/PF

Schlüter®-**BEKOTEC-THERM**
System components heated floor assembly

1 Schlüter®-**BEKOTEC-EN**
Studded screed panel for the attachment of Schlüter-heating pipes
Note: Additional insulation and waterproofing is required in accordance with the applicable regulations.

2 Schlüter®-**BEKOTEC-BRS**
Screed edge strip
The edge strip BRS 808 KSF must be used with the studded screed panels EN 23 F and EN 18 FTS.
For EN 12 FK, use the edge strip BRS 505 KSF *(see page 22 for matching edge strips)*.

3 Schlüter®-**BEKOTEC-THERM-HR**
Heating pipe (diameter corresponds to system)
BT HR symbol system:

4 Schlüter®-**BEKOTEC-THERM-HV**
Stainless steel heating circuit distributor with connection accessories
4.1 Hot flow leg **4.2** Cold return leg

5 Schlüter®-**BEKOTEC-THERM-VS**
Distribution cabinet

6 Schlüter®-**BEKOTEC-THERM-E**
Electronic temperature control
6.1 Room sensor **6.2** Actuator
6.3 Control base module with connection module
6.4 Timer unit (optional)

System components for the installation of tiles and natural stone (see separate price list)

7 **Schlüter®-DITRA**
7.1 Schlüter®-**DITRA 25**
(Assembly height 5 mm), Bonded uncoupling, waterproofing, vapour pressure equalisation, heat distribution, or
7.2 Schlüter®-**DITRA-DRAIN 4**
(Assembly height 6 mm), Bonded uncoupling, vapour pressure equalisation, heat distribution, or
7.3 Schlüter®-**DITRA-HEAT-E**
(Assembly height 7 mm),
Bonded uncoupling, waterproofing for additional electrical floor warming/heating

8 Schlüter®-**DILEX** or **-RF**
Maintenance free edge and movement joint profiles

9 Schlüter®-**RONDEC**, **-JOLLY**, **-QUADEC** or **-LIPROTEC-VB /-VBI**
Decorative finishing profiles for walls, skirting and floors

System components not available from Schlüter-Systems

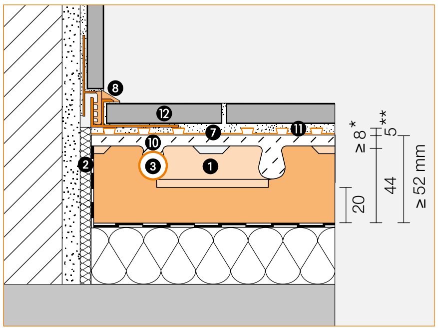
10 **Screed**
Cement or gypsum based screed

11 **Thin bed tile adhesive**

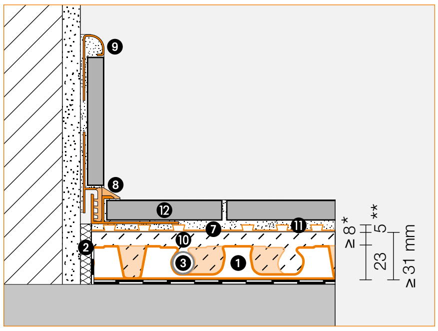
12 **Ceramic tiles or natural stone**
Other coverings such as carpet, laminates and parquet are also feasible in compliance with the applicable installation standards.

All-round systems

Installed over insulation or directly over load bearing substrates



Assembly with Schlüter-BEKOTEC-EN/P or -EN/PF and heating pipe 16 x 2 mm;
see product data sheet 9.1.

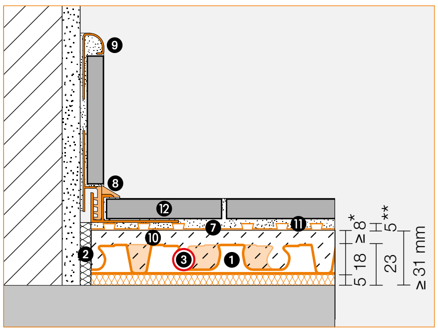


Assembly with Schlüter-BEKOTEC-EN 23 F and heating pipe 14 x 2 mm,
see product data sheet 9.2.

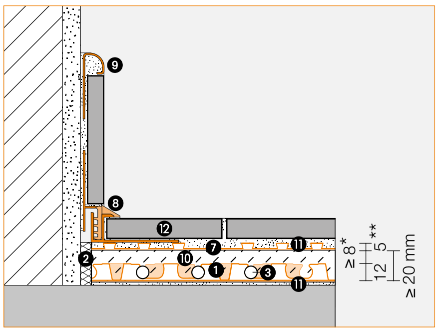
* Observe max. coverage *(see page 18)*.
** Assembly height DITRA 25 = 5 mm, see **7** for additional product specific assembly heights.

Restoration systems

directly over load bearing substrates only



Assembly with Schlüter-BEKOTEC-EN 18 FTS and heating pipe 12 x 1.5 mm (with integrated impact sound insulation; directly installed floating over load bearing substrates),
see product data sheet 9.4.



Assembly with Schlüter-BEKOTEC-EN 12 FK and heating pipe 10 x 1.3 mm (directly adhered over load bearing substrates),
see product data sheet 9.5.

* Observe max. coverage *(see page 18)*.
** Assembly height DITRA 25 = 5 mm, see **7** for additional product specific assembly heights.

BT-HR-symbol system*	Schlüter®-BEKOTEC-THERM System
	Schlüter®-BEKOTEC-EN System heating pipe Ø = 16 mm
	Schlüter®-BEKOTEC-EN F System heating pipe Ø = 14 mm
	Schlüter®-BEKOTEC-EN FTS System heating pipe Ø = 12 mm
	Schlüter®-BEKOTEC-EN FK System heating pipe Ø = 10 mm

*** The BT HR symbol system marks the allocation of technical statements and information.**

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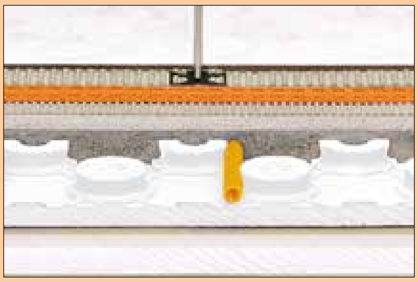
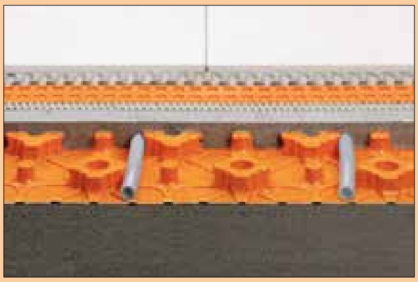
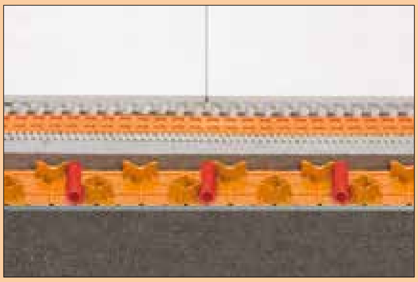
Schlüter®-BEKOTEC-EN — Page



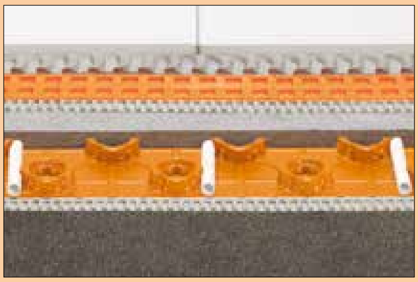
Schlüter®-BEKOTEC-EN F — Page



Schlüter®-BEKOTEC-EN FTS — Page



Schlüter®-BEKOTEC-EN FK — Page



Installation overview (with page references)

The 9 point guide for surface coverings of tile, natural stone or ceramics

1	**Traffic load acc. to DIN 1991 (BS EN 1991)**	*see pages 17 + 18*
	Ceramic tiles e.g. in industrial premises, workshops, warehouses (without forklifts)	
	Observe static requirements	
2	**General structural prerequisites**	*see pages 19 – 26*
	Installation notes, general requirements and structural prerequisites, screeds ...	
3	**Screed cover/ calculation**	*see pages 17, 18, 23*
	Depending on studded screed panel - match with Schlüter-DITRA 25, -DITRA-DRAIN 4, -DITRA-HEAT	
	(with various surface coverings, if applicable)	
4	**Joints in the screed**	*see pages 20 + 24*
	= Structural joints, existing joints, sound insulation joints (screed reductions, e.g. at door transitions, must be separated with the expansion joint profiles Schlüter-DILEX-DFP)	
	Observe architectural joint design	
5	**Joints in the surface covering**	*see page 24*
	(use Schlüter-DILEX movement or stress relieving profiles)	
	Observe architectural joint design	
6	**Filling, flushing, and venting** **Leak testing according to DIN EN 1264** **(with report) (BS EN 1264)**	*see page 23 + Page 107 – Attachment III* *see page 23 + Page 108 – Attachment IV*
	...to be completed before installing the screed (Test with double operating pressure, at least 6 bar)	
7	**Installation of screed**	*see pages 22 – 24*
	...and allocation of the matching system edge strips	

8	**Installation of the uncoupling membrane Schlüter®-DITRA and the surface covering**		*see pages 25 + 78*
	... on cement screeds CT C25 F4 (ZE20) (max. F5)	on flowing screeds CA C25 F4 (AE 20) (max. F5)	
	after reaching initial readiness *to bear weight* *(observe* *Data sheet 6.1 DITRA 25* *Data sheet 6.2 DITRA-DRAIN* *Data sheet 6.4 DITRA-HEAT)*	with residual moisture < 2% *(observe* *Data sheet 6.1 DITRA 25* *Data sheet 6.2 DITRA-DRAIN* *Data sheet 6.4 DITRA-HEAT)* **CM measurement by installer of surface covering**	
		- If necessary, surface treatment (in accordance with specifications of screed manufacturer)	

9	**Heating up / start up**	*see page 80*
	7 days after completion of the covering at the earliest. Start at 25 °C, and increase the water supply temperature by 5 °C every day until the specified design temperature is reached	

Installation overview (with page references)

The 9 point guide for surface coverings of non-ceramic materials

1	**Traffic load acc. to DIN 1991 (BS EN 1991)**				*see page 18*
	Carpet, vinyl, PVC, linoleum, cork	Parquet without tongue and groove connection	Parquet with tongue and groove connection	Floating parquet, laminate	
	Observe static requirements				
2	**General structural prerequisites**				*see pages 19 – 26*
	Installation notes, general requirements and structural prerequisites, screeds ...				
3	**Screed cover/ calculation**				*see pages 17, 18, 23*
	Depending on studded screed panel - match with Schlüter-DITRA 25, -DITRA-DRAIN 4, -DITRA-HEAT (with various surface coverings, if applicable)				
4	**Joints in the screed**				*see pages 20 + 24*
	= Structural joints, existing joints, sound insulation joints (screed reductions, e.g. at door transitions, must be separated with the expansion joint profiles Schlüter-DILEX-DFP) Areas with moisture sensitive covering materials that adjoin ceramic coverings created with Schlüter-DITRA 25, -DITRA-DRAIN 4 or -DITRA-HEAT must be protected from permeating moisture.				
	Observe architectural joint design				
5	**Joints in the surface covering**				*see page 24*
	in accordance with specifications of flooring manufacturer or other technical standards (use Schlüter-DILEX movement joint profiles)				
	Observe architectural joint design				
6	**Filling, flushing, and venting** **Leak testing according to DIN EN 1264** **(with report) (BS EN 1264)**				*see page 23 + page 107 – Attachment III* *see page 23 + page 108 – Attachment IV*
	If using flowing screed with Schlüter-BEKOTEC, use the matching BEKOTEC edge strips for the studded screed panels				
7	**Installation of screed**				*see pages 22 – 24*
	...and allocation of the matching system edge strips				
8	**Installation notes for non-ceramic floor coverings** **Cure heating (with report) / CM-measurement**				*see pages 109 + 110 - Attachment V + VI*
	After CM measurement by installer of surface covering (observe specifications and guidelines of flooring and adhesive manufacturer). Start: 7 days after completion of the screed at the earliest. Start at 25 °C, and increase the supply temperature by < 5 °C every day to a maximum of 35 °C.				
9	**Installation of the surface covering**				*see pages 78 – 80*
	…without the Schlüter-DITRA membrane directly on the cooled screed once the residual moisture content has been reached.				
	Observe manufacturer guidelines				

Ceramic thermal comfort floor - application and properties

Application areas

The ceramic thermal comfort floor Schlüter-BEKOTEC-THERM is an easily assembled, safe system with low construction height and short installation times for new buildings, renovation projects, exhibition halls, bathrooms and swimming pool surrounds, etc.
As a result, the application areas of the ceramic thermal comfort floor BEKOTEC-THERM are especially versatile. The construction advantages and thermal technology benefits of the system can be used in customised applications in the following areas

New construction

The quick installation of the entire ceramic thermal comfort floor system saves time and cost. This is made possible by installing the uncoupling membrane Schlüter-DITRA 25 in conjunction with ceramic tile or natural stone coverings as soon as the screed is ready to bear weight. The system does not require any functional heating or curing after interface assembly, as is customary with conventional heated floor constructions.
Due to the low screed mass, the ceramic thermal comfort floor has heating and cooling properties that respond quickly to thermostat adjustments.
The effective heating performance and low supply temperature of the ceramic thermal comfort floor in addition to conventional heating systems allows for the use of modern heating technology and regenerative energies, such as heat pumps and solar heating systems. The ceramic thermal comfort floor even allows for passive cooling in the summer. The low construction height of Schlüter-BEKOTEC-THERM enables compliance with low construction height specifications.
This means:

- Additional depth available for installing insulation materials to comply with **mandated insulation values** or
- **Improved insulation values** by installing additional insulation materials.

Renovations

Conventional floor heating systems with screed coverings of at least 45 mm over the heating pipes can weigh 130 kg/m² or more. For renovation projects, the following are essential: low weight (static concerns) and low assembly height. For this reason, the installation of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is feasible even when a conventional heated floor system has to be ruled out. Even lower assembly heights from 20 mm to the top edge of the screed can be achieved with the studded screen panel Schlüter-BEKOTEC-EN 12 FK.
For the BEKOTEC-EN 12 FK system with a screed cover of 8 mm, the volume weight to be considered is just 40 kg/m² *(see table on page 23).*
If sound insulation is required, the studded screed panel Schlüter-BEKOTEC-EN 18 FTS with its integrated sound insulation layer is a potential solution.

Sales areas and car showrooms

The load bearing capacities of the thin Schlüter-BEKOTEC-THERM ceramic thermal comfort floor has proven its lasting value in many large scale reference projects. The regular patterns of the BEKOTEC studded panel evenly reduce tensions in the screed, which allows for constructing the screed without joints. The free arrangement of movement joints in the joint pattern of the ceramic covering, therefore, allows for a great variety of design options.

Wet areas

Schlüter-DITRA 25, -DITRA-HEAT, KERDI-BOARD and -KERDI are certified bonded waterproofing assemblies for wet areas of classes 0 – B0 in accordance with the ZDB information and for the load classes A1, A2 and C in areas requiring German construction permits. Consequently, these systems are particularly suitable for use in bathrooms, swimming pools and other areas with high moisture loads *(see product data sheets 6.1, 6.4, 12.1 and 8.1)*. The systems are also ideal for the safe and quick installation of barrier free bathrooms with level shower cubicles *(see product data sheets 8.2 and 8.6; point drainage or 8.7 and 8.8; linear drainage).*

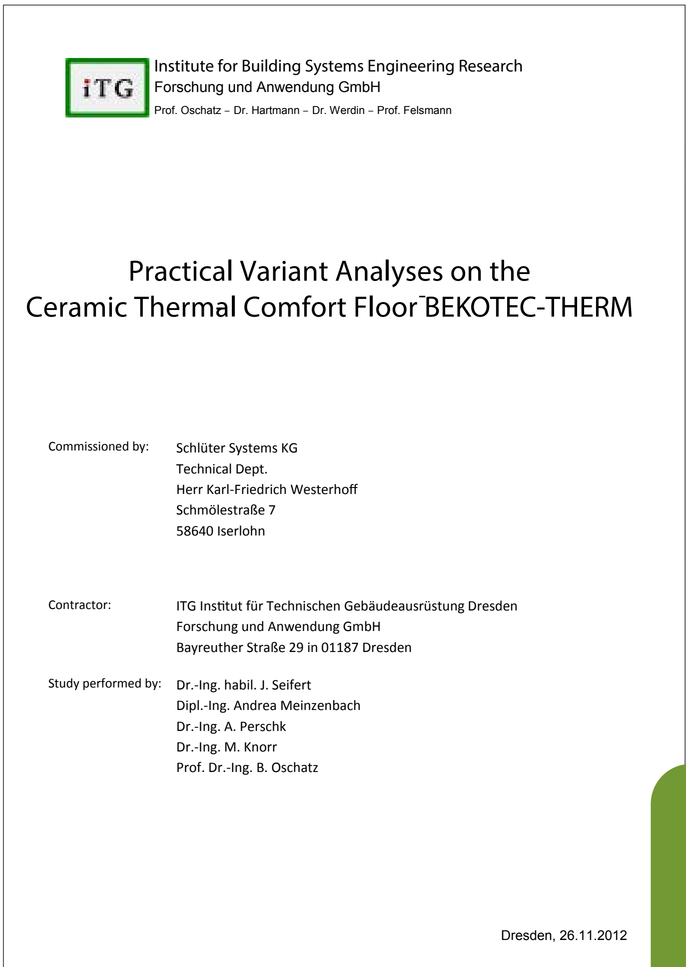
Saving energy with Schlüter®-BEKOTEC-THERM

Thermal properties - scientific study

Schlüter-BEKOTEC-THERM – considerable savings potential

The renowned Dresden Institute for Building Systems Engineering Research (ITG) compared the thin layer floor heating system BEKOTEC-THERM with a conventional radiant floor heating as a wet system as part of a research project. The assembly of the two systems was performed in accordance with the customary instructions and standards of the manufacturers. The results revealed remarkable energy differences between the conventional floor heating system and BEKOTEC-THERM. Thus, energy savings from the use of a heat pumpas the source of heat, were up to **9.5%**.

The systems were tested with a simulation program of Dresden Technical University, which specifies the same framework conditions for both assemblies. The base situation was a single family home with a living space of 160 m², parallel buffer storage and an air source heat pump as the source of heat. The study incorporated three different thermal insulation levels for the homes, namely the Thermal Insulation Ordinance (WSVO) in the versions of 1982 and 1995 as well as the Energy Savings Ordinance (EnEV) of 2004. Finally, the study also distinguished two different operating modes of the floor heating systems (lowering phase): The heating system was operated continuously or intermittently (time controlled). Additionally, the operation was simulated over the course of the day.



iTG Institute for Building Systems Engineering Research
Forschung und Anwendung GmbH
Prof. Oschatz – Dr. Hartmann – Dr. Werdin – Prof. Felsmann

Practical Variant Analyses on the
Ceramic Thermal Comfort Floor BEKOTEC-THERM

Commissioned by:	Schlüter Systems KG Technical Dept. Herr Karl-Friedrich Westerhoff Schmölestraße 7 58640 Iserlohn
Contractor:	ITG Institut für Technischen Gebäudeausrüstung Dresden Forschung und Anwendung GmbH Bayreuther Straße 29 in 01187 Dresden
Study performed by:	Dr.-Ing. habil. J. Seifert Dipl.-Ing. Andrea Meinzenbach Dr.-Ing. A. Perschk Dr.-Ing. M. Knorr Prof. Dr.-Ing. B. Oschatz

Dresden, 26.11.2012

Institute for Building Systems Engineering Research

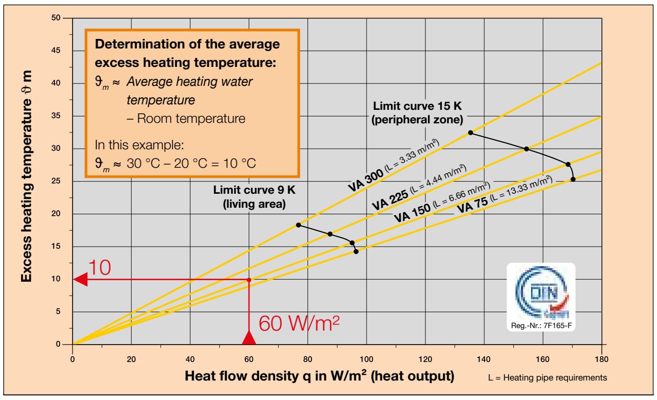
Ceramic thermal comfort floor - application and properties

Thermal properties

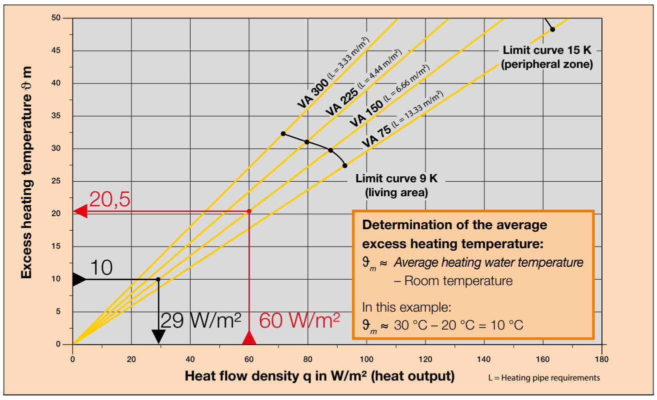
The construction advantages and the cooling and heating benefits of Schlüter-BEKOTEC-THERM are most pronounced in conjunction with ceramic tile and natural stone coverings. A mean heating water temperature of 30 °C is sufficient for the ceramic thermal comfort floor in most well insulated buildings. In addition to conventional heating systems, the ceramic thermal comfort floor can therefore be effectively operated with state-of-the-art heating technology such as condensing boilers and regenerative sources of energy, such as heat pumps and solar systems.
The performance comparison shown below clearly highlights the thermal advantages of the **ceramic thermal comfort floor**.

Practical performance comparison of ceramic coverings and thick carpeting/ parquet

Ceramic thermal comfort floor



Thick carpet/parquet ($R_{\lambda max}$= 0.15 m² * K/W)



The exact performance data from the thermal test of the system are allocated to the corresponding system.

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Conclusion
This sample calculation shows that carpet and hardwood floors reduce the heating performance by 50% compared to a ceramic thermal comfort floor because of their unfavourable thermal resistance factors.

Ceramic thermal comfort floor Schlüter®-BEKOTEC-THERM

Example: Schlüter-BEKOTEC-EN P or PF with heating pipe Ø 16 mm
A heat output of 60 W/m² was assumed for a room temperature of 20 °C. The heating pipe installation spacing (VA) was 150 mm.

Moving vertically up to the intersection of the output line of the installation spacing VA 150 with the desired output of 60 W/m², the left scale shows the corresponding excess heating temperature for the ceramic thermal comfort floor as 10 °C.
This excess heating temperature means that the heating water on average has to be 10 °C warmer than the desired room temperature to stay at the output level of 60 W/m². The average heating water temperature is calculated as follows:
10 °C excess heating water temperature (ϑm) + 20 °C room temperature = **30 °C average heating water temperature**.

Schlüter-BEKOTEC-THERM and carpet ($R_{\lambda max}$= 0.15 m² K/W)
Under the same conditions, an average heating water temperature of 40.5 °C is required for an output of 60 W/m² when carpet is used with a thermal resistance of $R_{\lambda max}$= 0.15 m² K/W. This is the equivalent of an excess heating temperature of about 20.5 °C in the diagram.
If the average heating water temperature is left at 30 °C, the heat output falls to approx. 29 W/m².

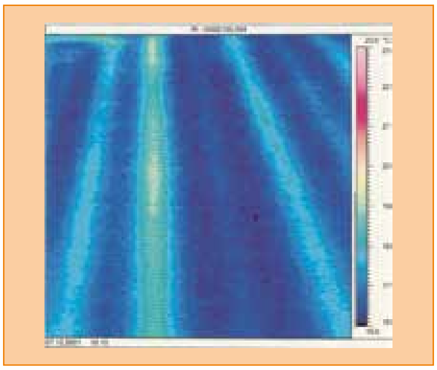
Ceramic thermal comfort floor - application and properties

Thermal properties

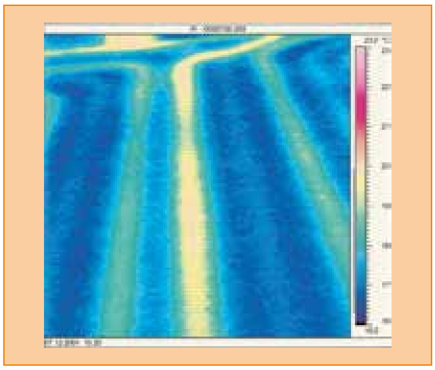
Heat distribution function

The fast heating of the system with low screed coverage highlights the excellent thermal conductivity of ceramic coverings. This was documented by a thermal technology test of the independent Laboratory for Process Technology at Darmstadt University. The heat radiation and convection processes in the interconnected air channels of Schlüter-DITRA 25 provide additional heat distribution and ensure an even surface temperature.
The low screed coverage achieves maximum heating performance with low supply temperatures *(see also performance diagrams on pages 81 to 97)*.

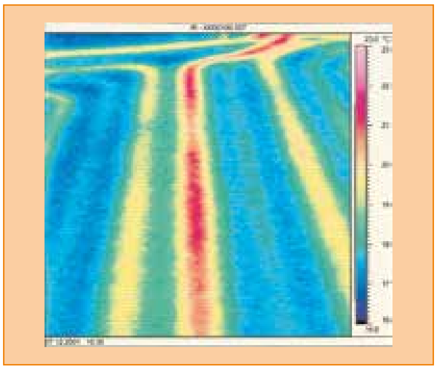
Thermographic analysis of heating response and heat distribution



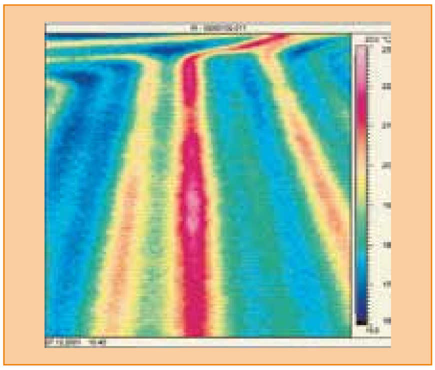
1 Start of heating phase with a surface temperature of 16 °C. The picture was taken after 10 minutes of system operation. Average surface temperature above the heating pipe: 18.5 °C.



2 The picture was taken after 20 minutes of operation. Average surface temperature above the heating pipe: 19.5 °C. The heat distribution within the uncoupling mat Schlüter-DITRA 25 shows first temperature increases between the heating pipes.



3 The picture was taken after 30 minutes of operation. Average surface temperature above the heating pipe: 21 °C. The heat distribution within the uncoupling mat Schlüter-DITRA 25 shows a clear temperature increase between the heating pipes.



4 The picture was taken after 40 minutes of operation. Average surface temperature above the heating pipe: 22.5 °C. The heat distribution within the uncoupling mat Schlüter-DITRA 25 provides an even surface temperature and low heat fluctuations.

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Summary

- Very little temperature fluctuation between the heating pipes
- Quick combination of surface temperatures between the heating pipes
- The requirements of the Energy Savings Ordinance for fast reacting systems are met
- The ceramic thermal comfort floor is fast and easy to regulate, leading to energy efficient control

Ceramic thermal comfort floor – application and properties

Regenerative sources of energy and modern energy technologies

Modern energy generators for heating and cooling buildings allow for an economic use of fossil fuels and the use of regenerative energy sources (such as geothermal energy). The potential of the energy and cost savings, with the associated reduction in CO_2 emissions, can be maximised when the system temperature of a heating system is as low as technically feasible. Additionally, the corresponding control technology must be adapted to these conditions to avoid supply losses and unnecessary room temperature fluctuations.
The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor features low system temperatures and is ideally suited for utilising geothermal energy (heat pumps), solar energy, and condensing boiler technology.

Guiding principle for using geothermal heat, solar energy, and condensing boiler technology

All of these systems have one factor in common: the lower the system temperature for covering the required heating load, the more efficient the use of the energy.

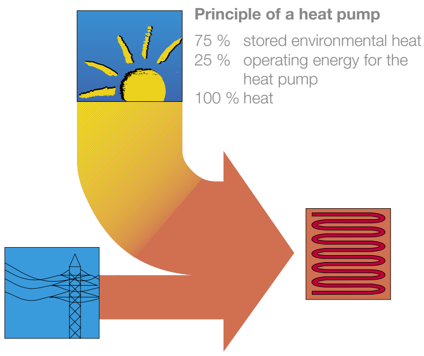
Heat pumps and Schlüter-BEKOTEC-THERM

Energy is available in large quantities in the air, the groundwater and the soil. By using a negligible amount of electric energy to operate the heat pump, the temperature can be increased to reach sufficient system temperatures. The larger the temperature difference between the heat source (air, soil or groundwater) and the intended system temperature, the more energy is required for operating the heat pump.
It follows from this principle that the effectiveness (output factor) of a heat pump increases when the temperature difference between the heat source (environment) and the heating system decreases. The output factor is the ratio of utilised power and generated heat.

The low supply temperatures of the BEKOTEC ceramic thermal comfort floor have the following advantages:

- Reduced use of energy (electric power) to operate the heat pump
- Improved output factor, and consequently, larger energy utilisation over the entire heating period
- faster pay back

The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor improves the energy utilisation of heat pumps.

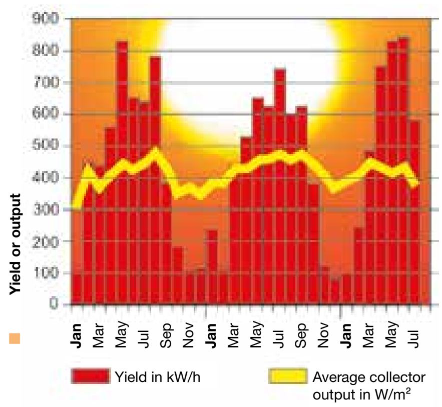


Source: Bundesverband Wärme Pumpe (BWP) e. V

Solar technology and Schlüter-BEKOTEC-THERM

The energy effectiveness of solar systems that are integrated into heating systems increases with every degree the system temperature can be lowered. On sunny days, a properly designed solar system can cover or support the heating system.
The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor improves the energy utilisation of solar systems.
Consequence:

- Lower supply temperatures can be used to heat floor areas.
- The energy effectiveness increases. This leads to a higher energy usage factor over the entire heating period.
- The payback period of the system is shorter.



Output/yield in 2 heating periods

Ceramic thermal comfort floor – application and properties

Regenerative sources of energy and modern energy technologies

Condensed boiler technology and Schlüter-BEKOTEC-THERM

The increase of energetic efficiency in these devices relies on the utilisation of latent heat contained in the water vapour of smoke gas (energy gain by partial condensation). The water vapour is the result of burning natural gas and oil. With the use of conventional low temperature heating boilers, the heat contained in emissions gas typically is released to the environment, together with water vapour. Condensed boiler technology is able to condense the water vapour of the emissions flow in a heat exchanger and derive additional heating energy even after the combustion process. This effect can only be utilised efficiently with low return temperatures.

The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor improves the energy utilisation of condensed boilers with low system temperatures.

Cooling and Schlüter-BEKOTEC-THERM

Pleasant temperatures are a major factor for the usage and comfort of residential and commercial premises and meeting rooms.

By installing a Schlüter-BEKOTEC-THERM system, you can combine the functions of heating and cooling with a single energy distribution system. In the summer, the floor cooling system is able to reduce the floor temperature by up to 3 °C compared to regular rooms without air conditioning. This gentle cooling makes residential areas, bedrooms, meeting rooms and exhibition spaces especially pleasant. For cooling and heating applications, both BEKOTEC-THERM-ER room sensors for “cooling/heating” can be used in the wired or wireless version. The operating state “heating/cooling” is displayed by the “red/blue” colour change of a light-emitting diode (LED). Both functions are controlled by the Control base module BTEBC.

The energy required for cooling must be provided by the corresponding cold generators. This can be so called reversible heat pumps, cold water sets, or refrigeration machines.

Cooling can be achieved with minimal energy costs if the heat pump is used in connection with the energy sources

- Probe drilling
- Groundwater
- Horizontal underground heat exchanger

Such systems must be designed by professional engineers to make sure that the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor can be supplied with the necessary cooling temperature and volume flow.

Conclusion: Schlüter-BEKOTEC-THERM, the ceramic thermal comfort floor

Value retention and value creation in property increasingly takes energy factors into account.

Those who decide in favour of a ceramic thermal comfort floor today not only have significant advantages in comfort, but also invest in a pioneering energy distribution system that is ideal for utilising and even for retrofitting regenerative energy systems.

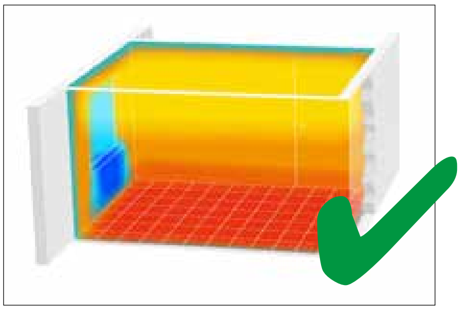
Considering the steady rise in energy cost and the declining cost of solar systems and heat pumps, subsequent retrofitting only requires finding a suitable energy distribution system.

Ceramic thermal comfort floor - application and properties

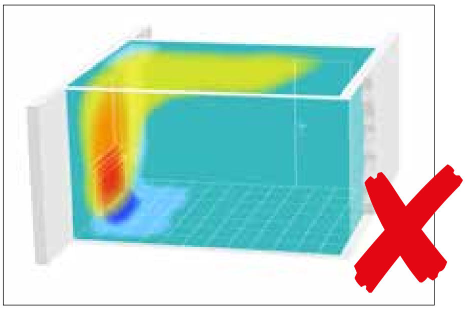
Advantages for users

A step ahead in thermal comfort

The ceramic thermal comfort floor Schlüter-BEKOTEC-THERM is a system that sets new standards of comfort. The heating advantages of the system provide higher quality of living in every room. Due to the large scale, unobtrusive heat transfer with low system temperatures in conjunction with quick control responses of the system, the entire house offers a previously unknown level of comfort. The perceived room temperature is significantly higher. As a consequence, the actual room temperature can be lowered by approx. 1- 2 °C without any change in comfort. This in turn leads to lower energy needs and reduces heating costs.



Ceramic thermal comfort floor with *even* heat distribution



Radiator heating system with *uneven* heat distribution

Better hygiene and health

The high share of radiated heat in floor heating systems reduces air movement, and consequently is associated with less dust. Additionally, the heat removes moisture from the warm surfaces and makes it more difficult for bacteria and mould to survive.

The healthcare system discovered the advantages of floor heating systems long ago. Treatment rooms, operating rooms and sanitary rooms are increasingly equipped with floor heating systems, which are easy to keep sterile.

Higher safety with dry ceramic coverings in bathrooms and indoor swimming pools

Cleaning measures or moisture caused by space utilisation reduces the anti-slip properties of ceramic coverings.
However, when these areas are heated with a ceramic thermal comfort floor system, they dry quickly. This prevents a possible slip hazard.

Design without limits

Clear room design without the intrusion of heating elements, for example along walls or under windows, opens up a large spectrum of design options. There are no limits to using and designing living, working, and showroom areas.

Ceramic thermal comfort floor - application and properties

Traffic loads

Car dealerships, exhibition halls and lobbies with higher traffic loads

The load bearing capacities of the thin layer Schlüter-BEKOTEC-THERM ceramic thermal comfort floor has proven its lasting value in many large scale sales and exhibition spaces, and particularly in car dealerships.

For this application, the screed cover should be increased to 15 mm if applicable. In principle, the design depends on the load transfer of the substructure. When selecting ceramic floor coverings for the anticipated stresses, determine the material thickness with the help of the information sheet “Coverings with high traffic loads”.

Impact resistant DEO insulation is presumed as substructure insulation for the use of our system panels Schlüter-BEKOTEC-EN/P, -EN/PF or -EN 23 F. These must be selected by the architect.

In principle, the design depends partially on the load transfer of the substructure.

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Note:

Higher traffic loads may be approved as part of a special agreement if applicable. For this purpose, we need to know the exact structure of the floor assembly with heights and additional insulation taken into account, including the corresponding designations or labels.

Our Technical Department will be pleased to assist you.

Ceramic thermal comfort floor - application and properties

Traffic loads

Schlüter®-BEKOTEC-THERM
Application areas with screed coverage, depending on traffic loads and surface coverings

	Max. traffic load qk according to DIN EN 1991	Max. single load* Qk according to DIN EN 1991	**Recommended min. system coverage with conventional screeds ***	Usage category/ application areas according to DIN EN 1991 (BS EN 1991)		Max. system coverage with conventional screeds ** (Maximum permissible leveling values**)
BEKOTEC-THERM System			**EN / EN F** **EN FTS** **EN FK**			EN / EN F EN FT S EN FK
Floor covering						
Ceramic tile/natural stone	5.0 kN/m²	3.5 - 7.0 kN	**8 mm**	to **C3**	e.g. exhibition spaces, access areas in public and administrative buildings, hotels, hospitals, train stations	25 mm 20 mm 15 mm
Soft coverings: PVC, vinyl, linoleum, carpet, cork	2 kN/m²	2.0 - 3.0 kN	**15 mm**	**A**	Residential buildings, nursing stations and patient rooms in hospitals, hotel and hostel rooms	25 mm 20 mm 15 mm
Adhered parquet without tongue and groove connection	5.0 kN/m²	3.5 - 7.0 kN	**15 mm**	to **C3**	e.g. exhibition spaces, access areas in public and administrative buildings, hotels, hospitals, train stations	25 mm 20 mm 15 mm
Adhered parquet with tongue and groove connection	5.0 kN/m²	3.5 - 7.0 kN	**8 mm**	to **C3**	e.g. exhibition spaces, access areas in public and administrative buildings, hotels, hospitals, train stations	25 mm 20 mm 15 mm
Floating parquet, laminate	2 kN/m²	2.0 - 3.0 kN	**8 mm**	**A**	Residential buildings, nursing stations and patient rooms in hospitals, hotel and hostel rooms	25 mm 20 mm 15 mm

* The contact area of individual loads must be adapted to the BEKOTEC structure with surface covering and to the static prerequisite of the ceiling structure.

****** For height adjustment purposes and levelling in some areas, the thickness of the screed may be increased to the specified maximum value over the studs. However, the overall height of the screed over the studs should be within the minimum coverage of **8 or 15 mm**. Screeds to be used: CT C25 F4 (ZE 20) or CA C25 F4 (AE 20). The flexural strength of the screed may not exceed F5.

Note:
The uncoupling mats **Schlüter-DITRA 25, -DITRA-DRAIN 4** or **-DITRA-HEAT -MA** must be used for the installation of ceramic tile and natural stone coverings. The height of the mats from approx. 5 mm to 8 mm must be considered in the assembly calculations. All other covering materials listed in the table are directly installed over the BEKOTEC screed without uncoupling mats. Keep in the installation height and final height of the corresponding DITRA mat in mind when calculating the height of the screed with regard to **adjoining areas** with tile coverings. For this reason, the table indicates a screed coverage of 15 mm for thin floor coverings such as vinyl, PVC, linoleum or carpet.
In addition to the applicable installation guidelines, note the permissible residual moisture content of the screed for the selected covering material.
For further information, please see page 19 and 78.

Prerequisites and implementation

Installation notes, general requirements

The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is an area heating system that differs substantially from conventional heated floor systems.
To mark the special properties and installation notes for the BEKOTEC system, they are labelled with the information symbol shown to the left. Additionally, the BT HR symbol system marks the allocation of technical statements and information.

Construction requirements

For the installation of a Schlüter-BEKOTEC-THERM ceramic thermal comfort floor, the windows of the building must be fully installed and closed and all openings have to be at least temporarily closed. The interior walls must be finished. The impact of frost must be prevented with suitable measures. The height measurements must be clearly marked in all rooms and must match the planned floor assemblies.

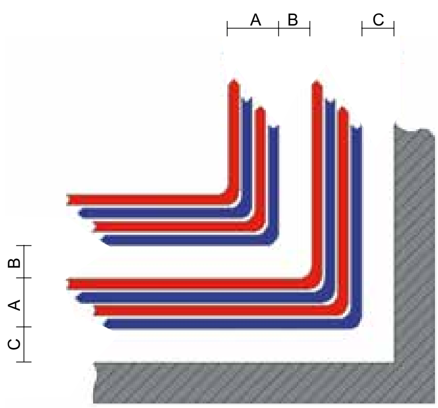
Protection from floor moisture and non-pressurised water
Construction engineers must select a waterproofing barrier against non-pressurised water and floor moisture (capillary moisture). This is especially important for floor areas that are in direct contact with the soil.

Preparing the substrate

The load bearing substrate must meet the static requirements for supporting the floor construction and the intended traffic load (DIN/BS EN 1991). According to DIN 18560 2, Section 4, the load bearing substrate must be sufficiently dry to support the construction system and have a level surface according to the measurement tolerances in buildings (DIN 18 202). This includes humps and hollows, point shaped high spots and mortar residue. The required floor slope and levelling measures must evenly distribute the load on the substrate and must be dimensioned in such a way that the screed can be applied in an even thickness.

When planning cable routes, the following dimensions from the information sheet “Pipes, cables, and cable routes on concrete bases” must be observed:

A: Routing width of parallel lines, including pipe insulation: **max. 300 mm**
B: Fully load bearing width between the routes **min. 200 mm**
C: Distance between walls and upright construction elements **min. 200 mm**



Pipes, cables and cable routes on the structural concrete base
Unfortunately, pipes and cables on concrete bases are a frequent occurrence at construction sites. This should be avoided with proper planning. If pipes are installed on the load bearing substrates, suitable levelling measures must be taken to create a level, load bearing installation area.

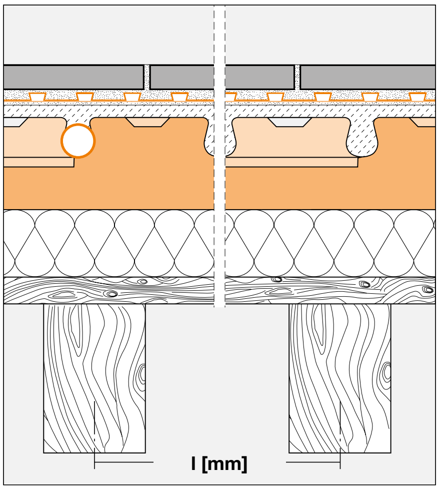
Note:
The information sheet “Pipes, cables and cable routes on concrete bases”, issued by the Central Association of German Construction Trade Professionals, contains important information and further planning suggestions.

The available methods include levelling mortar and screed, pressure resistant heat insulation or adding bound fill, such as Thermowhite, that is approved for use under screeds and capable of absorbing the required loads.
Note: As a general rule, loose fill may not be used for levelling purposes under floating screed constructions.
If it cannot be avoided, pipes and cables may be installed on the concrete base, but must be installed as straight as possible, without intersections, and must be parallel to the rising walls.

The studded screed panels EN 12 FK and EN 18 FTS are installed only on fully load bearing substrates, not insulation layers.

Prerequisites and implementation

Preparing the substrate



The studded screed panels EN 12 FK and EN 18 FTS are installed exclusively on fully load bearing substrates – not over insulation layers.

Schlüter-BEKOTEC-THERM over wooden floor assemblies

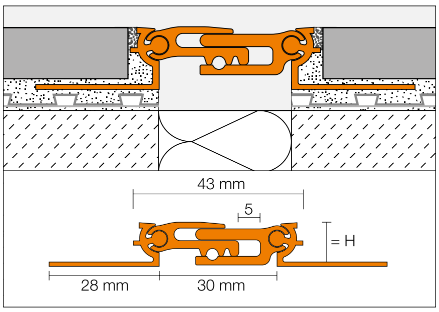
Special preparatory work may be necessary for installing a BEKOTEC-THERM system over a wooden floor assembly. The wooden floorboards or plywood panels must be firmly screwed to the substructure to completely rule out any flexing of the elements at the abutting joints of the floor-boards or panels. The entire structure must be sufficiently load bearing to guarantee low vibration use. The maximum deflection may not exceed l/300. This deflection refers to the distances of the supports/beams and to entire support span of the ceiling.

Example: *Beam spacing: 750 mm*
750 mm / 300 = 2.5 mm max. deflection between beams (joists)

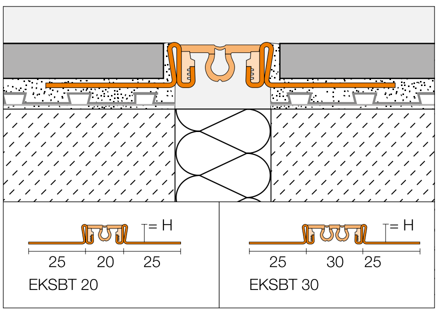
Ceiling support span: 3000 mm
3000 mm / 300 = 10 mm max. deflection over a ceiling support span of 3 meters.

Movement joints in the load bearing substrate

Structural joints in the load bearing substrates may not be covered by heating elements. These joints must be continued to the floor covering.
The following Schlüter system components are available for establishing joints in the surface covering:



Schlüter-DILEX-BT is a structural expansion joint made of aluminium, with opposing support profiles that connect to a sliding telescopic centre section. This allows for the absorption of three-dimensional movement *(see product data sheet 4.20)*.



Schlüter-DILEX-KSBT is a structural movement profile with edge protection. The profile's anchoring legs, made of, aluminium, or stainless steel, are connected to a 20 mm or 30 mm wide movement zone made of soft synthetic rubber *(see product data sheet 4.19)*.

Prerequisites and implementation

Requirements for additional heat and sound insulation

Installation of heat and sound insulation on a sufficiently load bearing and level substrate

Schlüter®-BEKOTEC-BTS
(max. traffic load: 2 kN/m²)

The minimum insulation requirements and thicknesses must be determined according to DIN-EN 1264 (BS-EN 1264), “Hot water underfloor heating systems,” DIN 4108-10, “Thermal insulation and energy economy in buildings - Application related requirements for thermal materials,” DIN 4109, “Noise control in buildings,” as well as the applicable regulations, such as the Energy Savings Ordinance. The insulation layer must be suitable for the required traffic loads. The utilised insulation materials must be approved for installation below floating screeds. Insulating layers are installed as a continuous layer with abutting joints. In the case of dual layer insulation, the joints must be staggered. The insulation layer must have full contact with the substrate. Hollow spots must be eliminated with suitable measures.

Note for Schlüter-BEKOTEC-THERM:
Only **one layer** of sound insulation is permissible, with a maximum compressibility CP3 (≤ 3 mm) (Not permissible for EN 12 FK and EN 18 FTS).
If both sound insulation and heat insulation panels are used, the insulation material with the lower compressibility factor should be on top. If the lower heat insulation layer is used, against the advice of standard regulations, to offset the height of installed pipes, the sound insulation must be on top in a consistent area.
Tip: Impact sound and refurbishment
If the construction height does not allow for using polystyrene or mineral fibre insulation, the Schlüter-BEKOTEC-BTS sound insulation membrane (thickness: 5 mm) can achieve significantly improved sound insulation in conjunction with ceiling construction (not permissible with EN 12 FK and EN 18 FTS).

For further information about Schlüter-BEKOTEC-THERM with drawings of insulation materials, please refer to pages 29 to 34.

Separating layer

Installation of separating layer

If using flowing screed, we recommend the installation of a PE protective foil (minimum thickness: 0.15 mm) on top of the insulation layer with overlaps of 8 cm prior to the installation of the Schlüter-BEKOTEC-EN studded screed panels.

The studded screed panels EN 12 FK and EN 18 FTS are installed exclusively on fully load bearing substrates–not over insulation or separating layers.

Prerequisites and implementation

Edge strips and edge joints

Sample installation of the edge strip BRS 810 or BRSK 810 with integrated foil leg

Edge strips are used to form the edge joints in order to provide the movement accommodation required according to DIN 18560. Edge joints are movement joints that delimit the screed along walls and floor penetrating construction elements, such as columns. They reduce impact sound transmission and absorb the expansion changes of the floor assembly caused by thermal factors. Additionally, they prevent tensions in the screed and in the surface covering. Edge joints must not be filled.

Note:

Make sure that no amount of tile adhesive, levelling compound, or grout can get into the edge joints. The edge profile joints Schlüter-DILEX-EK (*see below*) are ideally suited for this purpose.

The edge strips must be installed prior to fitting the Schlüter-BEKOTEC studded screed panels. The strip must run continuously along all rising construction elements and be secured against moving. Ensure the area is free from debris and dust which may prevent the correct positioning and fixing of the edge strip.

Schlüter®-BEKOTEC-THERM
Allocation of the matching system edge strips

		EN/P	EN/PF	EN 23 F	EN 18 FTS	EN 12 FK
	**BRS 810** for traditional semi-dry screeds only	X				
	**BRSK 810** for traditional semi-dry screeds only	X				
	**BRS 808 KF** for traditional semi-dry screeds and flowing screeds	X	X			
	**BRS 808 KSF** for traditional semi-dry screeds and flowing screeds	X	X	X	X	
	**BRS 505 KSF** for traditional semi-dry screeds and flowing screeds					X

Schlüter®-DILEX-EK

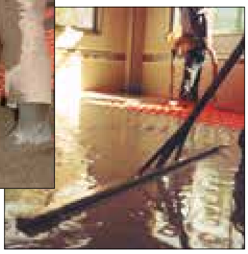
Depending on the final surface covering, the edge strip is cut off at the end of the floor installation work or prior to the installation of the flexible Schlüter-DILEX-EK or -RF edge joint profiles.

Schlüter-Systems offers a wide variety of Schlüter-DILEX profiles for creating maintenance free and safe edge and movement joints at the transition of floor and wall or skirting tiles.

For more information, see product data sheet 4.14, Schlüter-DILEX-EK/-EF.

Prerequisites and implementation

Installing conventional cement or gypsum based screeds



Prior to installing the screed, the seal of the heating system must be tested under pressure. However, the system may not be heated during the installation and curing process of the screed. *For further information on filling and venting and a pressure test report, please refer to the Appendix.*

As part of the screed installation, fresh cement screed of screed quality **CT-C25-F4**, **max. F5** or gypsum based screed **CA-C25-F4**, **max. F5** is installed with a minimum screed cover of 8 mm over the studded panels. **The flexural strength of the screed may not exceed F5.**

For height adjustment purposes and levelling in some areas, the thickness of the screed may be increased to the specified maximum value over the studs. However, the overall height of the screed over the studs should be within the minimum coverage of 8 or 15 mm *(see table "Traffic loads," page 18)*.

The screed quality must follow the specifications of DIN EN 13 813 (BS EN 13 813). The applicable installation instructions must be observed. The heating pipes must be carefully embedded in the screed mortar.

Screeds for BEKOTEC systems

The most important abbreviations for screeds used with BEKOTEC systems are:

- **CT** Cement screed
- **CA** Gypsum based screed

- **C** Compression, e.g. C25 means pressure impact resistance of 25 N/mm²
- **F** Flexural strength, e.g. F4 has a flexural strength of 4 N/mm²

Schlüter®-BEKOTEC-THERM screed volumes for a minimum coverage of 8 mm			
Studded panel	**min. screed coverage mm**	**Area weight* kg/m²**	**Screed volume* l/m²**
EN/P EN/PF EN 23 F	8	57	28.5
EN 18 FTS	8	52	26
EN 12 FK	8	40	20

* For screed density of approx. 2000 kg/m³.
The following calculation basis applies for additional screed coverage > 8 mm to 15 mm: 1 mm/m² ≙ 2 kg/m² ≙ 1 l/m².

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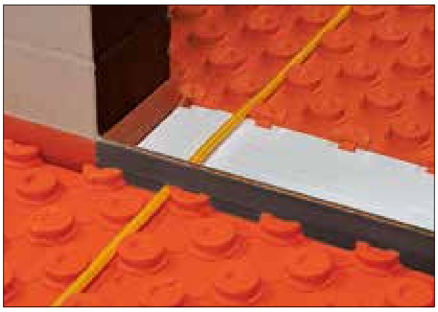
No reinforcement or screed additives Any "non static reinforcement" of the screed or heated screed to be poured is neither required for the system nor permissible. Similarly, additives or fibres that increase the flexural strength of the Schlüter-BEKOTEC screed are superfluous and not permissible.
In fact, the reinforcement with fibres and rebar mats or the use of additives to increase flexural strength may actually counter the modular reduction of tension in the screed that occurs in the stud patterns of the BEKOTEC studded panel.

Prerequisites and implementation

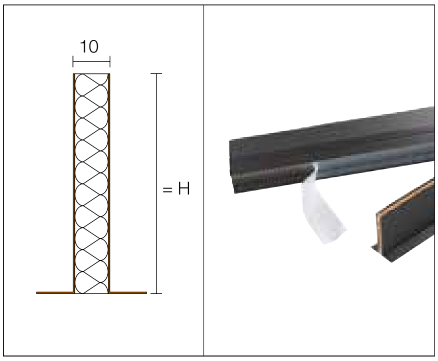
Joints in the Schlüter®-BEKOTEC system



Regardless of the floor covering, conventional screeds must be divided into fields of specific sizes with movement joints. This labour intensive division of screed fields and the associated need to coordinate with other tradesmen is not necessary when building a Schlüter-BEKOTEC system.

Any contraction occurring while the screed cures is absorbed by the studded pattern of the BEKOTEC studded panels. As a consequence, a BEKOTEC screed is not subject to contraction buckling over its entire area, making it unnecessary to install joints in the screed.

If any joints (e.g. a daywork joint) in the screed result from necessary work interruptions, these must be protected against height discrepancies, covered with resin, or turned into an expansion joint in the covering.



Schlüter®-DILEX-DFP

Exceptions

- *See page 20:* Movement joints in the load bearing substrate.
- To avoid sound bridges and in the case of height differences in the substrate, the screed should be separated, for example, at door transitions.

We recommend the use of Schlüter-DILEX-DFP expansion joint profiles for door transition areas (a height offset mechanism may need to be installed if applicable). Thanks to the bilateral coating and the self-adhesive strip, straight line installation is very easy.

If no impact sound insulation is required, only a joint under the door area is recommended. This joint must be continued into the covering as a movement joint.

Installing joints in the surface covering with the Schlüter®-DILEX product series

Example: Schlüter®-DILEX-BWS

Example: Schlüter®-DILEX-KS

Coverings of ceramic tile, natural or agglomerate stone can be directly installed on top of Schlüter-DITRA 25, using the thin bed method. The necessary joints in the ceramic covering can simply follow the joints of the tile pattern.

Above DITRA 25, the ceramic covering must be divided into fields with movement joints in accordance with the applicable regulations. The following specifications of DIN EN 1264 4 (BS EN 1264 4) must be observed in interior rooms:

- Maximum area size: 40 m² with a maximum side length of 8 m
- Maximum side ratio of rectangular rooms ≤ 1 : 2.
- In the case of expansions or narrowing (e.g. at protruding walls) and for L shaped and U shaped BEKOTEC screed areas, the covering should be divided into compact fields.

If the BEKOTEC screed includes movement joints, they must be continued in the same location in the covering. The design of movement joints should start at corners, e.g. at pillars and chimneys. If installing non ceramic surfaces, the applicable installation guidelines and manufacturer recommendations must be observed.

We recommend the movement joint profiles of the Schlüter-DILEX series for creating movement joints.

For more details about creating edge joints and connection joints, see page 22.

Additional system products for ceramic tiles and natural stone

Installation of the uncoupling membrane Schlüter®-DITRA 25

Schlüter®-DITRA 25

The uncoupling mat Schlüter-DITRA 25 can be installed in accordance with the manufacturer's recommendations in product data sheet 6.1 as soon as the cement screed is ready to bear weight.On gypsum based screeds CA C25 F4 (max. F5), the uncoupling mat DITRA 25 can be installed when the screed has reached a residual moisture level of < 2 CM %.

Floor covering materials, such as parquet or carpet, may be directly installed over the Schlüter-BEKOTEC screed **without** use of DITRA 25 as soon as the required residual moisture has been reached *(see also Residual Moisture on page 80).*

Depending on the thickness of non-ceramic coverings, it may be necessary to level the screed in order to avoid height discrepancies between the different coverings. The screed coverage may be increased to max. 25 mm for levelling *(see table on page 18)*. In addition to the applicable installation guidelines, note the permissible residual moisture content of the screed for the selected covering material.

For further information about the surface covering, see page 78.

Additional products for wetrooms and bathrooms

The surfaces of areas such as public showers, swimming pool surrounds and barrier free bathrooms must be constructed as bonded waterproofing assemblies. The following products of Schlüter-Systems may be used as supplements:

- Schlüter-DITRA 25 waterproofing and uncoupling mat, *(product data sheet 6.1)*
- Schlüter-KERDI for waterproofing wall and floor areas, *(product data sheet 8.1)*

The DITRA 25 waterproofing membrane can be installed in accordance with the waterproofing standards 18531-5 or 18534 applicable in Germany.

Water exposure classes: W0-I to W3-I.

Furthermore, DITRA 25 features the national technical approval (abP) required in Germany. Moisture load class according to ZDB: 0 to B0, as well as A and C.

Schlüter-DITRA 25 is a polyethylene membrane with cut back square indentations and an anchoring fleece laminated on the underside. In conjunction with tile coverings, DITRA 25 provides waterproofing, vapour pressure equalisation for back side moisture and uncoupling. Joints and wall transitions are sealed with the seaming tape Schlüter-KERDI-KEBA, using the sealing adhesive Schlüter-KERDI-COLL-L.

Schlüter-KERDI is a crack bridging waterproofing membrane of soft polyethylene with a special fleece fabric laminated on both sides for effective anchoring in the tile adhesive.

KERDI was developed for bonded waterproofing assemblies with coverings of tiles and pavers. The waterproofing membrane is adhered to a level substrate with a suitable tile adhesive. Tiles are then installed directly on KERDI, using the thin bed method.

Installation

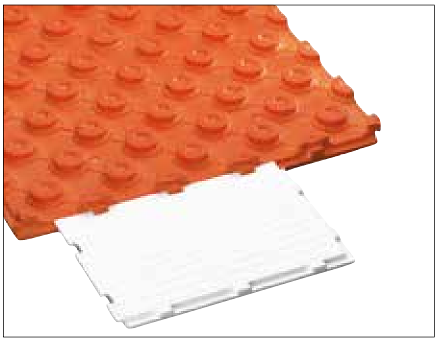
Installation of the Schlüter®-BEKOTEC-EN/Por EN/PF PF studded screed panel

Laying out and fitting the studded screed panel Schlüter-BEKOTEC-EN/P

Schlüter®-BEKOTEC-EN/P
for installation of conventional cement screeds CT-C25-F4 (ZE20) (max. F5)
Installation spacing of heating pipes: 75 – 150 – 225 – 300 mm
Dimensions/ working area: 75.5 cm x 106 cm = 0.8 m²

Base thickness:	20 mm
Total height:	44 mm
Insulation material:	EPS 033 DEO
Thermal conductivity Measuring value:	0.033 W/mK
U value:	1.650 W/m²K
Thermal resistance:	0.606 m² K/W

Reg.-Nr.: 7F165-F



Schlüter®-BEKOTEC-EN/PF on Schlüter®-BEKOTEC-ENR

Schlüter®-BEKOTEC-EN/PF
with additional foil coating, suitable for installing conventional cement screeds CT-C25-F4 (ZE20) or flowing screed (e.g. gypsum based screed CA-C25-F4) (max. F5).
Installation spacing of heating pipes: 75 – 150 – 225 – 300 mm

Dimensions/ working area:	75.5 cm x 106 cm = 0.8 m²
Base thickness:	20 mm
Total height:	44 mm
Insulation material:	EPS 033 DEO
Thermal conductivity Measuring value:	0.033 W/mK
U value:	1.650 W/m²K
Thermal resistance:	0.606 m²K/W

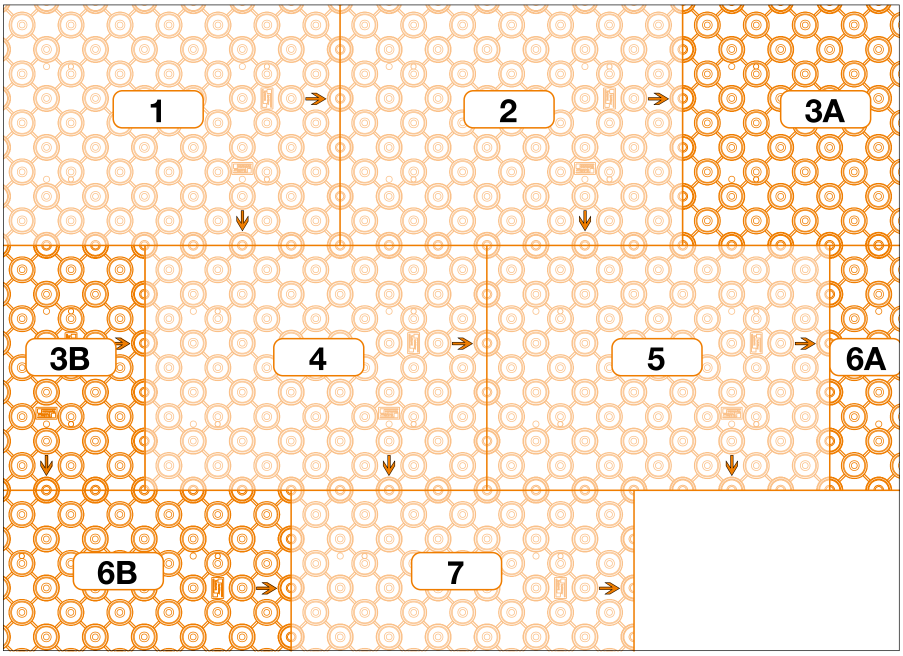
Schlüter®-BEKOTEC-ENR
edge panel (white) for reducing waste and fitting into small areas and open spaces

Dimensions:	30.5 cm x 45.5 cm = 0.14 m²
Thickness:	20 mm
Insulation material:	EPS 040 DEO
Heat conductor class:	040 (0.04 W/mK)
U value:	2 W/m²K
Thermal resistance:	0.5 m²K/W

The studded Schlüter-BEKOTEC-EN panels are cut to size in the peripheral areas. These panels have an interlocking design. The directional arrows on the topside indicate the alignment of the panels (*see installation drawing below*). This ensures a continuous interlocking connection. The panels are installed as a continuous area.
Cut out segments that are longer than 30 cm can fit into the next row to reduce waste. The studded Schlüter-BEKOTEC panels can also be fitted at the sides of the floor with their short end. This again cuts down on material waste. BEKOTEC-EN/P, made of polystyrene EPS 033 DEO, is intended for use with conventional cement screeds.
BEKOTEC-EN/PF, made of polystyrene EPS 033 DEO, has a foil cover on the top and is intended for use with flowing and conventional screeds. If installing a flowing screed, a fully waterproof assembly must be created, using the flowing screed edge strip Schlüter-BEKOTEC-BRS 808 KF or KSF.

Note:
Before and during the installation of the screed, the studded screed panel must be protected from mechanical damage in the traffic areas with suitable measures, such as laying out running boards.

Remaining areas or cut outs at doors and protrusions can be covered with the edge panel Schlüter-BEKOTEC-ENR.
BEKOTEC-ENR edge panels may be used in the area around the floor heating distribution cabinet to simplify the installation of closely adjacent heating pipes.

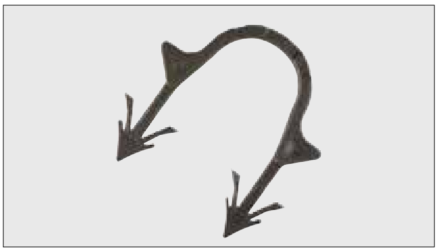


Installation process (with optimal use of material)

Installation

Installing and connecting Schlüter®-BEKOTEC-HR heating pipes


Schlüter®-BEKOTEC-THERM-RH 75


Schlüter®-BEKOTEC-THERM-RH 17

Schlüter-BEKOTEC-THERM-RH 17 is a plastic arch with barbed hooks to attach heating pipes in critical areas.

The matching system heating pipes with a diameter of 16 mm can be securely clamped between the undercut studs. The spacing of the pipes of 75, 150, 225 or 300 mm must be determined on the basis of the required heating output, as shown in the Schlüter-BEKOTEC *heating diagrams starting on page 81*.

The spiral or snail pattern installation method shown here is most suitable for achieving an even surface temperature. The heating pipes must be installed 50 mm from upright construction parts and 200 mm from chimneys, open fireplaces and ducts.

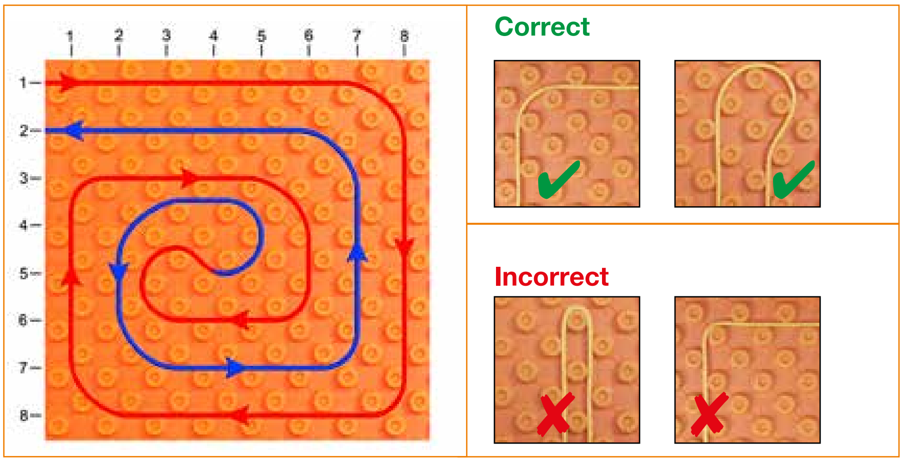
Note: It is important to minimise twisting in the heating pipes by turning the pipe coil in the opposite direction. Tensions in areas where the pipes change direction can be minimised by setting the pipe coil in the new direction.

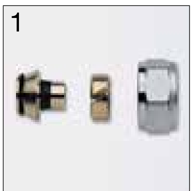
Use the angle bracket Schlüter-BEKOTEC-THERM-RH 75 to attach heating pipes installed partially at 45° angles.

The angle clips Schlüter-BEKOTEC-THERM-ZW are used to attach the heating pipes at the heating circuit distributor with a defined 90° angle. The clips allow for exact insertion of the pipes into the relatively thin screed.

The smallest permissible bending radius “r” equals five times the outside diameter of the pipe (with a diameter of 16 mm: smallest bending radius = 80 mm). Heating pipe angles must always involve two studs *(see pictures)*.


Schlüter®-BEKOTEC-THERM ZW





Schlüter-BEKOTEC-EN/P or EN/PF

In spiral installations, the heating pipe is installed at double the installation spacing to the reversal loop. After reversal, the return leg is installed in the remaining spaces, which results in the desired pipe spacing.

A form for a final pressure test can be found on page 108 - Attachment IV.

Connection elements

1 Schlüter®-BEKOTEC-THERM-KV: Clamp connections 3/4" (DN 20) for connecting heating pipes to heating circuit distributors and return temperature limit valves

2 Schlüter®-BEKOTEC-THERM-KU: Connector piece 3/4" (DN 20) for connecting the Schlüter heating pipes

3 Schlüter®-BEKOTEC-THERM-AN: Connector fitting 1/2" (DN 15) x 3/4" (DN 20) as self-sealing transition to an existing 1/2" male thread to Schlüter heating pipes

4 Schlüter®-BEKOTEC-THERM-AW: Connector angle 1/2" (DN 15) x 3/4" (DN 20) as self-sealing transition to an existing 1/2" male thread to Schlüter heating pipes

Product service and planning materials

Our service

- **Technical consulting**
- **Calculation of material needs**
- **Calculation service**
- **Tender documents**
- **PLANCAL data record**
- **Download data record VDI**

Technical consulting
The qualified employees of our technical department will be pleased to assist you with any questions you may have concerning the construction assembly and the corresponding heating and control technology. The department develops individual construction designs and solutions for your building projects.

Heat requirement calculation
Our software solution allows us to determine the heating requirements of buildings and individual rooms on the basis of the corresponding drawings and data in order to guarantee the most efficient heat distribution of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor.

Heating system design
We can use existing drawings, information about the number and size of rooms as well as the corresponding heat requirements to calculate the design of the heating system. This includes the determination of the required heating circuits and the optimal installation spacing. We will draw up a material list that includes all necessary components. Such lists can be supplied as tables or as CAD drawings with heating circuits.

Our project engineering data sheets (see Appendix) are used as the basis for designing heating systems.

Tender documents
Our own tender texts can be found online at **www.bekotec-therm.co.uk** for downloading. We also supply specifically adapted tender documents in accordance with the technical design of Schlüter-BEKOTEC-THERM in heated floor assemblies.

On site consulting
Our qualified consultants of the field service will be pleased to arrange a site visit for further details.

Note: We reserve the right to charge extra for design development that exceeds the framework of conventional product advisement.

Product service and planning materials

Heat insulation of floor heating systems in accordance with the Energy Saving Ordinance (EnEV)

The Energy Savings Ordinance (EnEV) has given designers and architects more freedom in the design of the required heat insulation of the external envelope of buildings. The main objective of the EnEV is to limit the annual primary energy need. This is also reflected in the system technology of buildings.
Comprehensive calculation programs are available to determine annual primary energy needs. They take all factors for the energy assessment of buildings into account. The energy needs certificate created on the basis of these calculations includes the necessary information to determine insulation needs.

Conclusion
It is no longer possible to refer to fixed insulation layers for compliance with the Energy Savings Ordinance. Floor heating systems do not have a fixed heat transfer coefficient (U value).
EnEV only requires a minimum heat insulation in accordance with current standards.

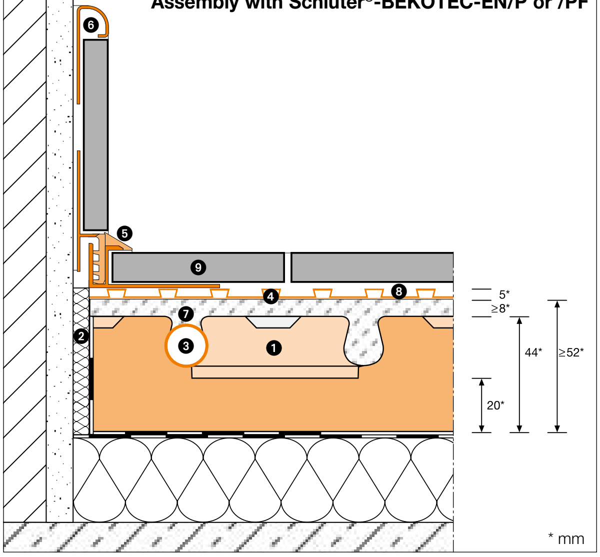
Simplification
In order to simplify the required individual documentation, the Technical Committee of the German Institute for Construction Technology (DIBt) has published the following statement:

"In the presence of sufficient insulation with a thickness of 8 cm and a thermal conductivity of 0.040 W (m K), the additional heat loss of a floor heating system is very low.
When an insulation of at least 8 cm is present, it is not necessary to determine the additional specific transmission heat loss HT, FH separately to comply with the Energy Savings Ordinance."
Excerpt from (source: DIBt 01.04.2007 / 2nd publication on interpretation questions for the Energy Savings Ordinance)

If the designer bases the calculations for the energy certificate of a building on better (lower) U values, these must be maintained for the insulation.
The designer will enter the requirements for the actual insulation values in the Energy Pass, which must be created for every new building. The Energy Pass is to be handed to the designer of the heating technology or the contractor at the earliest possible time to select the most suitable insulation materials.

Examples of Schlüter-BEKOTEC assemblies
The assembly examples shown on the following pages must be discussed with the architect with reference to the given U values, traffic loads and impact sound requirements.

Assembly with Schlüter®-BEKOTEC-EN/P or /PF



Assembly height DITRA 25 = 5 mm, see 4 for additional product specific assembly heights.

Schlüter®-BEKOTEC-THERM
System components Heated floor assembly

1. Schlüter®-BEKOTEC-EN/P or /PF
Studded screed panel for the attachment of Schlüter-heating pipes Ø 16 mm
Note: Additional insulation and waterproofing is required in accordance with the applicable regulations.

2. Schlüter®-BEKOTEC-BRS
Screed edge strip

3. Schlüter®-BEKOTEC-THERM-HR
Heating pipe Ø 16 mm

System components
for the installation of tiles and natural stone
(see separate price list)

4. **Schlüter®-DITRA**
4.1 Schlüter®-DITRA 25
(assembly height 5 mm)
Bonded uncoupling, waterproofing vapour pressure equalisation, heat distribution or
4.2 Schlüter®-DITRA-DRAIN 4
(assembly height 6 mm) Bonded uncoupling, vapour pressure equalisation, heat distribution or
4.3 Schlüter®-DITRA-HEAT-E
(assembly height 7 mm)
Bonded uncoupling, waterproofing for additional electrical floor warming/heating

5. Schlüter®-DILEX
Maintenance free edge and movement joint profiles

6. Schlüter®-RONDEC, -JOLLY, -QUADEC or -LIPROTEC-VB /-VBI
Decorative finishing profiles for walls, skirting and floors

System components
not available from Schlüter-Systems

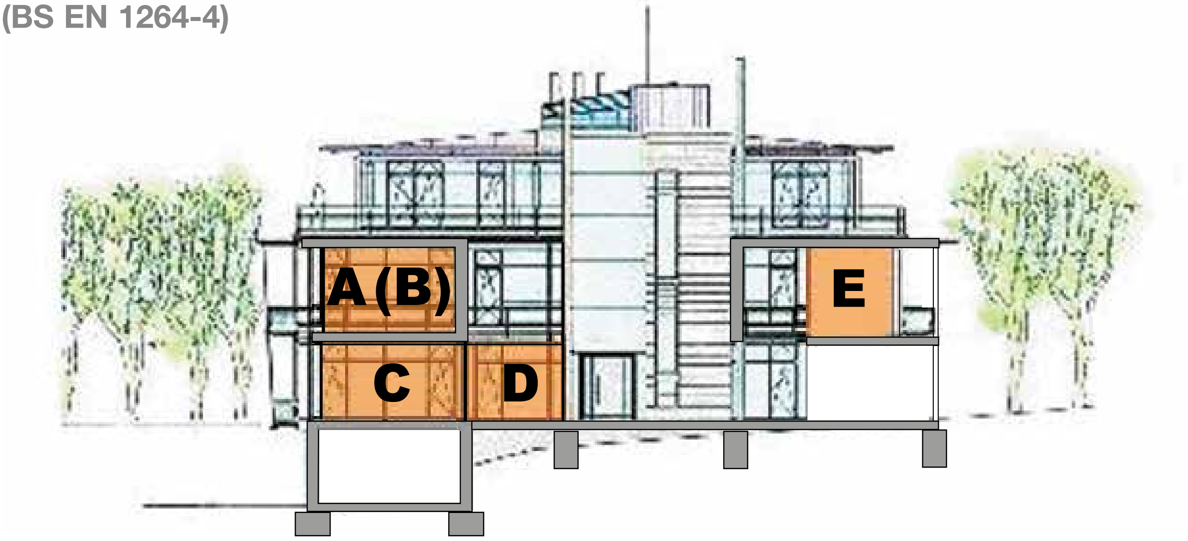
7. Screed
Cement or gypsum based screed

8. Thin bed tile adhesive

9. Ceramic tiles or natural stone
Other coverings such as carpet, laminates and parquet are also feasible in compliance with the applicable installation standards.

Product service and planning materials

Heat insulation of a warm water floor heating system according to DIN EN 1264-4 (BS EN 1264-4)



Minimum insulation values according to DIN EN 1264-4 (BS EN 1264-4)	Underlying room, heated	Unheated or occasionally heated underlying room or rooms with soil contact*	Lower outside temperature Td		
			Outside temperature used for design Td ≥ 0 °C	Outside temperature used for design 0 °C > Td ≥ -5 °C	Outside temperature used for design -5 °C > Td ≥ -15 °C
Room areas	**A**	**B, C, D**	**E**	**E**	**E**
Thermal resistance Rλ [m²K/W]	0.75	1.25	1.25	1.5	2

* These minimum values should be increased if the subsoil water level is ≤ 5 meter.

Note

The insulation values (U values) used by designers for calculations in compliance with the Energy Savings Ordinance determine the thickness of insulation layers in unheated rooms or rooms that directly adjoin the soil. These values typically exceed the minimum insulation listed in the table according to DIN EN 1264-4 (BS EN 1264-4).

A **Underlying heated room**

General requirements:

R_{ins} of at least 0.75 m² K/W
U_{ins} of at least 1.33 W/(m² K)

B, C, D **Ceiling adjoining unheated room and soil**

For installing a heated floor system in a new house with normal inside temperatures over ceilings that adjoin unheated or occasionally heated underlying rooms or are in direct contact with the soil, the following thermal resistance or U value must be selected:

R_{ins} of at least 1.25 m² K/W
U_{ins} of at least 0.80 W/(m² K)

E **Ceilings adjoining outside air**

Additionally, the following thermal resistance or U value must be selected for ceilings that adjoin outside air, with temperatures from – 5 °C to - 15 °C:

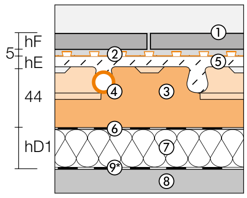
R_{ins} of at least 2.00 m² K/W
U_{ins} of at least 0.50 W/(m² K)

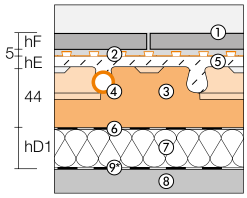
Floor assemblies for various application areas – ceramic thermal comfort floor

C, D, E

Sample assemblies adjoining unheated rooms and soil

- **Without sound insulation requirements:**



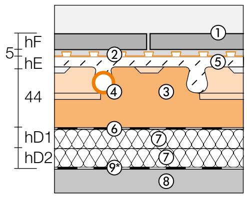


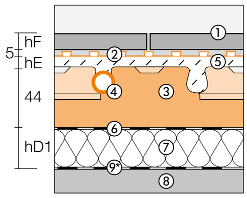
Total thermal resistance		R = 2.106 (m² K)/W			R = 2.006 (m² K)/W		
U value total		U = 0.475 W/(m² K)			U = 0.498 W/(m² K)		
	Position no./ (Designation)	Layer thickness s	Thermal conductivity λR	Thermal resistance s/λR	Layer thickness s	Thermal conductivity λR	Thermal resistance s/λR
		mm	W/(m K)	(m² K)/W	mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)						
Schlüter-DITRA 25, thin bed installation	②	5			5		
Screed coverage	⑤ (hE)	8			8		
BEKOTEC studded panel (height of studs)	③	24			24		
BEKOTEC studded panel/ floor thickness 20 mm EPS 033 DEO	③	20	0.033	0.606	20	0.033	0.606
hD1 additional insulation with EPS 040 DEO	⑦ (hD1)	60	0.040	1.500	–	–	–
hDl additional insulation with PUR 025 DEO	⑦ (hD1)	–	–	–	35	0.025	1.400
hD2 additional insulation with EPS 040 DEO	⑦ (hD2)	–	–	–	–	–	–
hD2 additional insulation with PUR 025 DEO	⑦ (hD2)	–	–	–	–	–	–
Assembly height without surface covering		**117**			**92**		

C, D, E

Sample assemblies adjoining unheated rooms and soil

- **Without sound insulation requirements**
- **With increased heat insulation**





Total thermal resistance		R = 2.981 (m² K)/W			R = 3.006 (m² K)/W		
U value total		U = 0.335 W/(m² K)			U = 0.333 W/(m² K)		
	Position no./ (Designation)	Layer thickness s	Thermal conductivity λR	Thermal resistance s/λR	Layer thickness s	Thermal conductivity λR	Thermal resistance s/λR
		mm	W/(m K)	(m² K)/W	mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)						
Schlüter-DITRA 25, thin bed installation	②	5			5		
Screed coverage	⑤ (hE)	8			8		
BEKOTEC studded panel (height of studs)	③	24			24		
BEKOTEC studded panel/ floor thickness 20 mm EPS 033 DEO	③	20	0.033	0.606	20	0.033	0.606
hD1 additional insulation with EPS 040 DEO	⑦ (hD1)	50	0.040	1.250	–	–	–
hDl additional insulation with PUR 025 DEO	⑦ (hD1)	–	–	–	60	0.025	2.400
hD2 additional insulation with EPS 040 DEO	⑦ (hD2)	45	0.040	1.125	–	–	–
hD2 additional insulation with PUR 025 DEO	⑦ (hD2)	–	–	–	–	–	–
Assembly height without surface covering		**152**			**117**		

Further drawing numbers:

④ Heating pipe – ⑥ PE foil (recommended if using flowing screeds) – ⑧ Load bearing substrate – ⑨* Waterproofing (if required)

Comments: These assemblies exceed the minimum requirements for insulating layers according to DIN EN 1264 (BS EN 1264 4) U ≤ 0.8 W W/(m²K) for rooms adjoining soil or unheated spaces. The supplementary specification of the German Institute for Construction Technology DIBt for U ≤ 0.50 W/(m2K) is met.

Note: The architect always has to verify whether additional requirements of EnEV must be met in conjunction with DIN 4108 6. Traffic load specifications for various objects must be taken into account when selecting insulating materials.

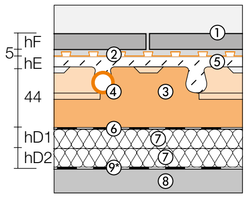
The architect also has to specify the required waterproofing assemblies, especially in the case of construction segments adjoining soil to prevent floor moisture.

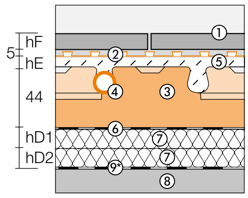
Floor assemblies for various application areas – ceramic thermal comfort floor

C, D, E

Sample assemblies adjoining unheated rooms and soil

- **With sound insulation requirements:**



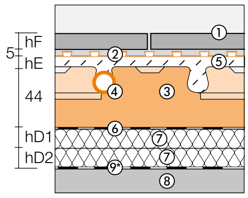


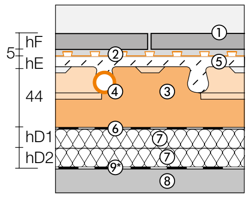
Total thermal resistance		**R = 2.023 (m² K)/W**			**R = 2.050 (m² K)/W**		
U value total		**U = 0.494 W/(m² K)**			**U = 0.487 W/(m² K)**		
	Position no./ (Designation)	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**
		mm	W/(m K)	(m² K)/W	mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)						
Schlüter-DITRA 25, thin bed installation	②	5			5		
25Screed coverage	⑤ (hE)	8			8		
BEKOTEC studded panel (height of studs)	③	24			24		
BEKOTEC studded panel/ floor thickness 20 mm EPS 033 DEO	③	20	0.033	0.606	20	0.033	0.606
hD1 additional insulation with EPS 040 DEO	⑦ (hD1)	30	0.040	0.750	–	–	–
hDI additional insulation with PUR 025 DEO	⑦ (hD1)	–	–	–	25	0.025	1.000
hD2 additional insulation with EPS 045 DES (impact sound insulation)	⑦ (hD2)	30	0.045	0.667	20	0.045	0.444
Assembly height without surface covering		**117**			**102**		

C, D, E

Sample assemblies adjoining unheated rooms and soil

- **With sound insulation requirements**
- **With increased heat insulation**





Total thermal resistance		**R = 2.884 (m² K)/W**			**R = 3.050 (m² K)/W**		
U value total		**U = 0.346 W/(m² K)**			**U = 0.328 W/(m² K)**		
	Position no./ (Designation)	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**
		mm	W/(m K)	(m² K)/W	mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)						
Schlüter-DITRA 25, thin bed installation	②	5			5		
Screed coverage	⑤ (hE)	8			8		
BEKOTEC studded panel (height of studs)	③	24			24		
BEKOTEC studded panel/ floor thickness 20 mm EPS 033 DEO	③	20	0.033	0.606	20	0.033	0.606
hD1 additional insulation with EPS 040 DEO	⑦ (hD1)	60	0.040	1.500	–	–	–
hDI additional insulation with PUR 025 DEO	⑦ (hD1)	–	–	–	50	0.025	2.000
hD2 additional insulation with EPS 045 DES (impact sound insulation)	⑦ (hD2)	35	0.045	0.778	20	0.045	0.444
Assembly height without surface covering		**152**			**127**		

Further drawing numbers:

④ Heating pipe – ⑥ PE foil (recommended if using flowing screeds) – ⑧ Load bearing substrate – ⑨* Waterproofing (if required)

Comments: These assemblies exceed the minimum requirements for insulating layers according to DIN EN 1264 (BS EN 1264 4) U ≤ 0.8 W W/(m²K) for rooms adjoining soil or unheated spaces. The supplementary specification of the German Institute for Construction Technology DIBt for U ≤ 0.50 W/(m2K) is met. Only one layer of sound insulation is permissible, with a maximum compressibility ≤ 3 mm (CP 3). The requirements for slab ceilings according to DIN 4109 or design specifications must be observed for sound insulation.

Note: The architect always has to verify whether additional requirements of EnEV must be met in conjunction with DIN 4108 6. Traffic load specifications for various objects must be taken into account when selecting insulating materials.

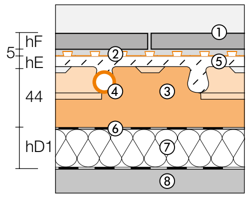
The architect also has to specify the required waterproofing assemblies, especially in the case of construction segments adjoining soil to prevent floor moisture.

Floor assemblies for various application areas – ceramic thermal comfort floor

A

Sample assembly adjoining other heated rooms

- **With sound insulation requirements:**

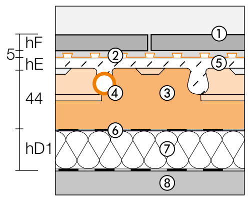


Total thermal resistance		R =1.050 (m² K)/W		
U value total		**U = 0.952 W/(m² K)**		
	Position no./ (Designation)	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**
		mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)			
Schlüter-DITRA 25, thin bed installation	②	5		
Screed coverage	⑤ (hE)	8		
BEKOTEC studded panel (height of studs)	③	24		
BEKOTEC studded panel/ floor thickness 20 mm EPS 033 DEO	③	20	0.033	0.606
hD1 additional insulation with EPS 045 DES (impact sound insulation)	⑦ (hD1)	20	0.045	0.444
Assembly height without surface covering		**77**		

B

Sample assembly adjoining other rooms with different heating (e.g. commercial properties)

- **With sound insulation requirements:**



Total thermal resistance		R = 1.273 (m² K)/W		
U value total		**U = 0.786 W/(m² K)**		
	Position no./ (Designation)	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**
		mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)			
Schlüter-DITRA 25, thin bed installation	②	5		
Screed coverage	⑤ (hE)	8		
BEKOTEC studded panel (height of studs)	③	24		
BEKOTEC studded panel/ floor thickness 20 mm EPS 033 DEO	③	20	0.033	0.606
hD1 additional insulation with EPS 045 DES (impact sound insulation)	⑦ (hD1)	30	0.045	0.667
Assembly height without surface covering		**87**		

Further drawing numbers:

④ Heating pipe – ⑥ PE foil (recommended if using flowing screeds) – ⑧ Load bearing substrate

Comments: The requirements for slab ceilings according to DIN 4109 or design specifications must be observed for sound insulation. Only one layer of sound insulation is permissible, with a maximum compressibility ≤ 3 mm (CP 3).

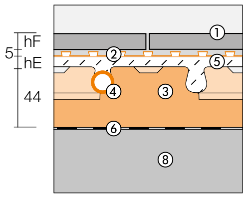
Traffic load specifications for various objects must be taken into account when selecting insulating materials

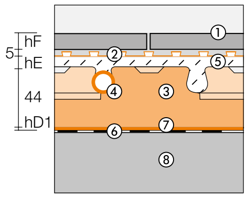
The architect must specify the required waterproofing.

Floor assemblies for various application areas – ceramic thermal comfort floor

Sample assembly for renovation projects

- **Without sufficient assembly height:**





Total thermal resistance		**R = 0.606 (m² K)/W**			**R = 0.717 (m² K)/W**		
U value total		**U= 1.650 W/(m² K)**			**U = 1.395 W/(m² K)**		
	Position no./ (Designation)	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**	**Layer thickness S**	**Thermal conductivity λR**	**Thermal resistance s/λR**
		mm	W/(m K)	(m² K)/W	mm	W/(m K)	(m² K)/W
Ceramic covering, thin bed installation	① (hF)						
Schlüter-DITRA 25, thin bed installation	②	5			5		
Screed coverage	⑤ (hE)	8			8		
BEKOTEC studded screed panel (stud height)	③	24			24		
BEKOTEC studded screed panel/ base thickness 20 mm EPS 033 DEO	③	20	0.033	0.606	20	0.033	0.606
hD1 Schlüter-BEKOTEC-BTS (impact sound improvement)*	⑦ (hD1)	–	–	–	5	0.045	0.111
Assembly height without surface covering		**57**			**62**		

* **Tip:** Use Schlüter-BEKOTEC-BTS for sound insulation and restoration *(See page 21)*!

Further drawing numbers:

④ Heating pipe – ⑥ PE foil (recommended if using flowing screeds) – ⑧ Load bearing substrate

Note: The architect must always verify whether additional insulation measures, waterproofing or heat or impact sound insulation is required.

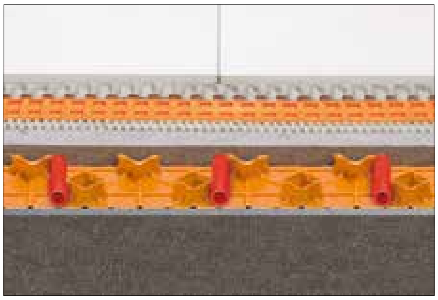
Ceramic thermal comfort floor – application and function

Non buckling, thin layer covering assembly

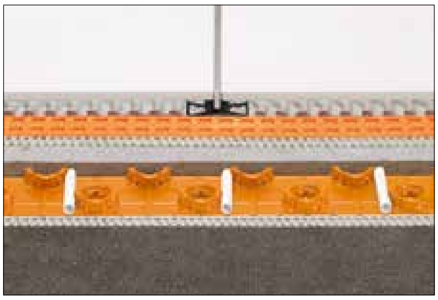
Schlüter-BEKOTEC-F is a safe cover assembly system for crack free and functionally safe floating screeds and heated screeds with ceramic or natural stone coverings. The BEKOTEC screed is also suitable for other covering materials. These systems are based on studded screed panels that are directly installed on top of load bearing substrates or conventional heat and/or sound insulation panels *(see pages 19 22 and 24 and 25 for requirements)*. The geometry of the studded screed panels result in a minimum screed thickness of 20 to 31 mm. The studs are designed to hold the heating pipes of the system in a grid pattern of 50 mm (with Schlüter-BEKOTEC-EN 12 FK and Schlüter-BEKOTEC-EN 18 FTS) or. 75 mm (with Schlüter-BEKOTEC-EN 23 F) in order to create heated screeds. The studded screed panel BEKOTEC-EN 12 FK is directly adhered on the load bearing substrate.

The studded screed panel BEKOTEC-EN 18 FTS features a 5 mm sound insulation layer on the underside and is directly installed on the load bearing substrate. Since only a relatively small amount of screed has to be heated or cooled, the heated floor system is easily adjustable and can be operated at low temperatures. The studded grid helps reduce the tension that occurs in the curing screed and ensures that the screed does not curl as a result of shearing tension. It is therefore not necessary to install joints in the screed. As soon as the cement screed is ready to bear weight, the uncoupling mat Schlüter-DITRA 25 can be installed (gypsum based screed < 2 CM %). The ceramic tiles or natural stone are then installed directly over this layer, using the thin bed method. Movement joints in the covering layer have to be created with Schlüter-DILEX in the customary spacing. Cover materials that are not susceptible to cracking, such as parquet or carpeting, can be directly installed over the screed as soon as it reaches the corresponding residual moisture level.

Schlüter®-BEKOTEC-EN 23 F



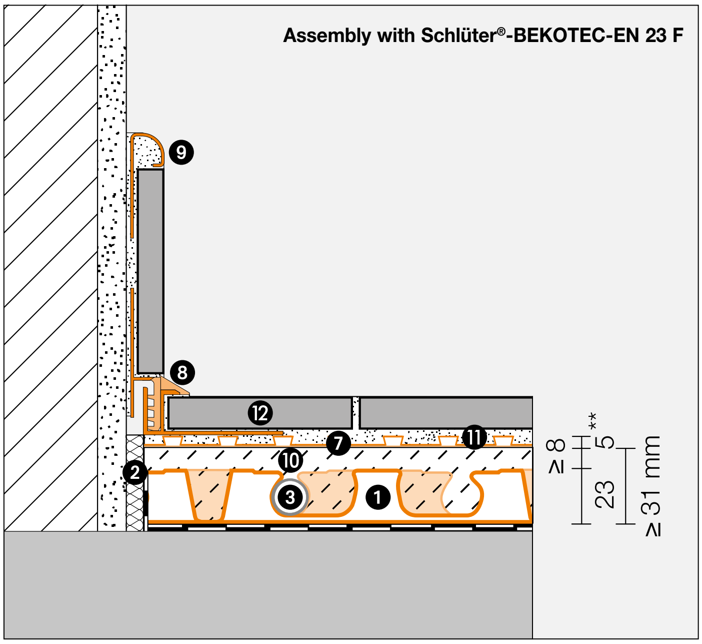
Schlüter®-BEKOTEC-EN 18 FTS with pre-adhered 5 mm sound insulation



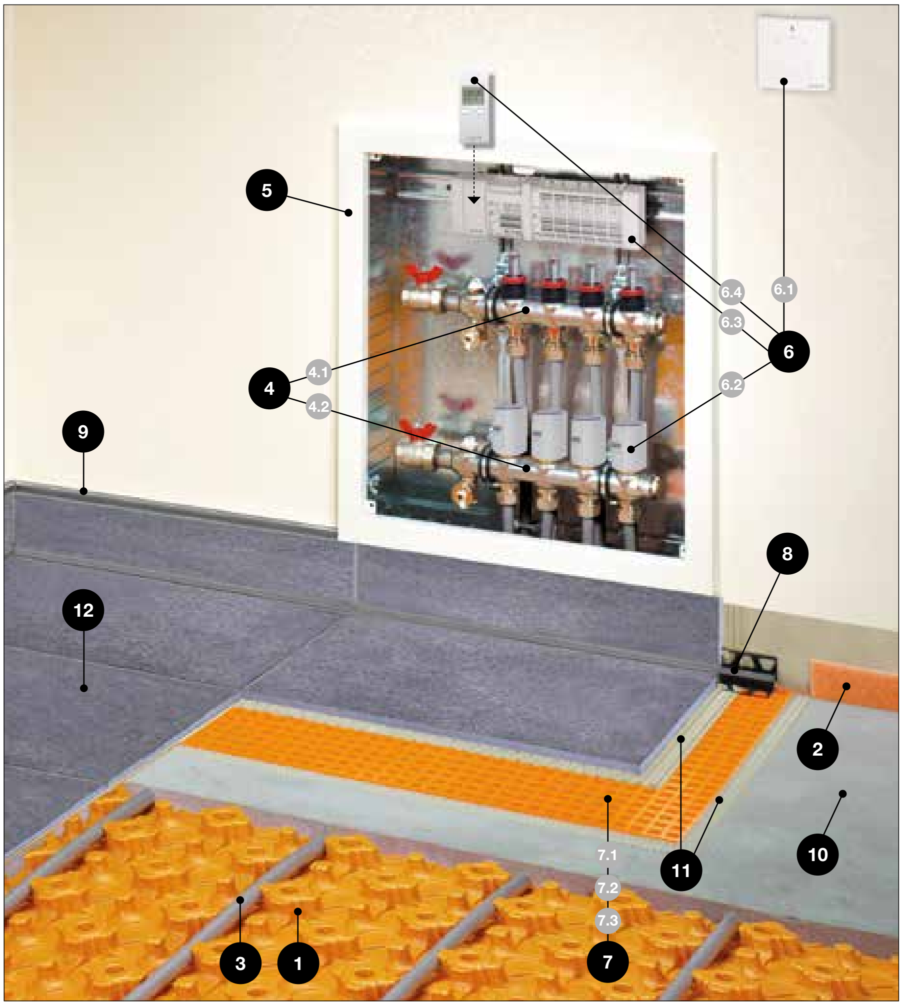
Installation of Schlüter®-BEKOTEC-EN 12 FK

Ceramic thermal comfort floor with Schlüter®-BEKOTEC-EN 23 F

System structure with low assembly height



** Assembly height DITRA 25 = 5 mm, see 7 for additional product specific assembly heights.



Schlüter®-BEKOTEC-THERM
System components
Floor heating system (with low assembly height)

1. **Schlüter®-BEKOTEC-EN 23 F**
   Studded screed panel for the attachment of Schlüter-heating pipes Ø 14 mm
   Note: Additional insulation and waterproofing is required in accordance with the applicable regulations.
   See pages 19 - 25!
2. **Schlüter®-BEKOTEC-BRS 808 KSF**
   Screed edge strip
3. **Schlüter®-BEKOTEC-THERM-HR**
   Heating pipe Ø 14 mm
4. **Schlüter®-BEKOTEC-THERM-HV**
   Stainless steel heating circuit distributor with connection accessories
   4.1 Hot flow leg **4.2** Cold return leg
5. **Schlüter®-BEKOTEC-THERM-VS**
   Distribution cabinet
6. **Schlüter®-BEKOTEC-THERM-E**
   Electronic temperature control
   6.1 Room sensor **6.2** Actuator
   6.3 Control base module with connection module
   6.4 Timer unit (optional)

System components
for the installation of tiles and natural stone
(see separate price list and product data sheets)

7. **Schlüter®-DITRA**
   7.1 Schlüter®-DITRA 25
   (Assembly height 5 mm), Bonded uncoupling, waterproofing, vapour pressure equalisation, heat distribution,
   or
   7.2 Schlüter®-DITRA-DRAIN 4
   (Assembly height 6 mm), Bonded uncoupling, vapour pressure equalisation, heat distribution,
   or
   7.3 Schlüter®-DITRA-HEAT-E
   (assembly height 7 mm)
   Bonded uncoupling, waterproofing for additional electrical floor warming/heating
8. **Schlüter®-DILEX -EK** or **-RF**
   Maintenance free edge and movement joint profiles
9. **Schlüter®-RONDEC**, **-JOLLY**, **-QUADEC** or **-LIPROTEC-VB /-VBI**
   Decorative finishing profiles for walls, skirting and floors

System components
not available from Schlüter-Systems

10. **Screed**
    Cement or gypsum based screed
11. **Thin bed tile adhesive**
12. **Ceramic tiles or natural stone**
    Other coverings such as carpet, laminates and parquet are also feasible in compliance with the applicable installation standards.

Prerequisites and implementation

Installation of the studded screed panel Schlüter®-BEKOTEC-EN 23 F

The studded panels Schlüter-BEKOTEC-EN 23 F must be precisely cut to size in the peripheral areas. The BEKOTEC panels are connected by overlapping a row of studs. In threshold areas and near distributor boxes, the smooth levelling panel Schlüter-BEKOTEC-ENFG may be used to simplify the pipe installation. This panel is used underneath the studded panels and is adhered with double sided adhesive strips. The self-adhesive pipe clamping strip Schlüter-BEKOTEC-ZRKL allows for precise routing of pipes in these areas. It may be necessary to adhere the panels to the substrate; for example if the force of the pipes is relatively high (in small rooms with tight pipe radiuses). The double-sided adhesive tape Schlüter-BEKOTEC-ZDK can be used for this purpose. The system pipes with a diameter of 14 mm are now clamped between the cutback studs to create a ceramic thermal comfort floor with Schlüter-BEKOTEC-THERM-EN 23 F. The spacing of the pipes must be determined on the basis of the required heating output, as shown in the Schlüter-BEKOTEC-THERM heating diagrams (from page 86).

Note: Schlüter-BEKOTEC-EN 23 F, -ENFG, -BRS and -BTS do not rot and require no special maintenance or care. Before and during the installation of the screed, the studded screed panel may need to be protected from mechanical damage with suitable measures, such as laying out wooden boards.

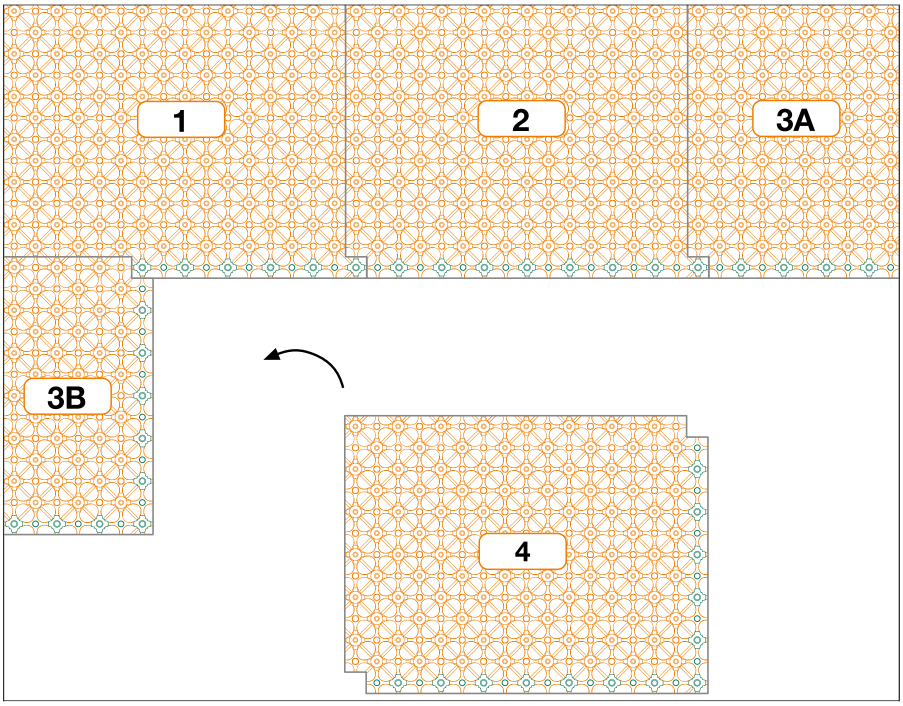
Technical data

1. Stud size:
   approx. 20 mm for small studs
   approx. 65 mm for large studs

Installation spacing: 75, 150, 225, 300 mm
Diameter of the system
heating pipes: Ø 14 mm
The studs have a cutback design to securely keep heating pipes in place without the need for clamps.

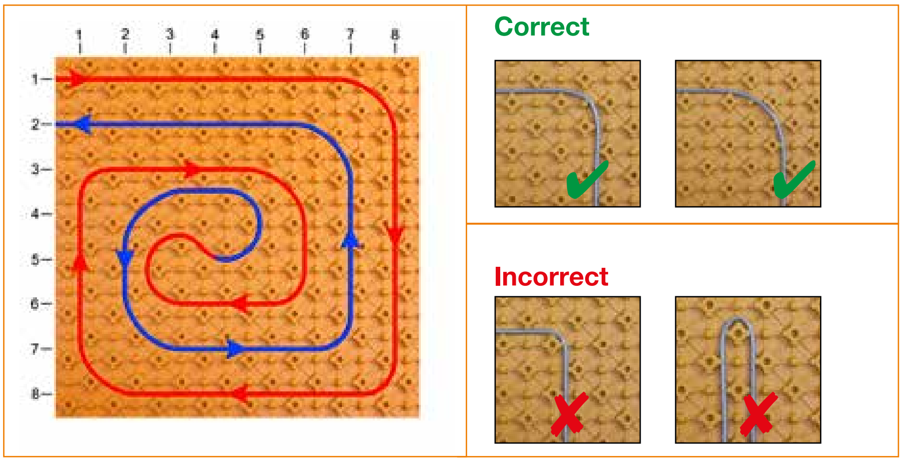
2. Connections:
The studded panels are connected by overlapping a row of studs and clicking the panels together.

3. Working area: 1.2 x 0.9 m = 1.08 m²
Panel height: 23 mm



The installation direction is indicated by the tapered connection studs, which are shown in green colour in the drawing. Cut segments that are longer than 30 cm can fit into the next row.

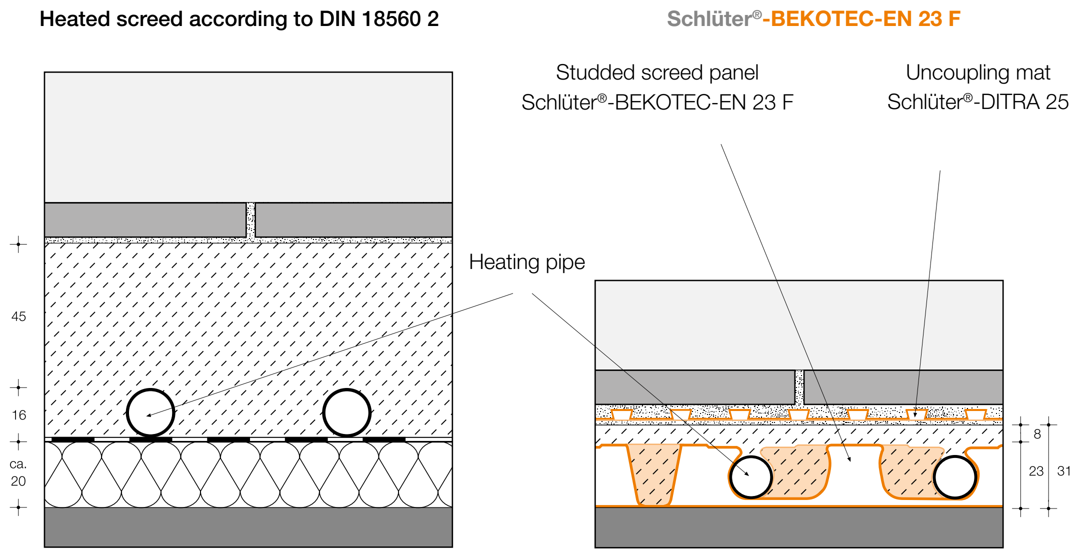
Note: When using a flowing screed we recommend that the corner overlaps are sealed with a suitable sealant, e.g. Schlüter-KERDI-FIX to prevent the screed seeping underneath the panels.



The system heating pipes (Ø 14 mm) are installed at double the installation spacing to the reversal loop. After the reversal point, the return line (blue) is inserted into the centre of the remaining space. **Important:** Form the heating pipes as shown in the drawing!

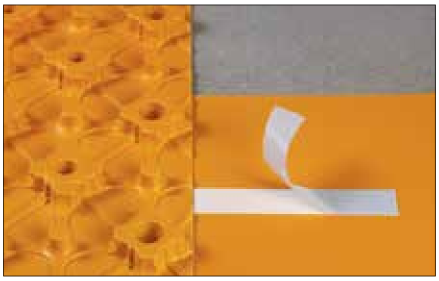
Schlüter®-BEKOTEC-EN 23 F

Comparison with conventional screed assembly



Supplementary system products

Levelling panel
Schlüter-BEKOTEC-ENFG is installed in the area of the heating circuit distributors and at thresholds to simplify connections and to minimise cutting waste.
It consists of a smooth polystyrene foil material and is adhered below the studded panels, using the supplied double sided adhesive tape.
Dimensions: 1275 x 975 mm
Thickness: 1.2 mm

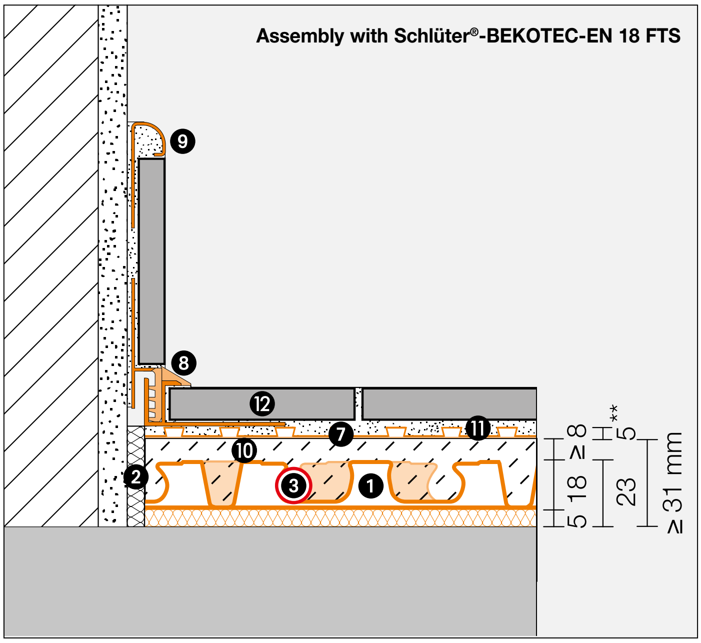


Pipe clamping strip
Schlüter-BEKOTEC-ZRKL is a pipe clamping strip for securing the pipes on the levelling panel. The clamping strips are self-adhesive to allow for permanent attachment.
Length: 20 cm
Number of pipe spaces: 4

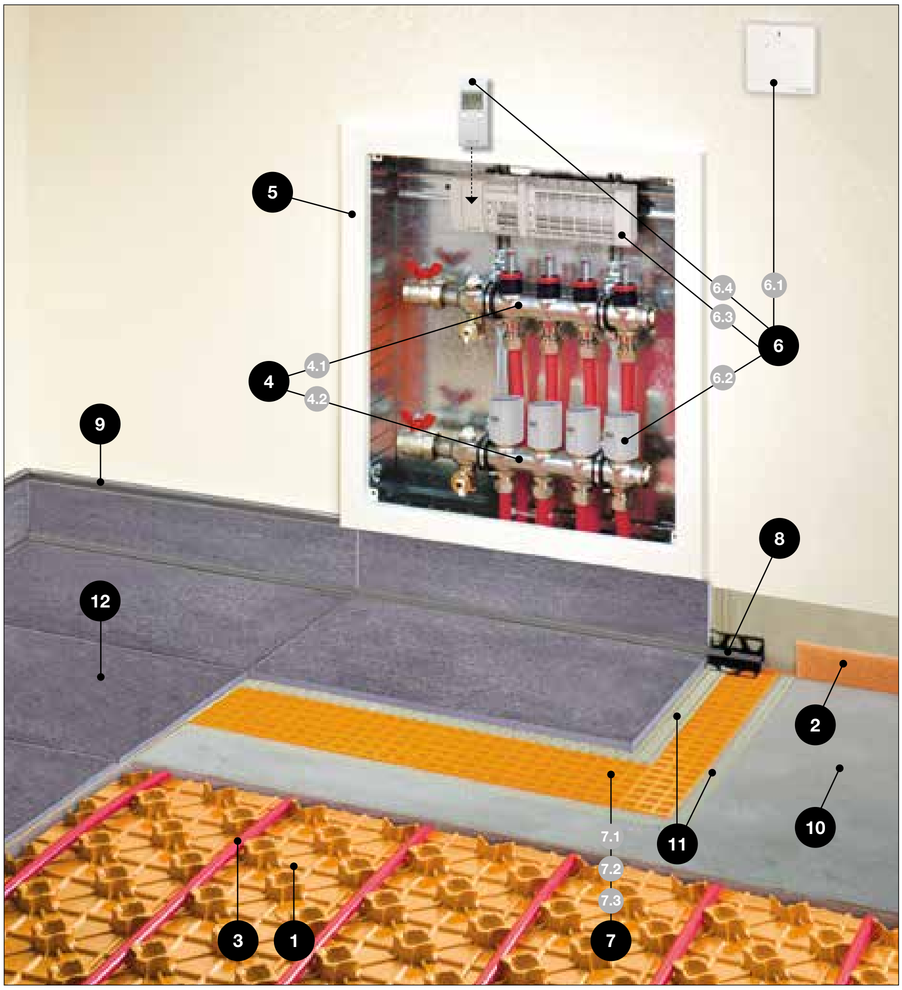
Double sided adhesive tape
Schlüter-BEKOTEC-ZDK is a double sided adhesive tape for adhering the studded panel to the levelling panel or to the substrate if necessary.
Roll: 66 m, height: 30 mm
Thickness: 1 mm

Ceramic thermal comfort floor with Schlüter®-BEKOTEC-EN 18 FTS

System assembly with integrated sound insulation



** Assembly height DITRA 25 = 5 mm, see 7 for additional product specific assembly heights.



Schlüter®-BEKOTEC-THERM
System components Floor heating system (with integrated sound insulation)

1. **Schlüter®-BEKOTEC-EN 18 FTS**
(directly installed on load bearing substrate)
Studded screed panel for the attachment of Schlüter-heating pipes ø 12 mm
Note: Additional insulation and waterproofing is required in accordance with the applicable regulations. For prerequisites for installation, *please see pages 19 - 25.*

2. **Schlüter®-BEKOTEC-BRS 808 KSF**
Screed edge strip

3. **Schlüter®-BEKOTEC-THERM-HR**
Heating pipe Ø 12 mm

4. **Schlüter®-BEKOTEC-THERM-HV**
Stainless steel heating circuit distributor with connection accessories
4.1 Hot flow leg **4.2** Cold return leg

5. **Schlüter®-BEKOTEC-THERM-VS**
Distribution cabinet

6. **Schlüter®-BEKOTEC-THERM-E**
Electronic temperature control
6.1 Room sensor **6.2** Actuator
6.3 Control base module with connection module
6.4 Timer unit (optional)

System components
for the installation of tiles and natural stone (see separate price list and product data sheets)

7. **Schlüter®-DITRA**
7.1 Schlüter®-DITRA 25
(Assembly height 5 mm), Bonded uncoupling, waterproofing, vapour pressure equalisation, heat distribution,
or
7.2 Schlüter®-DITRA-DRAIN 4
(Assembly height 6 mm), Bonded uncoupling, vapour pressure equalisation, heat distribution,
or
7.3 Schlüter®-DITRA-HEAT-E
(assembly height 7 mm)
Bonded uncoupling, waterproofing for additional electrical floor warming/heating

8. **Schlüter®-DILEX -EK or -RF**
Maintenance free edge and movement joint profiles

9. **Schlüter®-RONDEC, -JOLLY, -QUADEC or -LIPROTEC-VB /-VBI**
Decorative finishing profiles for walls, skirting and floors

System components
not available from Schlüter-Systems

10. **Screed**
Cement or gypsum based screed

11. **Thin bed tile adhesive**

12. **Ceramic tiles or natural stone**
Other coverings such as carpet, laminates and parquet are also feasible in compliance with the applicable installation standards.

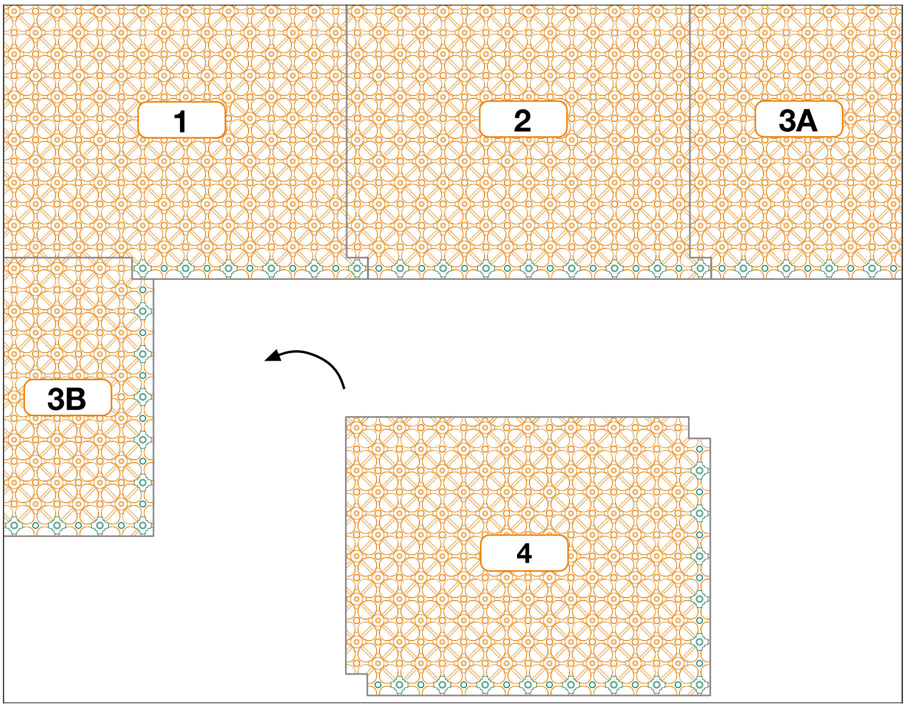
Prerequisites and implementation

Installation of the studded screed panel Schlüter®-BEKOTEC-EN 18 FTS

The studded panels Schlüter-BEKOTEC-EN 18 FTS must be precisely cut to size in the peripheral areas. The BEKOTEC panels are connected by overlapping a row of studs. In threshold areas and near distributor boxes, the smooth levelling panel Schlüter-BEKOTEC-ENFGTS may be used to simplify the pipe installation. This panel is used underneath the studded panels and is adhered with double sided adhesive strips. It may be necessary to remove the sound insulation of the studded panel for a precise fit (see photo). The self-adhesive pipe clamping strip Schlüter-BEKOTEC-ZRKL allows for precise routing of pipes in these areas. The double- sided adhesive tape Schlüter-BEKOTEC-ZDK can be used for this purpose. The system pipes with a diameter of 12 mm are now clamped between the cut-back studs to create a ceramic thermal comfort floor with Schlüter-BEKOTEC-THERM EN 18 FTS. The spacing of the pipes must be determined on the basis of the required heating output, as shown in the BEKOTEC-THERM heating diagrams *(from page 90)*.

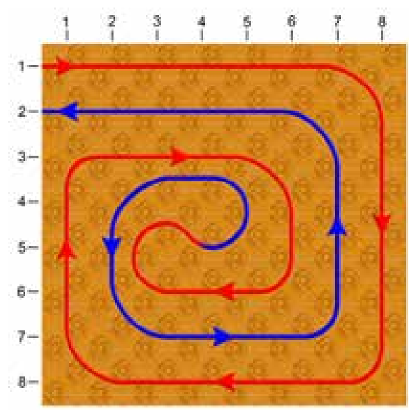
Important: Schlüter-BEKOTEC-EN 18 FTS, -ENFGTS and -BRS do not rot and require no special maintenance or care. Before and during the installation of the screed, the studded screed panel may need to be protected from mechanical damage with suitable measures, such as laying out wooden boards.

Technical data
1. Improvement in sound insulation
(according to DIN EN ISO 717 2: 25 db)
2. Stud size: approx. 40 mm
Installation spacing: 50, 100, 150 mm ...
Diameter of system heating pipes: ø 12 mm
The studs have a cutback design to securely keep heating pipes in place without the need for clamps.
3. Connections:
The studded panels are connected by overlapping a row of studs and clicking the panels together.
4. Working area: 1.4 x 0.8 m = 1.12 m2
Panel thickness: 18 + 5 mm integrated sound insulation ≈ 23 mm

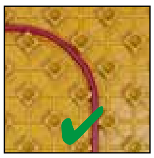


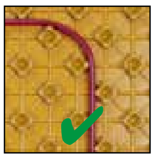
The installation direction is indicated by the tapered connection studs, which are shown in green colour in the drawing.

Cut segments that are longer than ≥ 30 cm can fit into the next row.

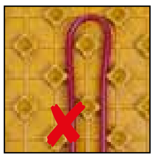


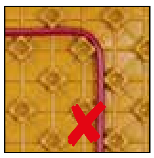
Correct





Incorrect

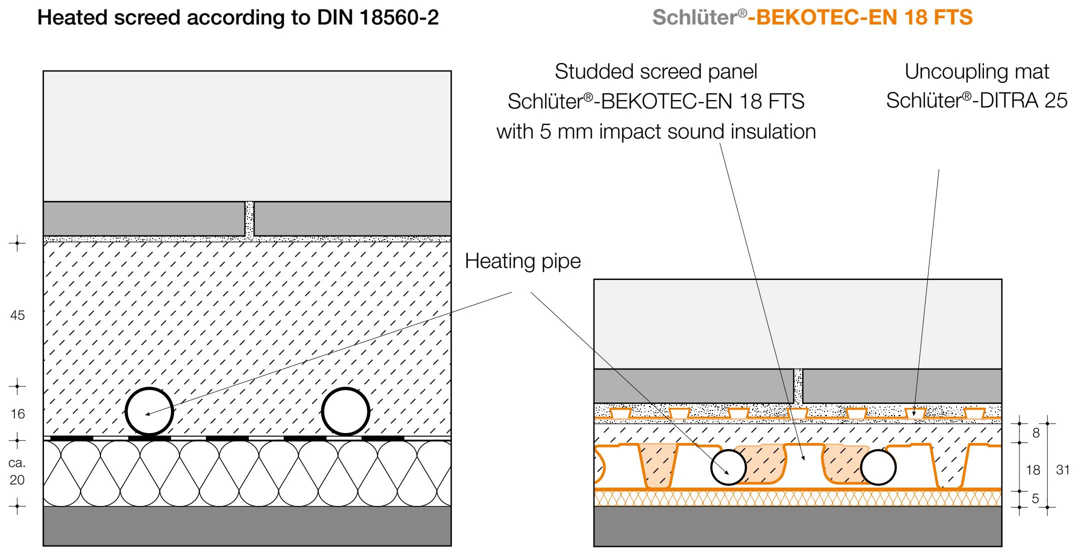




The system heating pipes (Ø 12 mm) are installed at double the installation spacing to the reversal loop. After the reversal point, the return line (blue) is inserted into the centre of the remaining space. **Important:** Form the heating pipes as shown in the drawing!

Schlüter®-BEKOTEC-EN 18 FTS

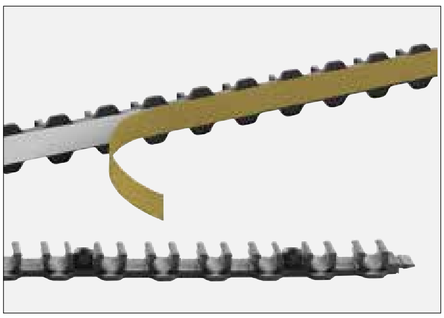
Comparison with conventional screed assembly



Supplementary system products

Levelling panel

The levelling panel Schlüter-BEKOTEC-ENFGTS is installed in the area of the heating circuit distributors and at thresholds to simplify connections and to minimise cutting waste.
It consists of a smooth polystyrene foil material with sound insulation on the reverse side and is adhered below the studded panels, using the supplied double sided adhesive tape.
Dimensions: 1400 x 800 mm
Thickness: 6.2 mm



Pipe clamping strip

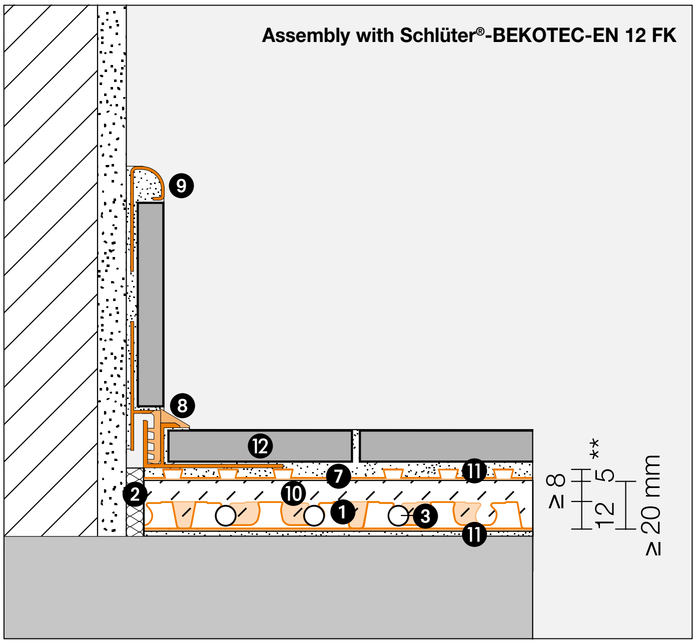
Schlüter-BEKOTEC-ZRKL is a pipe clamping strip for securing the pipes on the levelling panel. The clamping strips are self-adhesive to allow for permanent attachment.
Length: 80 cm
Number of pipe spaces: 32

Double sided adhesive tape

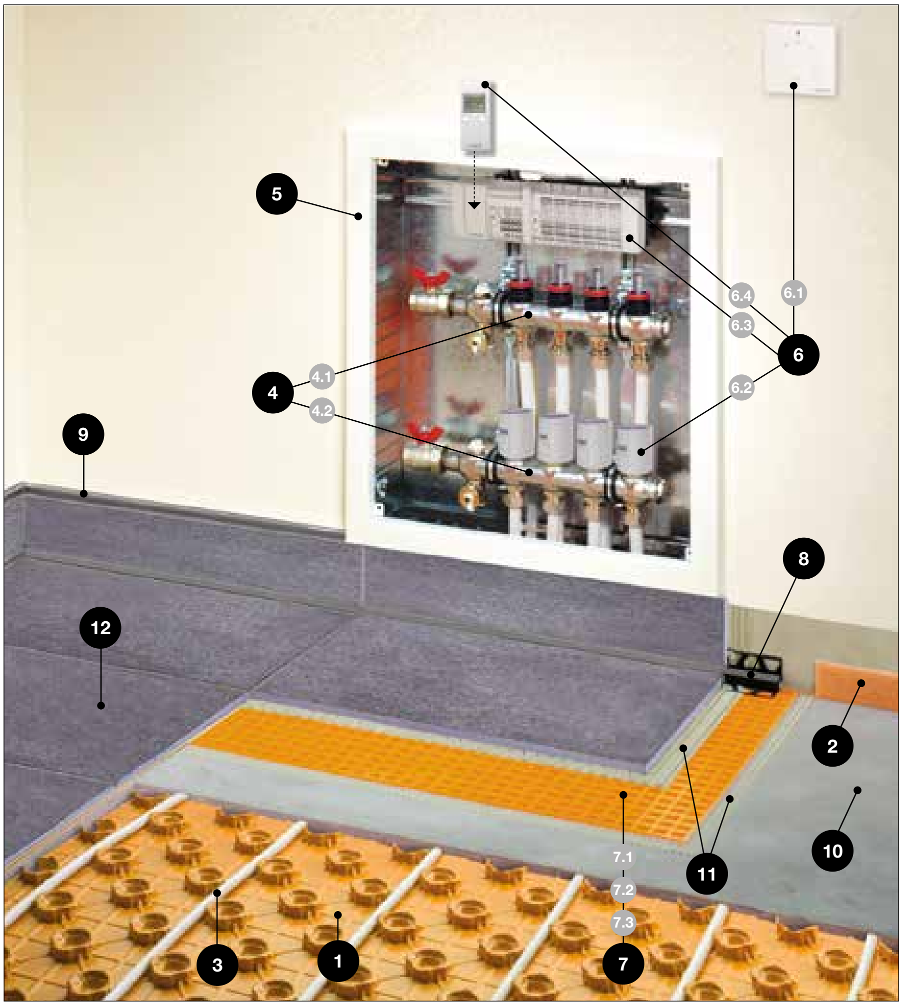
Schlüter-BEKOTEC-ZDK is a double sided adhesive tape for adhering the studded panel to the levelling panel or to the substrate if necessary.
Roll: 66 m
Height: 30 mm
Thickness: 1 mm

Ceramic thermal comfort floor with Schlüter®-BEKOTEC-EN 12 FK

System structure with very low assembly height



** Assembly height DITRA 25 = 5 mm, see 7 for additional product specific assembly heights.



Schlüter®-BEKOTEC-THERM

System components Floor heating system (with very low assembly height)

1. **Schlüter®-BEKOTEC-EN 12 FK**
   directly adhered over load bearing substrate) Studded screed panel for the attachment of Schlüter-heating pipes ø 10 mm, *please see pages 19 – 24.*
2. **Schlüter®-BEKOTEC-BRS 505 KSF**
   Screed edge strip
3. **Schlüter®-BEKOTEC-THERM-HR**
   Heating pipe Ø 10 mm
4. **Schlüter®-BEKOTEC-THERM-HV**
   Stainless steel heating circuit distributor with connection accessories
   4.1 Hot flow leg **4.2** Cold return leg
5. **Schlüter®-BEKOTEC-THERM-VS**
   Distribution cabinet
6. **Schlüter®-BEKOTEC-THERM-E**
   Electronic temperature control
   6.1 Room sensor **6.2** Actuator
   6.3 Control base module with connection module
   6.4 Timer unit (optional)

System components
for the installation of tiles and natural stone
(see separate price list and product data sheets)

7. **Schlüter®-DITRA**
   7.1 Schlüter®-DITRA 25
   (Assembly height 5 mm), Bonded uncoupling, waterproofing, vapour pressure equalisation, heat distribution,
   or
   7.2 Schlüter®-DITRA-DRAIN 4
   (Assembly height 6 mm), Bonded uncoupling, vapour pressure equalisation, heat distribution,
   or
   7.3 Schlüter®-DITRA-HEAT-E
   (assembly height 7 mm)
   Bonded uncoupling, waterproofing for additional electrical floor warming/heating
8. **Schlüter®-DILEX -EK** or **-RF**
   Maintenance free edge and movement joint profiles
9. **Schlüter®-RONDEC, -JOLLY, -QUADEC** or **-LIPROTEC-VB /-VBI**
   Decorative finishing profiles for walls, skirting and floors

System components
not available from Schlüter-Systems

10. **Screed**
    Cement or gypsum based screed
11. **Thin bed tile adhesive**
12. **Ceramic tiles or natural stone**
    Other coverings such as carpet, laminates and parquet are also feasible in compliance with the applicable installation standards.

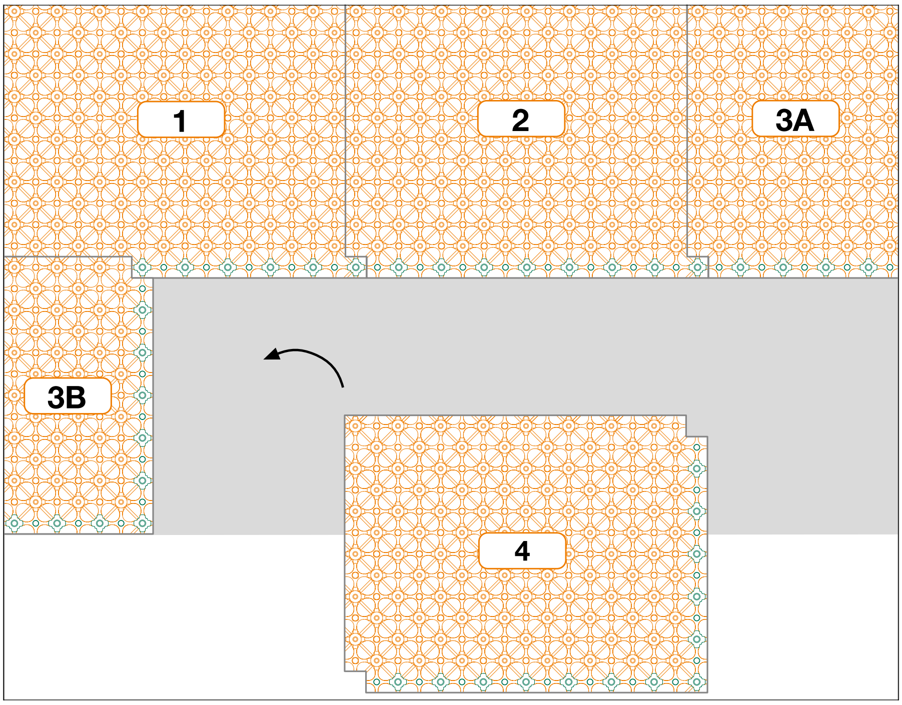
Prerequisites and implementation

Installation of the studded screed panel Schlüter®-BEKOTEC-EN 12 FK

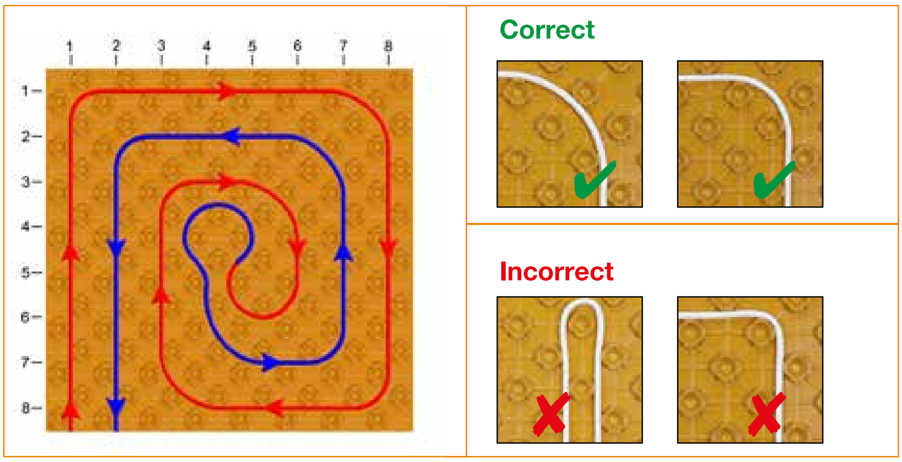
The studded Schlüter-BEKOTEC-EN 12 FK panels, which are adhered directly over the load bearing substrate, must be cut to size in the peripheral areas. The BEKOTEC panels are connected by overlapping a row of studs. In threshold areas and near distributor boxes, the smooth levelling panel Schlüter-BEKOTEC-ENFGK may be used to simplify the pipe installation. This panel is used underneath the studded panels and is adhered directly on the substrate. The self-adhesive pipe clamping strip Schlüter-BEKOTEC-ZRKL allows for precise routing of pipes in these areas. The double sided adhesive tape Schlüter-BEKOTEC-ZDK can be used to attach the studded panels to the levelling panel. The system pipes with a diameter of 10 mm are now clamped between the cutback studs to create a ceramic thermal comfort floor with Schlüter-BEKOTEC-THERM-EN 12 FK. The spacing of the pipes must be determined on the basis of the required heating output, as shown in the Schlüter-BEKOTEC-THERM heating diagrams *(from page 94)*.

Note: Schlüter-BEKOTEC-EN 12 FK, -ENFGK and -BRS do not rot and require no special maintenance or care. Before and during the installation of the screed, the studded screed panel may need to be protected from mechanical damage with suitable measures, such as laying out wooden boards.

Technical data
1. Stud size: approx. 44 mm
Installation spacing: 50, 100, 150 mm ...
Diameter of system heating pipes: Ø 10 mm
The studs have a cutback design to securely keep heating pipes in place without the need for clamps.
2. Connections:
The studded panels are connected by overlapping a row of studs and clicking the panels together.
3. Working area: 1.1 x 0.7 m = 0.77 m²
Panel height: 12 mm



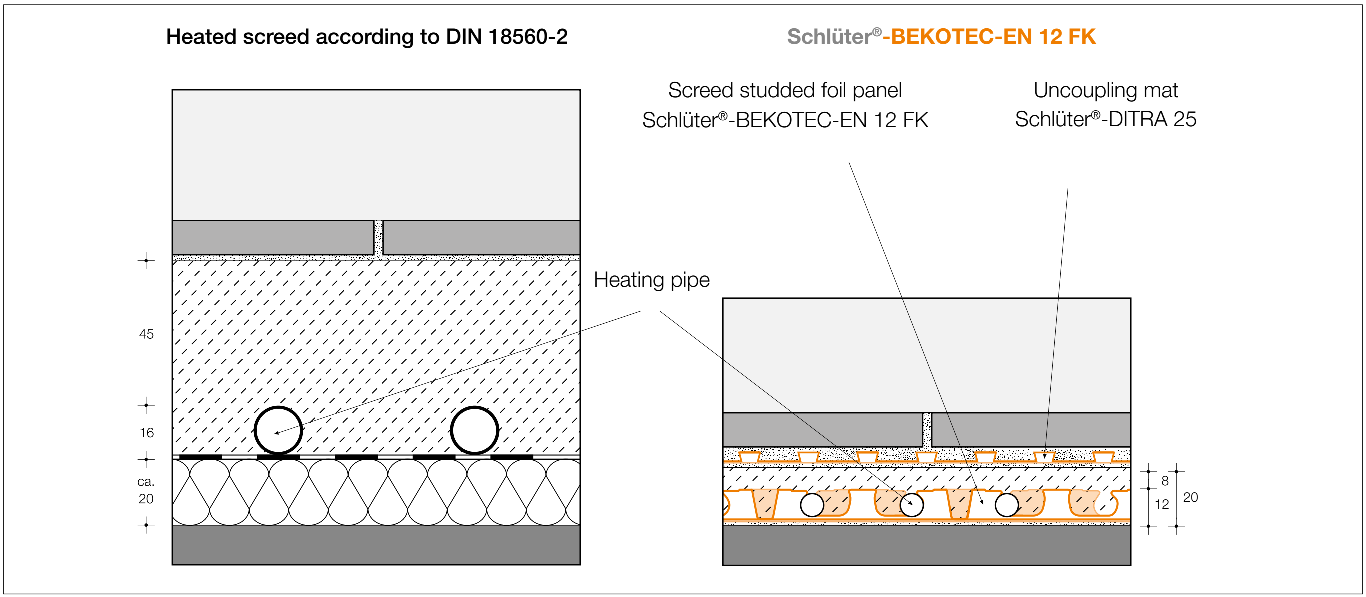
The installation direction is indicated by the tapered connection studs, which are shown in green colour in the drawing. Cut segments that are longer than ≥ 30 cm can fit into the next row.



The system heating pipes (Ø 10 mm) are installed at double the installation spacing to the reversal loop. After the reversal point, the return line (blue) is inserted into the centre of the remaining space. **Important:** Form the heating pipes as shown in the drawing!

Schlüter®-BEKOTEC-EN 12 FK

Comparison with conventional screed assembly



Supplementary system products

Levelling panel

The levelling panel Schlüter-BEKOTEC-ENFGK is directly adhered to the substrate in the area of the heating circuit distributors and at thresholds to simplify connections and to minimise cutting waste.

It consists of smooth polystyrene foil material and is adhered below the studded panels, using the supplied double sided adhesive tape if necessary.

Dimensions: 1100 x 700 mm

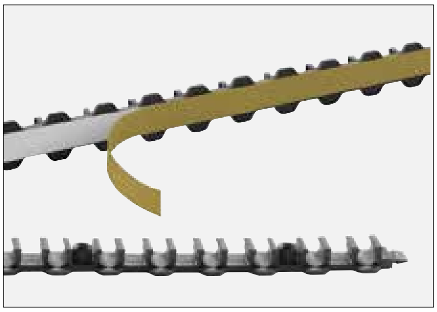
Thickness: 1.2 mm

Pipe clamping strip

Schlüter-BEKOTEC-ZRKL is a pipe clamping strip for securing the pipes on the levelling panel. The clamping strips are self-adhesive to allow for permanent attachment.

Length: 80 cm

Number of pipe spaces: 32



Double sided adhesive tape

Schlüter-BEKOTEC-ZDK is a double sided adhesive tape for adhering the studded panel to the levelling panel or to the substrate if necessary.

Roll: 66 m

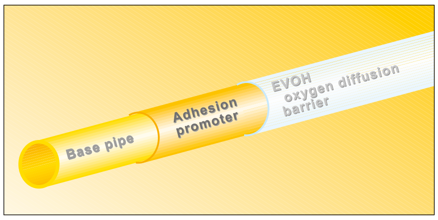
Height: 30 mm

Thickness: 1 mm

Technical data – system products

System heating pipe Schlüter®-BEKOTEC-THERM-HR

Schlüter-BEKOTEC-THERM-HR heating pipes are made of a special, highly flexible polyethylene material. The typical molecular structure of this material with branched octenes and a close molecular weight distribution allows for the production of pipes with high thermal resistance and pressure resistance. The applicable quality requirements have been far exceeded. Consequently, no cross linking of the molecular structure is necessary for this high quality material.



Example: HR Ø 16 mm

BEKOTEC-THERM-HR heating pipes are coated with an oxygen barrier of EVOH. This oxygen barrier is connected to the base pipe with a special process. Together, the base pipe, the adhesion promoter, and the oxygen barrier form an inseparable unit. Therefore, it is not necessary to implement a system separation because of oxygen diffusion.

Our high value BEKOTEC-THERM-HR heating pipes are characterised by the following properties:
- Easy, time saving installation thanks to low internal stress in the pipes
- Installation is feasible with outside temperatures to –10 °C
- Minimal flow resistance thanks to high surface gloss in the interior of the pipe

The system heating pipe Schlüter-BEKOTEC-THERM – *with **its 10 year warranty*** – is
- Safe
- Flexible
- Durable
- Low in tension

Additional benefits
- Highly temperature resistant and enormously durable (life expectancy)
- Non toxic and physiologically harmless
- For floor heating and cooling systems and concrete core cooling

Standards, testing and monitoring
- Meets requirements of DIN 4726/4721 (PE RT), oxygen impermeable according to DIN 4726/4729
- Assembly monitoring according to DIN 8074/8075
- Consistent monitoring and testing by the Southern German Plastics Research Centre in Würzburg: PE RT SKZ A 240
- KIWA/KOMO
- The Schlüter-BEKOTEC-THERM-HR heating pipe has been tested according to the BRL5607 standard of the EU and is approved for connections to heating systems with high temperature demands.

Technical data – system products

System heating pipe - fatigue testing

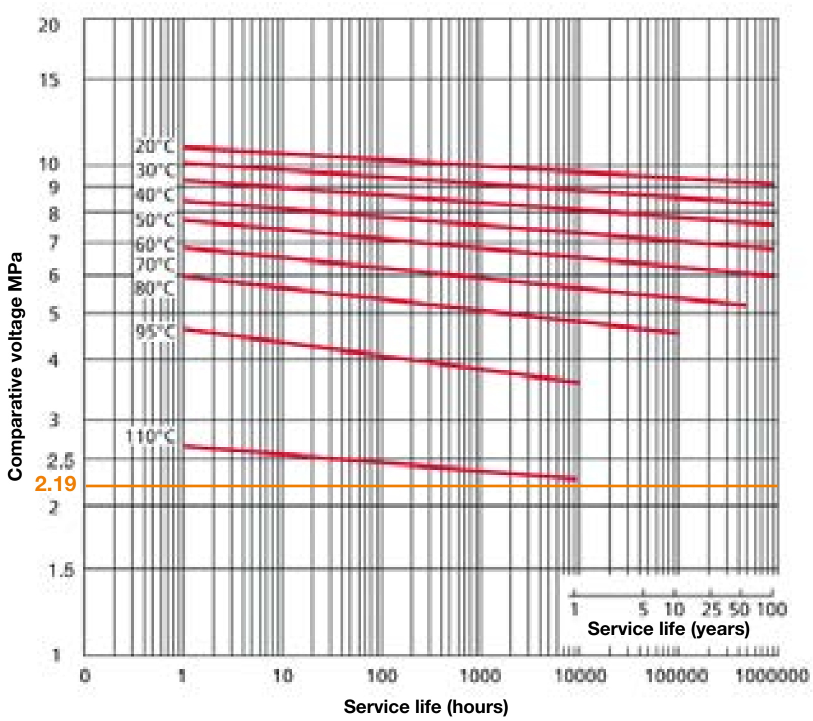
The durability of pipe materials is tested in long term fatigue tests, with results displayed in the so called creep rupture strength diagrams. In order to determine the requirements of prolonged stress exposure, the mechanical properties of the material had to be analysed over the long term. The diagram below shows the pressure resistance and temperature resistance with the projected life expectancy of the material.

PR RT was the first substance ever to be specially designed for the production of pipes for application in heated floor assemblies. Due to its unique molecular structure with branched octenes distributed evenly over its main chains and the close distribution of molecular weight, the material is highly durable even under elevated temperature and pressure conditions.

Example
A conventional heating system with an interior pipe pressure of max. 2.5 bar and dimensions of Ø 16 x 2 mm has a calculated equivalent stress of 0.875 MPA. Even with a safety factor of 250 % **(2.19 MPa)** no failure of the Schlüter-BEKOTEC-THERM heating pipe has been documented at a heating water temperature of 50 °C *(see diagram)*.

The requirements for these heating pipes are specified in the industry standards DIN 16833, DIN 16834, DIN 4721 and DIN 4724. Endurance tests have shown that the pipes far exceed the requirements of DIN 4726.

Creep rupture strength diagram Schlüter®-BEKOTEC-THERM-HR



Technical data – system products

System heating pipe – physical and mechanical properties

Properties	Unit	Test method	Values
Density	g/cm³	ISO 1183	0.933
Thermal conductivity	W/(mK) at 60 °C	DIN 52612-1	0.40
Coefficient of thermal expansion	10^{-4}/K	DIN 53752 A (20 °C – 70 °C)	1.95
Yield strength (1) (2)	Mpa	ISO 527	16.5
Tensile strength (1) (2)	%	ISO 527	13
Oxygen permeability (3)	g/m³ d	DIN 4726	< 0.1
Stress crack resistance	h	50 % antifreeze (PEG) (4)	> 8760 (no break)
Water content (Ø 16 mm)	l/m		0.113
Water content (Ø 14 mm)	l/m		0.079
Water content (Ø 12 mm)	l/m		0.064
Water content (Ø 10 mm)	l/m		0.043

(1) Test speed 50 mm/min.
(2) Sample compression plate: 2 mm thick
(3) Tested with co extruded EVOH layer
(4) Test according to ASTM 1693 with the specified medium.

Chemical resistance*

Chemicals	
Acetone	++
Ammonia	+
Gasoline	-
Chromic acid	++
Ethylene glycol	++
Ferrous sulphate	++
Formaldehyde 30 %	++
Isopropyl alcohol	++
Sodium hydroxide solution	++
Propylene glycol	++
Nitric acid 5 %	++
Hydrochloric acid	++
Acids, inorganic/organic	++
Sulphuric acid 30 %	++
Hydrogen	++

++ resistant[1)]
+ conditionally resistant[1)]
- not resistant[1)]
* with reference to heating medium (interior of heating pipe)

[1)] The chemical resistance tests were conducted according to ASTM D543 60T (ASTM D543 87) at 23.9° C.

Storage

The pipes may not be exposed to direct sunlight for a long time. Boxes should be protected from moisture.

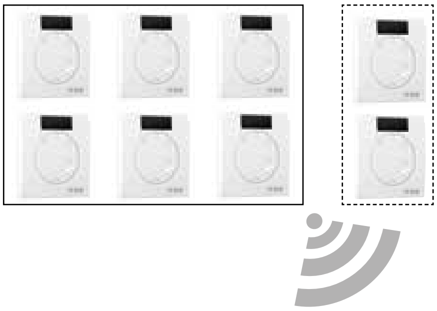
Pressure loss

See pressure loss diagram, Attachment I on page 100.

Technical data – system products

Room temperature control technology

1.1 **BTER WL**
Room sensors for heating/cooling
Wireless version



Schlüter control technology allows for individual, time-controlled room temperature management for heating and cooling. As part of a research project. the renowned Dresden Institute for Building Systems Engineering Research (ITG) reached the following conclusions in a comparison of the thin layer floor heating system Schlüter-BEKOTEC-THERM with conventional radiant floor heating systems:
The use of efficient control technology and the quick response time of the BEKOTEC-THERM system can lead to additional **energy savings of up to 9.5 %**. In particular, this can be achieved with temperature reductions during night hours, which cannot be sufficiently implemented with standard radiant floor heating systems due to their large screed volume. Thanks to the quick responsiveness of BEKOTEC-THERM, the ceramic thermal comfort floor therefore meets the requirement of the Energy Saving Ordinance (EnEV) for highly controllable systems.
Additional technical documentation about the individual control components is available online at www.bekotec-therm.com.
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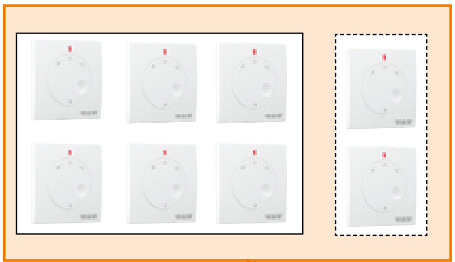
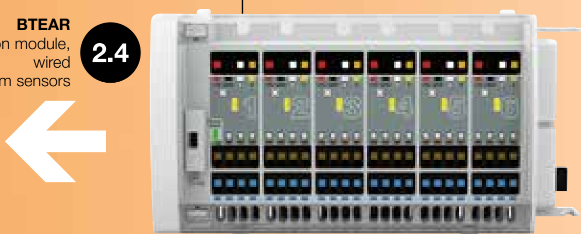
1.2 **BTER**
Room sensors for heating/cooling 5 V DC (SELV)
Wired version
Cable recommendation: J-Y (St) Y 2 x 2 x 0.6 mm
(red, black, white, yellow - see note for 1.2)



2.3 **BTEAR WL**
Connection module, wireless
for 6 WL room sensors

2.4 **BTEAR**
Connection module, wired
for 6 room sensors



2.2 **BTEET**
Timer unit
(optional)

2.1 **BTEBC**
Control base module

3 **BTESA**
Actuators

Expansion options:
Up to 4 actuators can be directly assigned to each room sensor connection unit. Schlüter-Systems offers additional logical control module expansions. The expansion option, including as a mixed combination with wireless control, allows for combining a total of max. 18 room sensors and 72 actuators.

Components of control technology

1

Room sensors

The following two variants are available:

- **Room sensor WL (wireless)**
- **Room sensor (wired)**

1.1

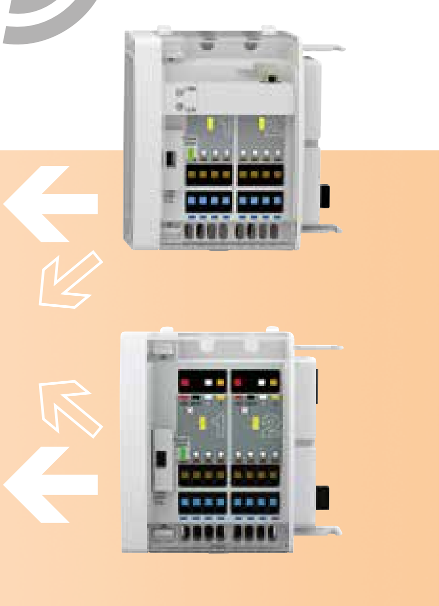
BTER WL room sensor for heating/cooling WL

- Wireless

Unrestricted, flexible use for building and structural technology.

The wireless room sensor transmits the current room temperature and the set-point value to the room sensor connection module WL.

2.3 **BTEAR WL**
Wireless connection module for 2 room sensors WL



2.4 **BTEAR**
Wired connection module for 2 room sensors

1.2

BTER room sensor for heating/cooling

The wired version of room sensor transmits the current room temperature and the set-point value to the connection modules. *See note regarding cable installation!*

The module is operated with 5 V DC of safety extra-low voltage (SELV) via the base module in combination with the room sensor connection module.

The operating state "heating/cooling" is displayed by the "red/blue" colour change of a light-emitting diode (LED).

For both room sensor types, the temperature set-point is adjustable from 8 to 30 °C and can be restricted below the dial with set-point limiters.

The time-controlled temperature reduction of 4 °C is effected by a timer unit at the base module.

Note:

Only cables with maximum wire cross-sections of 0.8 mm² may be connected to wired room sensors.

Cable recommendation: J-Y (St) Y 2 x 2 x 0.6 mm (red, black, white, yellow)

2.1

BTEBC "Control" base module

The base module is used for both wireless and/or wired connection modules, which makes it easy to realize mixed installations and upgrades.

The base module supplies the corresponding room sensors of the wired version with 5 V DC safety extra-low voltage (SELV) via the corresponding connection modules. The connected actuators are supplied with 230 V AC via the connection modules.

Additional functions:

- Slot for optional timer unit
- Pump circuit (relay) "Heating"
- Pump circuit (relay) "Cooling"
- Cascade output for connecting the heating/cooling output to additional base modules
- Input for "heating/cooling" switch

2.2

BTEET timer unit

The timer unit can be plugged directly into the base module after programming. This effects a temperature reduction of 4 °C during the night.

Functions:

- Time recording/programming: date, time weekdays (century calendar)
- Time recording/programming of temperature reduction
- Setting the deferred pump shut-down
- Setting the valve and pump protection function

2.3

BTEAR WL room sensor connection module - Wireless

For assigning 2 or 6 wireless room sensors BTER WL. The connection modules BTEAR2 WL for 2 or BTEAR6 WL for 6 room sensors can be combined by simply plugging them together in order to adjust the number of rooms to be regulated or to adjust and expand the actuators/heating circuits to be assigned.

The BTEBC base model supplies the voltage of 230 V for the actuators.

2.4

BTEAR room sensor connection module

For connecting 2 or 6 BTER room sensors.

The connection modules BTEAR2 for 2 or BTEAR6 for 6 room sensors can be combined by simply plugging them together in order to adjust the number of rooms to be regulated or to adjust and expand the actuators/heating circuits to be assigned.

The voltage of 5 V DC (SELV) for the room sensors and 230 V for the actuators is supplied by the BTEBC base modules.

Wired and wireless modules can be combined.

3

BTESA actuators 230 V

The Schlüter actuators regulate the flow rate of the individual heating circuit distributor return valves (one actuator for each heating circuit). They are equipped with an optical function display and valve adjustment control and are simply plugged in for installation.

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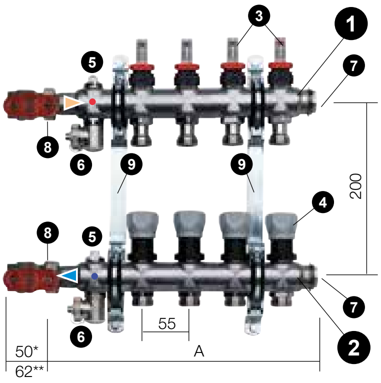
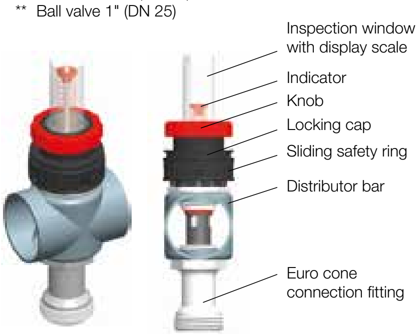
Note:
An additional relay switch will be included, where required, to switch the boiler to ON, when the system water requires heating. Standard wiring schematics will be provided when required.

Technical data – system products

Heating circuit distributor DN 25 of stainless steel – HV/DE



* Ball valve 3/4" (DN 20)
** Ball valve 1" (DN 25)



Schlüter-BEKOTEC-THERM-HV/DE is a heating circuit distributor DN 25 of stainless steel with supply bar ❶ and return bar ❷ and an outside diameter of 35 mm.
Als The integrated and pre-assembled set includes:

- Supply water flow meter ❸ with transparent scale for regulating flow volumes from 0.5 to 5 litres per minute.
- Thermostat valves ❹, manually adjustable for every heating circuit, to match the electrically controlled Schlüter actuators
- one manual vent ❺, nickel plated brass for supply and return flow,
- Fill and drain cock ❻ 1/2" (DN 15), rotatable, nickel plated brass,
- Stop plug ❼ 3/4" (DN 20), nickel plated brass,
- Connection to the distribution system with flat sealing union nut ❽ 1“ (DN 25)
- Heating circuit outlets with spacing 55 mm, consisting of connector nozzle 3/4" (DN 20) AG with matching cone for Schlüter clamp connections.
- The carton also includes two distributor supports ❾ with sound insulation insert to match the Schlüter distribution cabinet and an additional wall mounting set.

A matching connector set with the necessary accessories for connecting the heating circuits and the supply and return bar ❷ to the pipes may be ordered separately and is available in all distributor sizes.
Please note that for the assembly of the Schlüter-BEKOTEC-THERM-PW connection set *(page 54)* for retrofitting the calorimeter, the connector set has to be connected from individually purchased parts. In this case, the ball valves are not necessary.

Heating circuit distributor	2-circuit	3-circuit	4-circuit	5-circuit	6-circuit	7-circuit	8-circuit	9-circuit	10-circuit	11-circuit	12-circuit
Item no.	BTHV 2 DE	BTHV 3 DE	BTHV 4 DE	BTHV 5 DE	BTHV 6 DE	BTHV 7 DE	BTHV 8 DE	BTHV 9 DE	BTHV 10 DE	BTHV 11 DE	BTHV 12 DE
Length without ball valve **A** = mm	200	255	310	365	420	475	530	585	640	695	750

The installation depth is approx. 70 mm.

Lockable volumetric flow meter Set up/locking

The Memory volumetric flow meter is integrated into the supply heating circuit distributor bar and is used to display, set up, or lock the volume flows of floor heating or cooling systems. It meets the requirements of DIN EN 1264-4 (BS EN 1264-4), which specifies that locking and calibration functions must be separate. The open volumetric flow meter shows the water volume flow in litres per minute when the circulating pump is running. The water volume can be decreased by turning the knob clockwise, while turning the knob counter clockwise increases the water volume. Locking permanently establishes the water volume setting with no risk of losing the setting.

Setting the flow

Fig. 1 Pull the sliding safety ring upward (wide black ring)

Fig. 2 Turn the locking cap with sliding safety ring counter clockwise toward the top until reaching the stop.

Fig. 3 Set the flow value by turning the red knob

Fig. 4 Turn the black locking cap with sliding safety ring clockwise to the stop.

Fig. 5 Push the sliding safety ring down

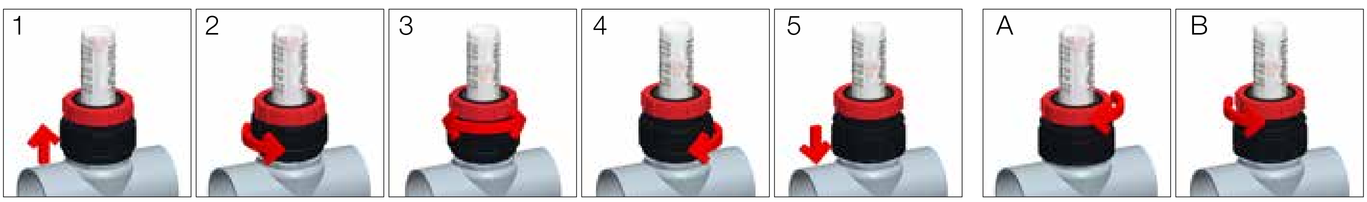
Locking

Fig. A Turn the knob clockwise to the stop: The heating circuit is now locked.

Fig. B Turn handwheel counter clockwise to the stop. The heating circuit is now open with the set up flow value.

Pressure loss diagrams

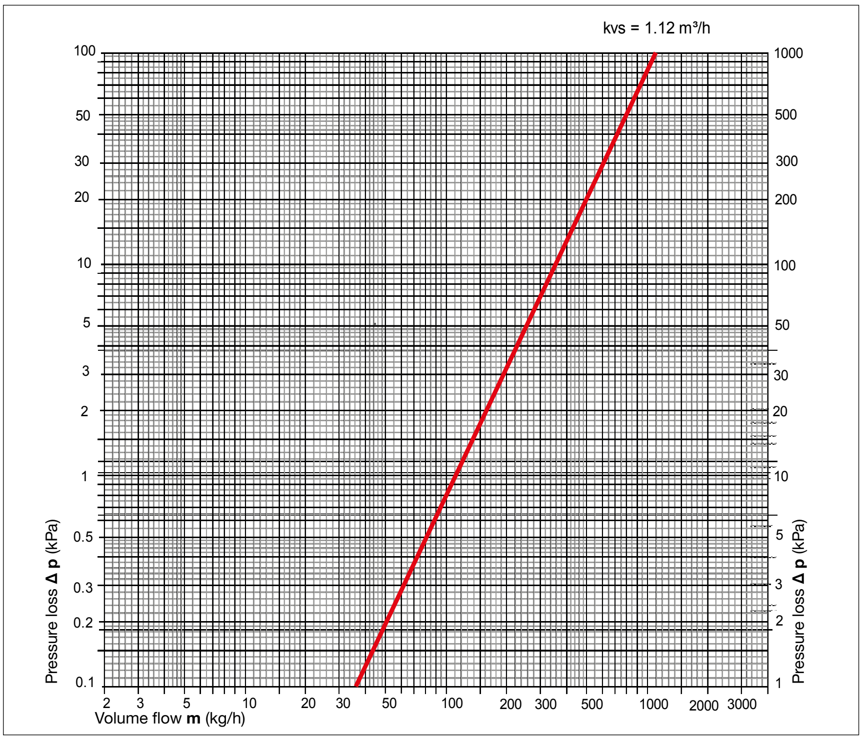
Pressure loss diagrams see pages 51/100



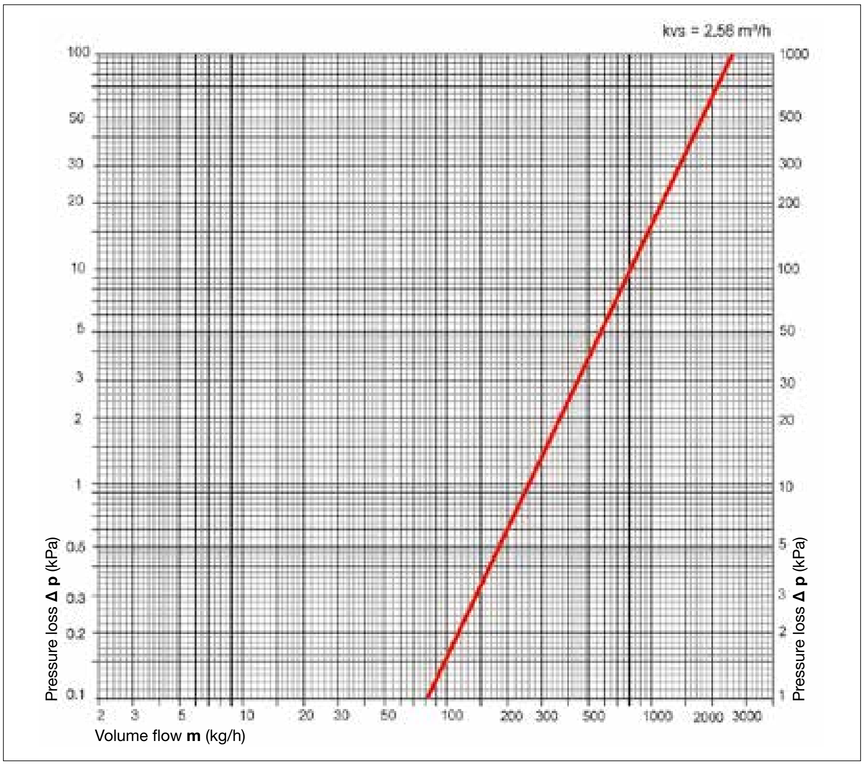
Technical data – system products

Pressure loss diagrams for heating circuit distributors DN 25

Pressure loss diagram for flow meters 0.5-5l/ min (supply line)

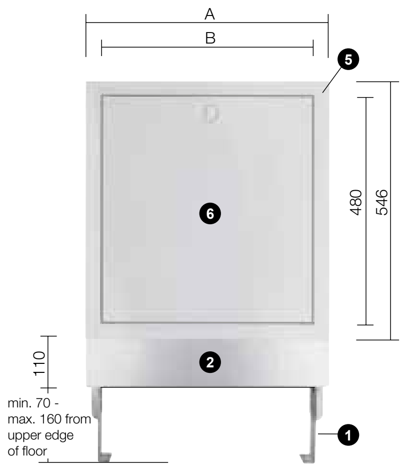


Pressure loss diagram for thermostat valve (return line)



Technical data – system products

Distribution cabinet for in wall installation – VSE

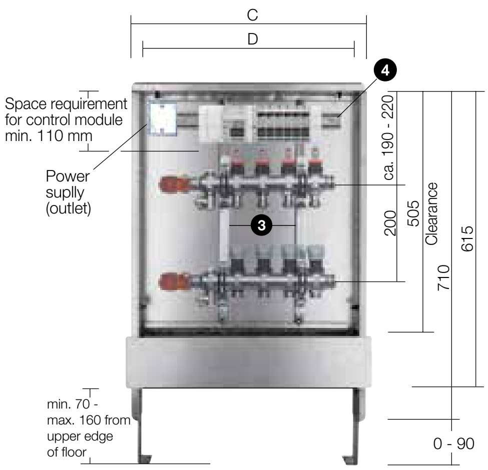


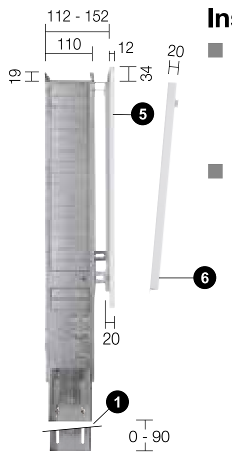
Schlüter-BEKOTEC-THERM-VSE is a distributor cabinet for in wall installation to fit a Schlüter heating circuit distributor and the associated control components. The distributor cabinet is made of galvanised steel with two stabilizing double edges and pre cut openings in the sidewalls for routing connector cables. The set includes:

- Two lateral installation legs, height adjustable from 0 to 90 mm ❶
- Screed finishing panel ❷, depth adjustable and removable,
- Heating pipe track
- Adjustable attachment tracks ❸ for Schlüter heating circuit distributors and an additional installation track ❹ for simple plug in assembly of the Schlüter control modules
- Frame ❺ and door ❻ (packaged separately) are powder coated and are mounted subsequently at 4 insertion points, using wing screws. They are adjustable for depths from 100 mm to 150 mm. The door ❻ is locked with a thumb turn.

Colour: brilliant white

Note: A lock with the corresponding keys is available as a special accessory (Art.-No. BTZS).





Installation note

- The adjustable installation legs ❶ must be adjusted to the planned floor assembly.
  The finished floor assembly must end in front of the screed finishing panel ❷.
- At least 110 mm of space should be left above the heating circuit distributor for the installation of the control modules.

Schlüter®-BEKOTEC-THERM-VSE distributor cabinet for in wall installation

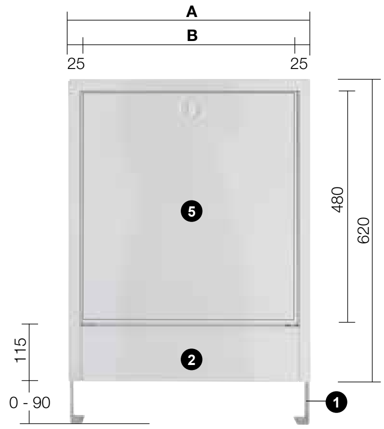
	Distribution cabinet				Maximum number of heating circuits			
Item no:	Outside frame A = mm	Inside frame B = mm	Outside measure of wall opening C = mm	Inside measure of cabinet D = mm	without additional installations	with vertical connection set PW*	with horizontal connection set PW*	incl. RVT/HV2
BTVSE 4 BW	513	445	490	455	4	2	0	2
BTVSE 5 BW	598	530	575	540	5	4	2	2
BTVSE 8 BW	748	680	725	690	8	7	5	5
BTVSE 11 BW	898	830	875	840	11	9	7	8
BTVSE 12 BW	1048	980	1025	990	12	12	11	11

* PW = Connection set for calorimeter.

RVT/HV2 = Water temperature control unit with two integrated heating circuit connections.

Technical data – system products

Distributor cabinet for wall installation – VSV

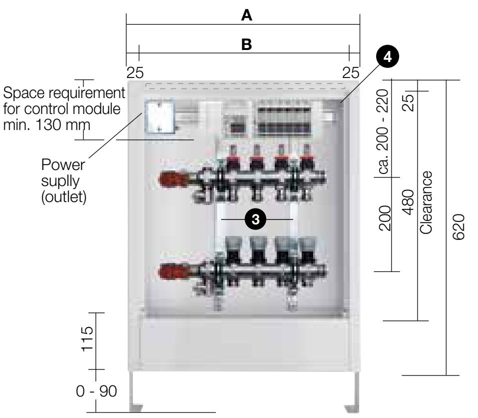


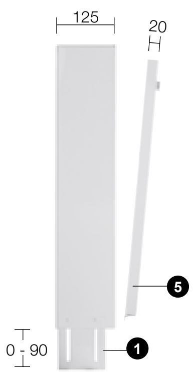
Schlüter-BEKOTEC-THERM-VSV is a distributor cabinet for wall installation to fit a Schlüter heating circuit distributor and the associated control components. The distributor cabinet is made of galvanised steel, and is powder coated on the inside and outside.
The set includes:

- Two lateral installation legs, height adjustable from 0 to 90 mm ❶,
- Screed finishing panel ❷, removable,
- Heating pipe track,
- Adjustable attachment tracks ❸ for Schlüter heating circuit distributors and an additional installation track ❹ for simple plug in assembly of the Schlüter control modules.

Cabinet depth = 125 mm. The door ❺ is locked with a thumb turn.
Colour: brilliant white

Note: A lock with the corresponding keys is available as a special accessory (Art.-No. BTZS).





Installation note:

- The adjustable installation legs ❶ must be adjusted to the planned floor assembly. The finished floor assembly must end in front of the screed finishing panel ❷.
- At least 130 mm of space should be left above the heating circuit distributor for the installation of the control modules.

Schlüter®-BEKOTEC-THERM-VSV distributor cabinet for wall installation

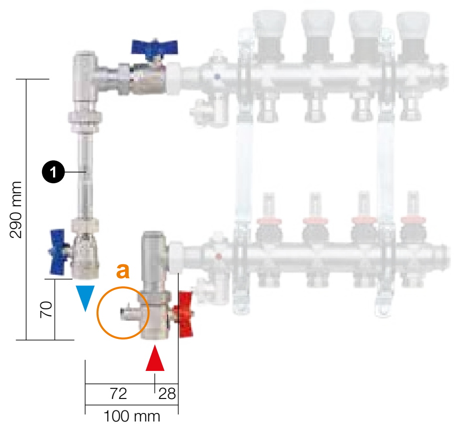
Distribution cabinet			Maximum number of heating circuits			
Art.-No:	Outside frame A = mm	Inside frame B = mm	Without additional installations	with vertical connection set PW*	with horizontal connection set PW*	incl. RVT/HV2
BTVSV 4 BW	496	445	4	2	0	2
BTVSV 5 BW	582	531	5	4	2	2
BTVSV 8 BW	732	681	8	7	5	5
BTVSV 11 BW	882	831	11	9	7	8
BTVSV 12 BW	1032	981	12	12	10	11

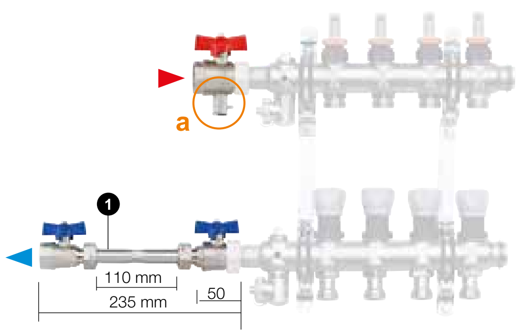
* PW = Connection set for calorimeter.
RVT/HV2 = Water temperature control unit with two integrated heating circuit connections.

Technical data – system products

Connection set for calorimeter – PW

Schlüter-BEKOTEC-THERM-PW is a connection set for retrofitting a calorimeter, which is in part pre-assembled. Calorimeters are installed to determine energy consumption and to help calculate the heating costs with a connected distributor. For this purpose, the spacer pipe is removed and replaced with a calorimeter with a length of 110 mm. The counter determines the energy consumption on the basis of the water flow and the temperature differences.





BTZPW 20 V vertical consists of:
Spacer pipe ❶ 110 mm, with external thread 3/4" (DN 20),
2 angles 90°
- 2 ball valves 3/4" (DN 20)
- 1 ball valve 3/4" (DN 20) with sensor connection for immersion sensors (5 mm, M10 x 1)
- Separate sensor connector 1/2" for immersion sensors (5 mm, M10 x 1)
- 2 flat seals 1" (DN 25)

BTZPW 20 H horizontal consists of:
Spacer pipe ❶ 110 mm, with external thread 3/4" (DN 20),
- 2 ball valves 3/4" (DN 20)
- 1 ball valve 3/4" (DN 20) with sensor connection for immersion sensors (5 mm, M10 x 1)
- Separate sensor connector 1/2" for immersion sensors (5 mm, M10 x 1)
- 2 flat seals 1" (DN 25)

Note

The installation follows the flow direction.
The connection set for the measuring mechanism of the calorimeter is usually connected to the return flow. Depending on the connecting situation, it may be necessary to install the return distributor bar above or below.

The installation instructions for the calorimeter must be observed. The space requirements for the selection of the distributor cabinet must be taken into account *(see table on pages 52 – 53)*.

PW= connection set for calorimeter

Item “a”

Measuring position for the supply temperature
For the installation of the immersion sleeves, plug "a" is removed from the ball valve supply leg. The immersion sleeve of the calorimeter is now installed in this space.

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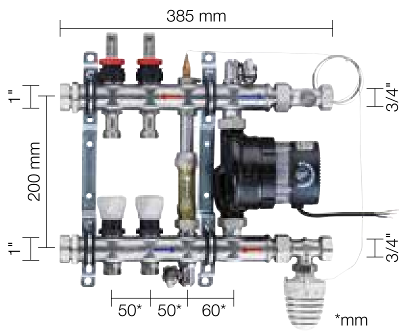
Note:
The data must match the specifications of the corresponding calorimeter brand.

Supply note:

In contrast to the scope of supply for the heating circuit distributor connection set, the connector set for the installation of the Schlüter-BEKOTEC-THERM-PW has to be assembled from the same individually purchased parts. However, no ball valves are needed *(see also page 50)*.

Technical data – system products

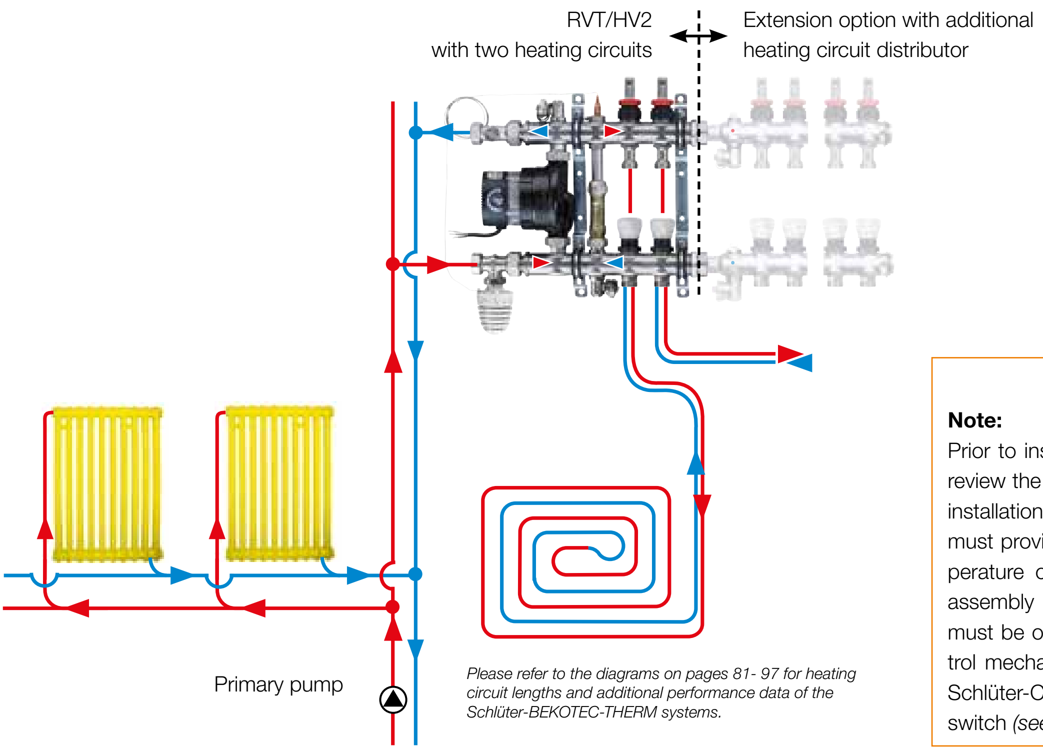
Use of the RVT/HV2 water temperature control unit with two integrated heating circuits



The water temperature control unit Schlüter-BEKOTEC-THERM-RVT/HV2 is a simple mixing and control system to supply the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor with the required low supply temperatures.
By mixing heating water from hotter parts of the heating system, for example from the radiator supply, the system allows for **directly** supplying two **BEKOTEC heating circuits**, or up to a maximum of 14 heating circuits with an installed BEKOTEC heating circuit distributor, with the required low supply temperatures.
The number of heating circuits for the installation in wall distributor cabinets is limited to a maximum of 11.

- This solution is ideal when just some parts of the house, or individual floor levels, have heated floors, while others are heated with radiators.
- The water temperature control unit BEKOTEC-THERM-RVT/HV2 can also be used to install a BEKOTEC-THERM ceramic thermal comfort floor in individual apartments.

The water temperature control unit BEKOTEC-THERM-RVT/HV2 is ideally suited for the use of an existing, shared pipe network, which is designed for the higher supply temperatures of radiator heaters. BEKOTEC-THERM-RVT/HV2 can easily be connected to individual radiators, even when the pipes have small bores. This allows for the implementation of BEKOTEC-THERM ceramic thermal comfort floors in renovation projects *(see planning and calculation example on page 59)*.
The BEKOTEC-THERM heating circuits are supplied separately by an integrated high efficiency pump.
The additionally integrated, adjustable bypass enables the flawless function of the pump even with very low volume flow in single heating circuits.



Please refer to the diagrams on pages 81- 97 for heating circuit lengths and additional performance data of the Schlüter-BEKOTEC-THERM systems.

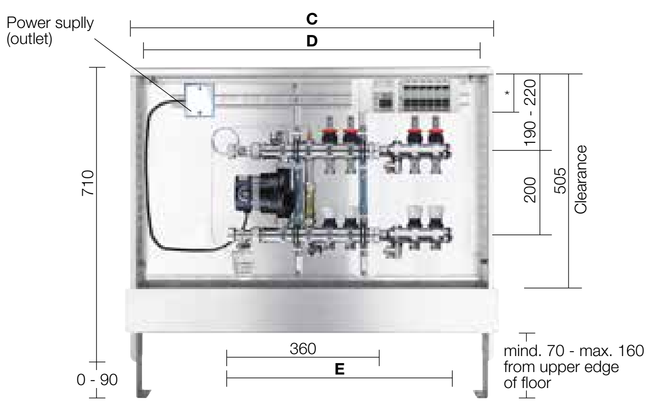
Note:
Prior to installation, a qualified expert must review the control technology and hydraulic installations. A supply pump (primary pump) must provide the supply for the water temperature control unit. The installation and assembly instructions of the manufacturer must be observed. We recommend a control mechanism via the pump outlet at the Schlüter-Control base module to the pump switch *(see page 58)*.

Technical data – system products

Water temperature control-unit – RVT/HV2

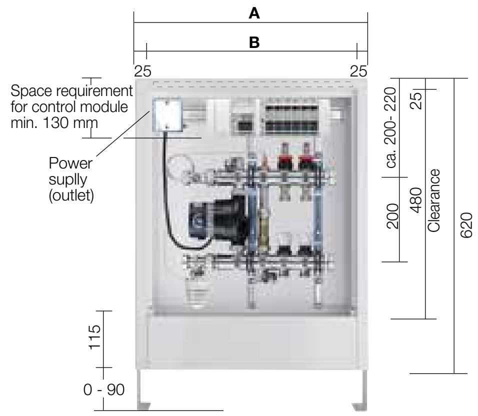
Schlüter-BEKOTEC-THERM-RVT/HV2 is a water temperature control unit with two heating circuits for setting up the supply temperature, for direct connection to the Schlüter-BEKOTEC-THERM heating circuit distributor with 2 to 12 heating circuits. The water temperature control unit supplies the BEKOTEC-THERM ceramic thermal comfort floor with the required low supply temperatures by mixing in heating water from hotter parts of the heating system (e.g. radiators) The control unit can be used in Schlüter-BEKOTEC-THERM-VSE and -VSV distributor cabinets *(see the following pages for information about use, function, and installation)*.

Water temperature control unit in VSE



* Space requirement for control module min. 110 mm

Water temperature control unit in VSV



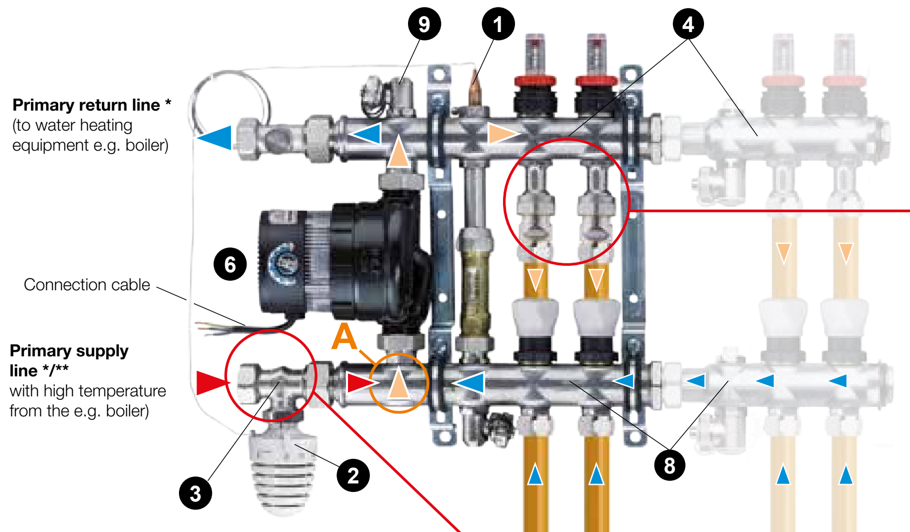
Schlüter®-BEKOTEC-THERM-RVT/HV2 with water temperature control unit in VSE / VSV distributor cabinet

	VSE distributor cabinet*		VSV distributor cabinet*		RVT/HV2	
Item no. VSE Item no. VSV	Outside measurement of wall opening C = mm	Cabinet Inside dimension D = mm	Outside dimension A = mm	Inside dimension B = mm	Number of heating circuits with RVT/HV2 **	Total length E = mm
BTVSE 4 BW	490	455			2	360
BTVSV 4 BW			496	445		
BTVSE 5 BW	575	540			2	360
BTVSV 5 BW			582	531		
BTVSE 8 BW	725	690			4 5	560 621
BTVSV 8 BW			732	681		
BTVSE 11 BW	875	840			6 7 8	670 725 780
BTVSV 11 BW			882	831		
BTVSE 12 BW	1025	990			9 10 11	835 890 945
BTVSV 12 BW			1032	981		
without	free installation		free installation		12 13 14	1000 1055 1110

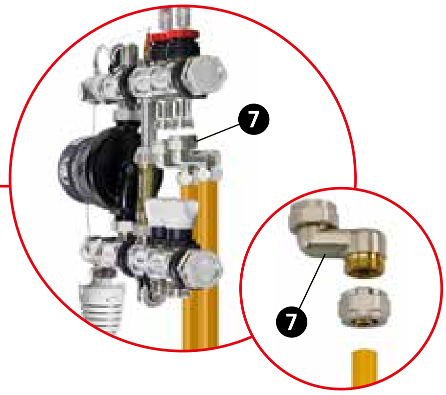
* *For additional dimensions of distributor cabinets, see page 52 and 53.*
** RVT/HV2 = Water temperature control unit with two integrated heating circuit connections.

Technical data – high efficiency pump

Function and operation of the RVT/HV2 water temperature control unit

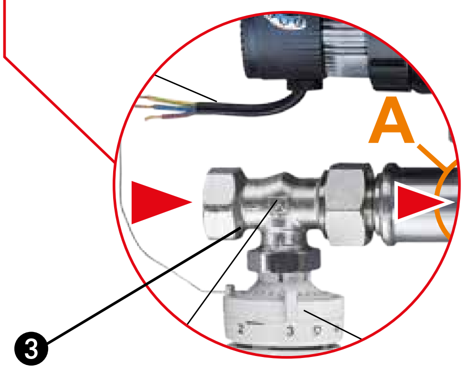


* (Supply must be ensured with a primary pump).
** The water from the heat generator (primary supply leg) must be at least 15- 20 °C warmer than the required supply temperature of the floor heating system.



The compensation fittings ❼ included in the scope of delivery ensure the tension free pipe channelling of the heating circuit supply lines. They enable the protrusion behind the return leg distributor bar.
If an additional distributor is connected to the water temperature control unit, the supply heating circuit distributor bar can be turned toward the back to allow for direct pipe connection. The S-shaped compensation fittings are not necessary in this case.

Once the high efficiency pump ❻ is activated, the necessary volume flows are put in motion, *as shown on page 55.*
At point **A**, cool returning water from the floor heating system is mixed with the “hot” water of the supply circuit by the primary pump. Immersion sensor ❶, which is connected to temperature control ❷ with a capillary line, records the actual temperature.
The temperature set at the temperature control ❷) is directly compared to the temperature of the immersion sensor ❶. If necessary, valve ❸ mixes in water for correction..
Next, the water enters the supply leg ❹ of the Schlüter-BEKOTEC-THERM system and passes through the individual heating circuits. Once the heat has been transferred, the water flows back through the heating circuit return leg ❽. When the heating water in the floor heating circuit drops below the temperature set at the temperature control ❷, part of the returning water is sent to the heat source for reheating.
“Hot” supply water from the radiator circuit is mixed in at point **A**. The amount of supply water ** mixed into the radiator circuit depends on the quantity of water that is sent to the heat source for reheating.
The high efficiency pump has an additional integrated sensor that switches off the pump when the maximum supply temperature (55 °C) is exceeded.
The pump provides the BEKOTEC-THERM heating circuits with optimal heating water volumes, which saves electricity.



Programmable valve –
Observe setting and flow direction

Note:
Prior to installation, a qualified expert must review the control technology and hydraulic installations. All work associated with the installation, start up, maintenance, and repair should exclusively be performed by authorised personnel.
**** The water from the heat source (primary supply) must be at least 15 - 20 °C hotter than the required supply temperature of the floor heating system.**
The separately provided installation and operating instructions must be observed. The system must be disconnected from all voltage prior to starting the installation.
For dimensions and installation drawings of the water temperature control unit, for example in conjunction with the installation in distributor cabinets, please refer to page 56.

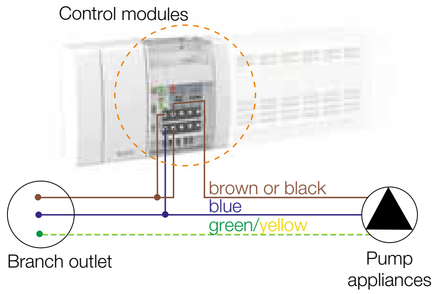
The water temperature control unit can be fastened to the joints of the distributor, using the supplied 1" gaskets.
After removing the protective cap, check and adjust the programming settings of valve ❸ as needed, then screw the temperature control unit ❷ into place.
The capillary pipe between the temperature control ❷ and the immersion sensor ❶ may not be kinked or flattened.

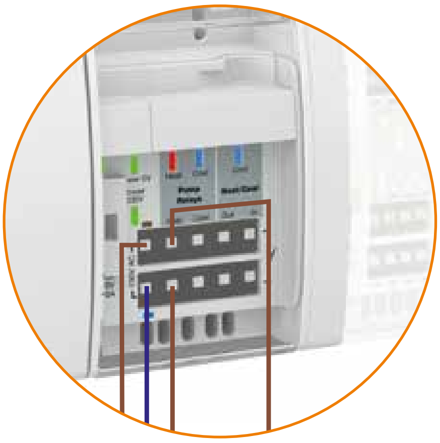
Technical data – system products

Power supply · Set up and start up · Technical data- RVT

Power supply

The electrical cable for the water temperature control of the supply temperature is about 2 m long. A corresponding 230 V/50 Hz voltage supply must be set up in the distributor cabinet, either for in wall installation or in the area of the distributor.





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Note:
A pump control mechanism via the Schlüter-Control base module is recommended. The pump switch deactivates the pump of the fixed supply temperature control when all actuators at the heating circuit distributor are closed. This variation ensures the energy efficient operation of the water temperature control unit.

Set up and start up

After the installation, fill the heating system in the flow direction of the flow meters (e.g. fill and drain cock ❾) and vent it at the heating circuit distributor.
Then perform a pressure test according to the provided procedure *(page 108- Attachment IV)*.

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Note:
Do not heat the screed and floor covering during the installation.
The shut-off is ensured by closing the ball valves and switching off the power.

For information about heating, see page 80.

Set the temperature control ❷ to the desired temperature. The temperature change from scale line to scale line is approximately 5 °C. The recommended setting range of the temperature control for the ceramic thermal comfort floor is between 25 and approx. 35 °C ≙ 2 - 4.
Scale lines 1 through 7 at the temperature control correspond to 20 to approx. 50 °C (in steps of 5 °C).

For further information, please refer to the operating instructions.

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Note:
The safety temperature shut-off in the pump is activated when the supply temperature exceeds ≥ 55 °C and switches the pump off. Pump operation resumes when the temperature drops below < 55 °C.

Technical data

Description of the technical data:

- Pre mounted and tested water temperature control unit with high efficiency pump
- Max. operating pressure: 6 bar
- Maximum differential pressure: 0.75 bar
- Maximum operating temperature, primary: 75 °C
- Control setting range of the supply temperature: 20- approx. 50 °C (secondary circuit of floor heating)
- Temperature control with immersion sensor and sleeve
- Nominal width: DN 25
- Primary connections Rp 3/4"

Technical data – system products

Design and layout of the RVT water temperature control unit

Due to the high temperature difference (splay) between the primary and secondary circuit (radiator floor heating circuit), the "hot" water volume, which is fed from mixing point **A** and returned to the heat source by way of the three way distributor valve, is much smaller than the total water quantity for the floor heating system.
It is important to determine the volumes for the planned splay to define the dimensions of the lines and the hydraulic conditions of the system. The water volume of the heating circuit distributor for the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is shown in the calculations for the ceramic thermal comfort floor. If these calculations are not available, the following equation may be used on the basis of the system temperatures employed for the design:

$$\mathbf{m_{FBH} = \frac{Q_{FBH}}{(\vartheta_{VFBH} - \vartheta_{RFBH}) \cdot 1.163}\ [kg/h]}$$

where: Q_{FBH} = Total heat output of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor [W]
ϑ_{VFBH} = Supply temperature, secondary circuit (Schlüter-BEKOTEC-THERM ceramic thermal comfort floor)
ϑ_{RFBH} = Return temperature, secondary circuit (Schlüter-BEKOTEC-THERM ceramic thermal comfort floor)

Example:
Q_{FBH} = Total heat output of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor = 5,000 W
ϑ_{VFBH} = Supply temperature, secondary circuit (Schlüter-BEKOTEC-THERM ceramic thermal comfort floor) = 35 °C
ϑ_{RFBH} = Return temperature, secondary circuit (Schlüter-BEKOTEC-THERM ceramic thermal comfort floor) = 28 °C

$$\mathbf{m_{FBH} = \frac{5000\ W}{(35\ °C - 28\ °C) \cdot 1.163} = \underline{\underline{615\ kg/h}}}$$

This water quantity with the pressure loss of the least favourable BEKOTEC-THERM heating circuit provides the base data for setting the pump (see pump characteristics). Since the required output also has to come from the primary circuit (radiator circuit), the water quantities for the primary circuit have to be calculated as follows:

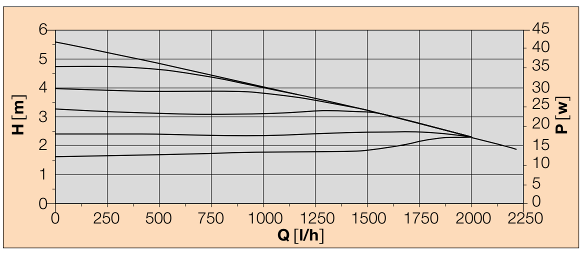
$$\mathbf{m_{HK} = \frac{Q_{FBH}}{(\vartheta_{VHK} - \vartheta_{RFBH}) \cdot 1.163}\ [kg/h]}$$

where: Q_{FBH} = Total output of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor
ϑ_{VHK} = Supply temperature, primary circuit (radiator)
ϑ_{RFBH} = Return temperature, secondary circuit (floor heating) (Schlüter-BEKOTEC-THERM ceramic thermal comfort floor)

Beispiel:
Q_{FBH} = Total heat output of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor = 5,000 W
ϑ_{VHK} = Supply temperature, primary circuit (radiator) = 65 °C
ϑ_{RFBH} = Return temperature, secondary circuit (floor heating) (Schlüter-BEKOTEC-THERM ceramic thermal comfort floor) = 28 °C

$$\mathbf{m_{HK} = \frac{5000\ W}{(65\ °C - 28\ °C) \cdot 1.163} = \underline{\underline{117\ kg/h}}}$$

Due to the larger splay, the primary water volume will always be smaller than the sum of the total volume of the connected BEKOTEC-THERM heating circuits.
This makes it possible to utilise the very small pipe bores of the individual radiators for connecting Schlüter-BEKOTEC-THERM-RVT.
In the case of the data assumed for this example, a supply line with an interior diameter of 13 mm (copper pipe with Ø 15 x 1 mm) may be sufficient, considering the hydraulic conditions in the primary circuit.



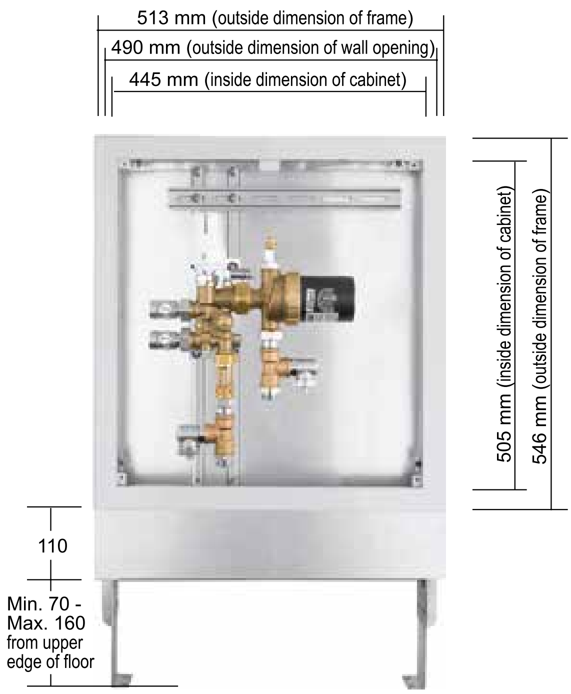
Characteristics of the high efficiency pump

Technical data – system products

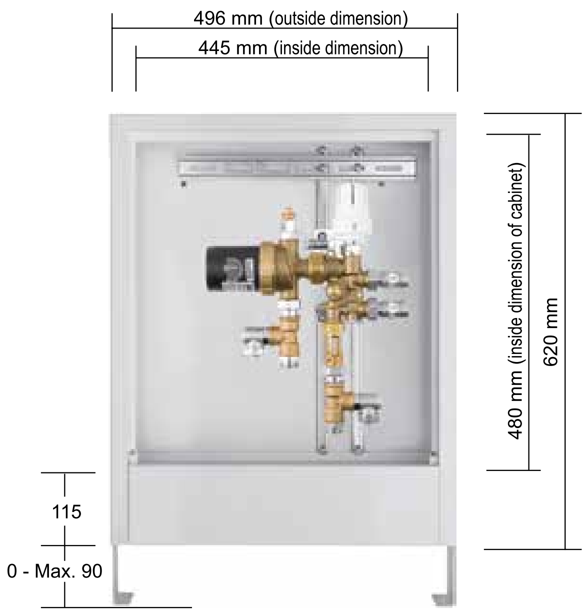
Control unit – BMS
Control unit – BMS/RT with interior thermostat

Schlüter-BEKOTEC-THERM-BMS is a control unit to supply a single room equipped with one or two Schlüter-BEKOTEC-THERM heating circuits.
The **control unit BMS/RT** is equipped with an additional interior thermostat that allows for controlling the control unit depending on room temperature.
The control unit supplies the BEKOTEC-THERM ceramic thermal comfort floor with the required low supply temperatures by mixing in heating water from warmer heating circuits, for example from the radiator heating circuit.
The control unit is suitable for use in BEKOTEC-THERM distributor cabinets.

Installation in Schlüter-BEKOTEC-THERM BT VSE 4 distributor cabinet (e.g. **BMS** with left side connection)



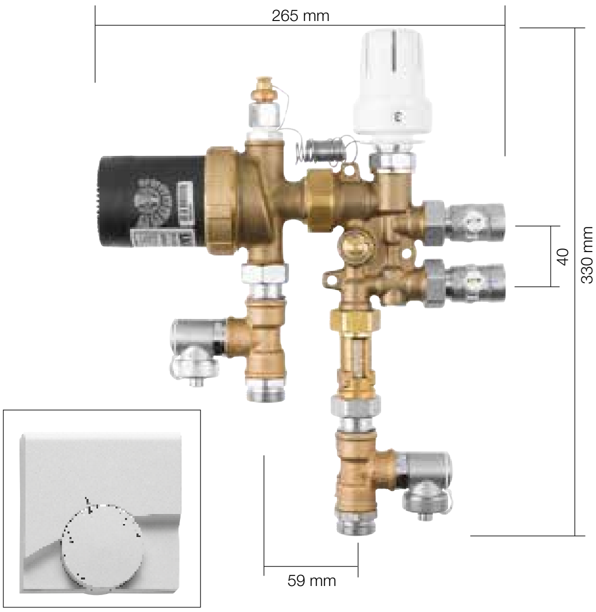
Installation in Schlüter-BEKOTEC-THERM BT VSV 4 distributor cabinet (e.g. **BMS** with right side connection)

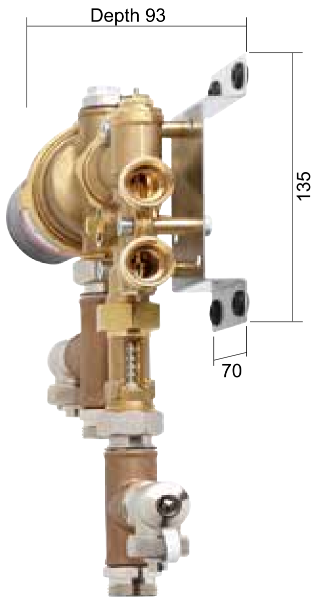


Please see the following pages for information about use, function, and installation.

Technical data – system products

Utilisation of the control unit – BMS
Control unit – BMS/RT with interior thermostat





All data in mm.

The Schlüter-BEKOTEC-THERM-BMS control unit is a simple mixing and control concept to supply smaller spaces, which are heated with one or two Schlüter-BEKOTEC-THERM heating circuits. The control unit BEKOTEC-THERM is a simple mixing and control concept to supply smaller spaces, which are heated with one or two BEKOTEC-THERM heating circuits. The control unit - BMS/RT is equipped with an additional interior thermostat that allows for controlling the control unit depending on room temperature.

A second heating circuit can be installed with an available set of twin connectors (order separately, item no.: BTZ 2 DA (for DN 20). In this case, the heating circuits must have approximately the same lengths and performance ratings *(Page 67)*.

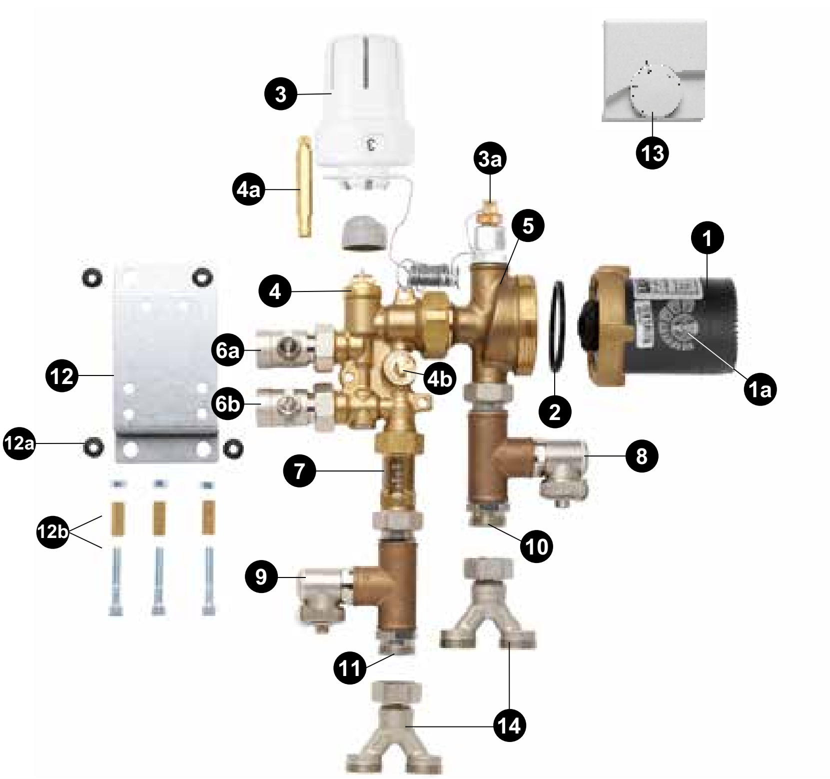
Due to the concept of mixing in heating water from hotter parts of the heating system, the BEKOTEC heating circuits can be directly connected to the control unit for supply with the required lower water temperature.

The use of the BEKOTEC-THERM-BMS control unit is ideally suited for combination with an existing, shared pipe network, which is designed for the higher supply temperatures of radiator heaters.
Due to the option of connecting to the small pipe bores of individual radiators, this allows for the easy installation of BEKOTEC-THERM ceramic thermal comfort floors in renovation projects.

The circulating pump in the control unit supplies the BEKOTEC-THERM heating circuits with a separate source of heating water.

Technical data – system products

Function and operation of the control unit – BMS and BMS/RT

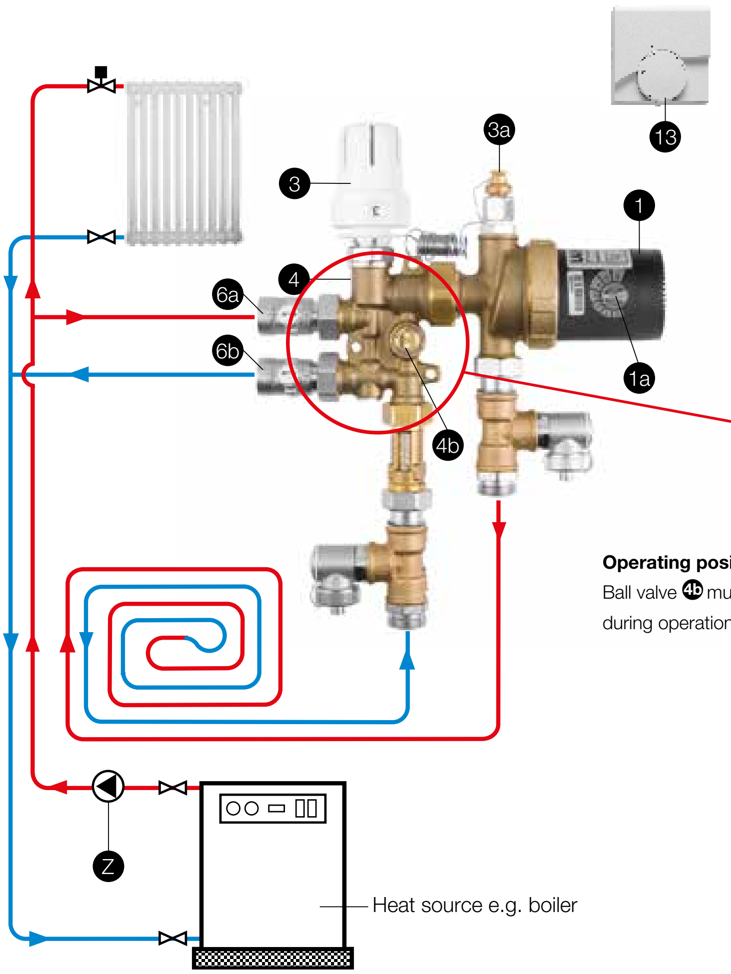


Note:
The clamp connections BTZ 2 KV ... are not included in the scope of delivery and must be ordered separately to match the diameter of the heating pipes.

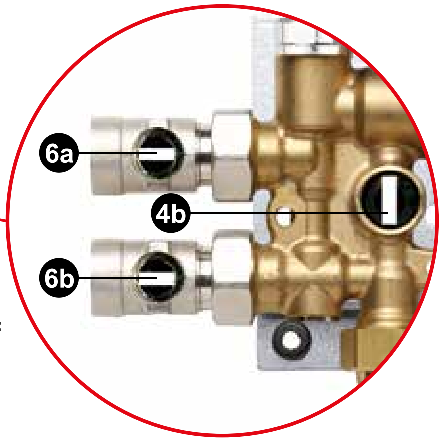
		BTBMS	BTBMS/RT
1	High efficiency pump	x	x
1a	Speed regulator 0- 6 / 0 ≙ Standby /Seasonal switch	x	x
2	Gasket	x	x
3	Thermostat head	x	x
3a	Temperature sensor		
4	Mixing valve	x	x
4a	Setup tool for the mixing valve	x	x
4b	Integrated ball valve	x	x
5	Pump housing	x	x
6a	Ball valve supply line 1/2“ (DN 15) IG	x	x
6b	Ball valve return line 1/2“ (DN 15) IG	x	x
7	Flow meter	x	x
8	Fill/drain cock supply line	x	x
9	Fill/drain cock return line	x	x
10	BEKOTEC 3/4“ Euro cone supply line connection	x	x
11	BEKOTEC 3/4“ Euro cone return line connection	x	x
12	Installation panel	x	x
12a	Sound insulation inserts	x	x
12b	3 x screw set with spacer sleeves	x	x
13	Interior thermostat (supplied with BTBMS/RT only)	–	x
Additional accessories (to be ordered separately)			
14	Twin connectors	Item no.:	BTZ 2 DA (for 2 x DN 20)

Technical data – system products

Function and operation of the control unit – BMS und BMS/RT



Note:
Prior to start up, be sure to follow the notes regarding the flushing and proper venting as well as the necessary valve settings *(pages 64 - 66)*.



Operating position of the ball valves:
Ball valve 4b must be in vertical position during operation.

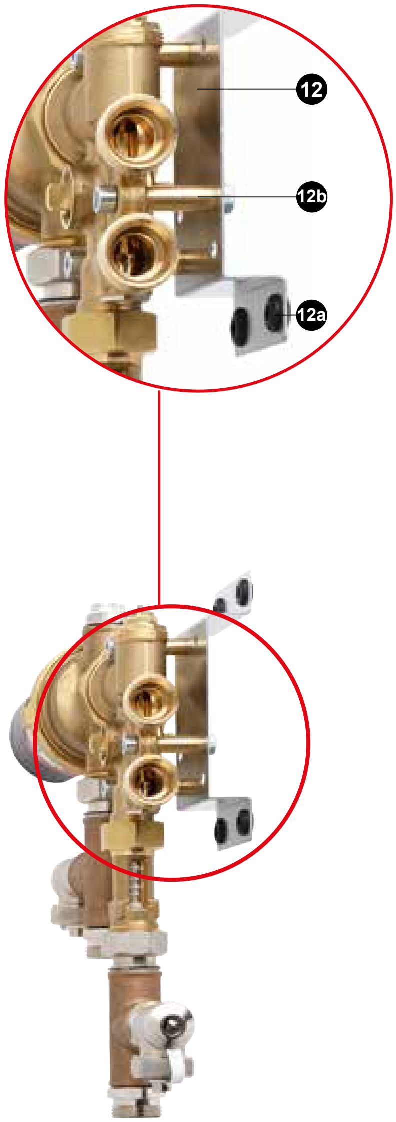
Temperature setting at the thermostat	
Setting value at the thermostat head BMS	**Supply temperature**
1	approx. 20 °C
2	approx. 25 °C
3	approx. 30 °C
4	approx. 35 °C
5	approx. 38 °C
6	approx. 42 °C
7	approx. 45 °C
8	approx. 50 °C
9	approx. 55 °C

The **BMS control unit** can either be operated with external switches/controls or manually with speed regulator 1a if the unit is directly connected (note switch capacity, see "Technical data").
The **control unit BMS/RT** is activated by the interior thermostats 13, which are part of the delivery supply. Note the corresponding wiring diagrams shown on Page 68.
After switching on 1a and setting the speed, the necessary volume flows are put in motion, as shown in the drawing.
The temperature setting at thermostat 3 *(see table on the left) is compared to the actual mixing temperature of sensor* 3a. This opens or closes valve 4 of the control unit and adds more or less hot water, as required.
The circulating pump 1 provides the connected Schlüter-BEKOTEC-THERM heating circuit with the mixed water. For the optimum supply of the control unit, the supply pump Z of the heating circuit at the control unit must be able to provide a minimum pressure of 10 kPa (100 mbar).
A safety expansion element integrated into the control unit prevents the system from exceeding the maximum supply temperature of 55 °C for heated floor systems. It interrupts the further inflow of hot supply water.

Technical data – system products

Function and installation of the control unit – BMS and BMS/RT

Prior to installation, a qualified expert must review the control technology and hydraulic installations. For optimum supply, the supply pump of the radiator system must be able to provide a minimum pressure of 10 kPa (100 mbar) at the control unit.
The supply temperature in the radiator circuit must be at least 10 K higher than the required mixing temperature for the Schlüter-BEKOTEC-THERM system.
The control unit is always installed at a level above the heating circuit. Left side or right side connection is possible by simple rotation of the control unit. The pump always must always be installed horizontally as shown.
All work associated with the installation, start up, maintenance, and repair should exclusively be performed by authorised personnel. The system must be disconnected from all voltage prior to starting the installation.



For dimensions and installation drawings of the control unit in conjunction with the installation of distributor cabinets, please refer to page 60. The supplied installation panel allows for the direct installation of the control unit on a wall or in a BEKOTEC -THERM distribution cabinet.

A second heating circuit can be installed with an available set of twin connectors (order separately, item no.: BTZ 2 DA (for DN 20). In this case, the heating circuits must have approximately the same lengths and performance ratings (Page 67).

Remove the protective cap from valve ❹ and screw the thermostat head ❸ into place. See page 68 for wiring diagrams of the control units BTBMS and BTBMS/RT.

Start up- filling, flushing, and venting of the Schlüter®-BEKOTEC-THERM control unit

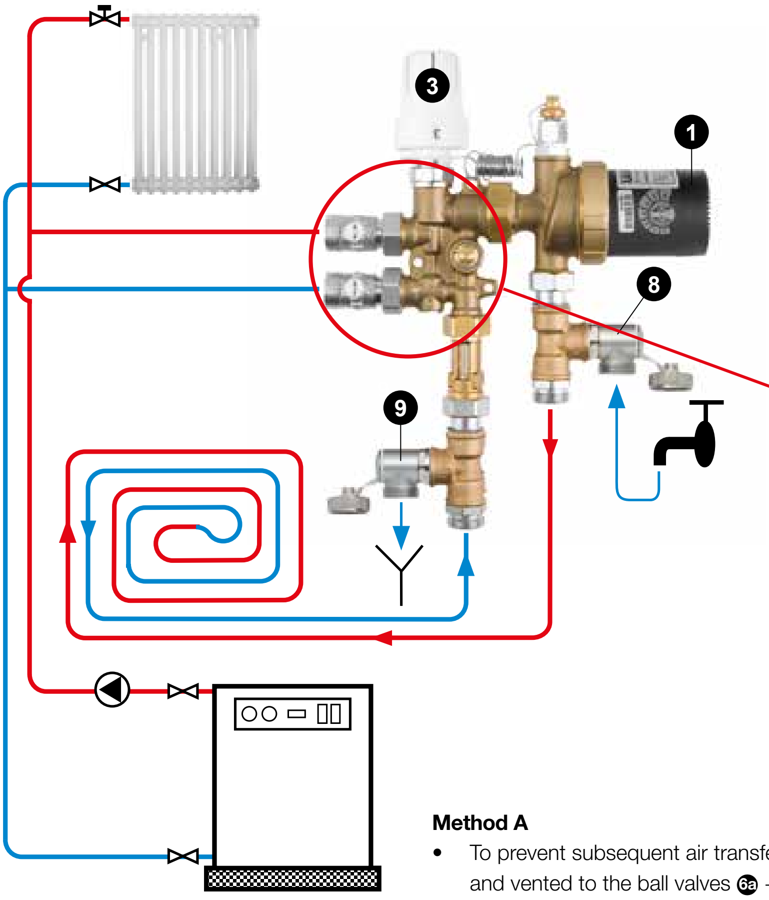
The system must be filled and flushed, following either the steps of Method A or Method B.

General notes and prerequisites: Prior to start up, the air bubbles in the system must be removed with the flushing procedure described below. Failure to perform these steps may lead to functional disruptions and defects in the circulating pump ❶. Filling, flushing and venting should be monitored or performed by a qualified technician. The available connection pressure and the flow velocity must be limited by using suitable filling equipment. The system is filled with filtered feed water that must be of appropriate water quality. Prior to installing the screed, the heating system must undergo a seal test. A template for the pressure test report can be found in the Appendix on page 108. Close ball valves 6a + 6b and fully disconnect the control unit from all power sources to ensure that the system cannot be heated during the installation and curing process of the screed. The requirements described in the section "Installation notes and system start up for various floor coverings" *(see pages 78 - 80)* also must be observed.

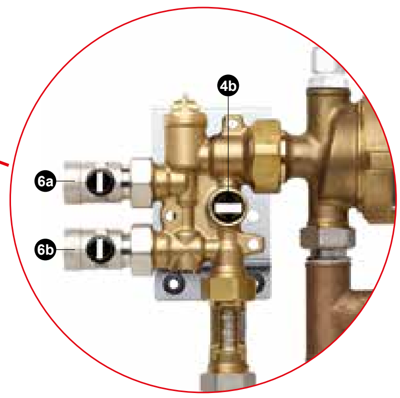
Technical data – system products

Procedure to fill and vent the Schlüter®-BEKOTEC-THERM system

Filling the system according to Method A.



Operating position of the ball valves during the filling/flushing procedure according to **Method A**.



Method A

- To prevent subsequent air transfer from the radiator heating circuit, the heating system is filled and vented to the ball valves 6a + 6b of the control unit.
- All ball valves 6a + 6b + 4b of the control unit are closed (see figure).
- The heating circuit is flushed by way of the fill/drain cocks of the control unit.
- The thermostat head 3 is removed prior to this step.
- The water flow is routed through the fill/drain cock at the supply line. The drainage is connected to the return line and routed to an open drainage/outflow Y, where the water flow is visible.
- As a first step, fully open the fill/drain cock 8 at the return line.
- By opening the fill/drain cock 9 at the supply line, the heating circuit can now be flushed through the control unit, until no more air bubbles come through the connected drain.
- Close the fill/drain cock 8 at the supply line, followed by closing the fill/drain cock 9 at the return line.
- After flushing, equalise the pressure with the heating system by opening ball valves 6a + 6b.
- Return ball valves 6a + 6b + 4b their operating position *(see figure on page 63)*
- Start up the system. The flow meter now shows the current volume flow.
- If no volume flow is shown or if it breaks off after a short time, repeat the venting process. Switch the pumps off for this purpose.
- It may be necessary to repeat the process in accordance with Method B.
- Monitor the system pressure and correct it accordingly.
- Reattach the actuator 3.

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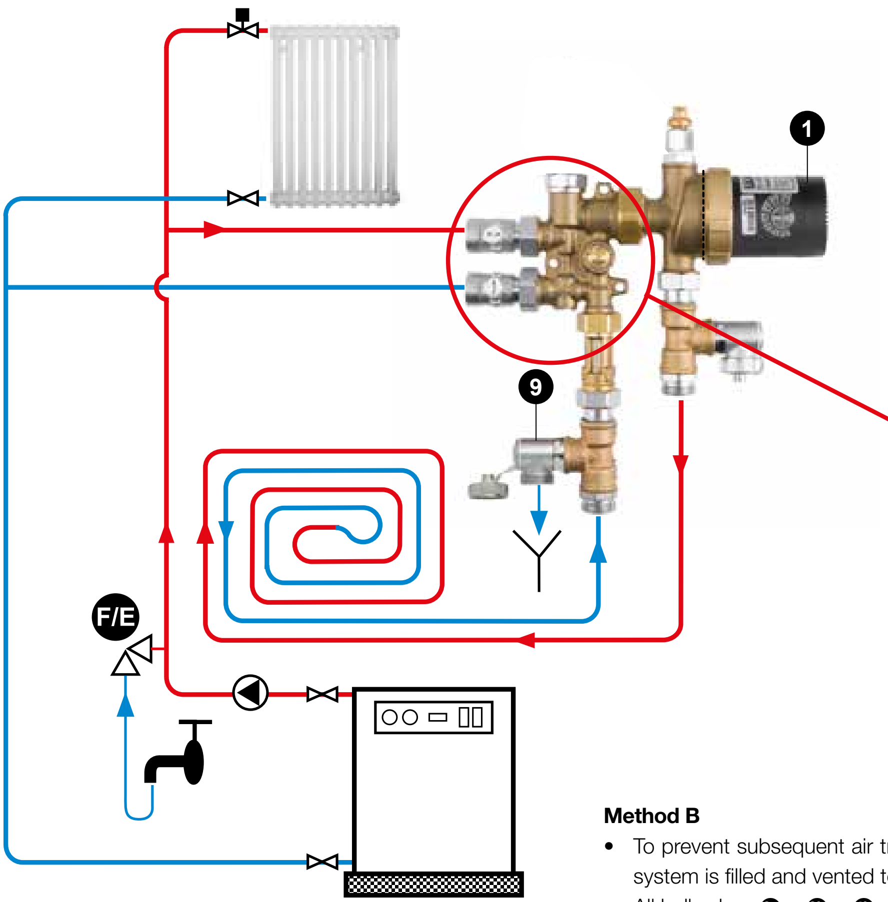
Note:
Keep in mind that the system must include a pump shut-off via an existing boiler control or additional control technology features. This applies particularly to operation in the summer.

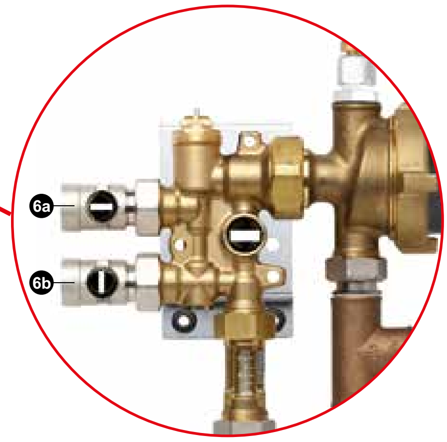
Technical data – system products

Procedure to fill and vent the Schlüter®-BEKOTEC-THERM system

Filling the system according to Method B.



Position of ball valves during the flushing process through the heating system according to **Method B.**



Method B

- To prevent subsequent air transfer from the radiator heating circuit, the heating system is filled and vented to the ball valves 6a + 6b of the control unit.
- All ball valves 6a + 6b + 4b of the control unit are closed.

- Flush the system, starting from the fill/drain cock of the heating system via the control unit and the heating circuit to the fill/drain cock in the return line of the control unit.
- The thermostat head 3 is removed prior to this step.
- The water flow is routed through the fill/drain cock F/E of the heating system. The drainage is connected to the return line of the control unit and routed to an open drainage/outflow Y, where the water flow is visible.
- As a first step, fully open the fill/drain cock 9 at the return line of the control unit.
- By opening the upper ball valve 6a (supply line of the control unit) and the fill/drain cock F/E of the heating system, the heating circuit can now be flushed through the control unit, until no more air bubbles come through the connected drain. Close the fill/drain cock at the supply line, followed by closing the fill/drain cock 9 at the return line.
- Return ball valves 6a + 6b + 4b their operating position *(see figure on page 63)*
- Start up the system. The flow meter now shows the current volume flow.
- If no volume flow is shown or if it breaks off after a short time, the pump housing must be vented again. For this purpose, switch off the pumps and use the manual vent valve to vent the housing.
- This procedure may need to be repeated several times until the control unit no longer contains any air.
- Monitor the system pressure and correct it accordingly.
- Reattach the actuator 3.

Technical data – system products

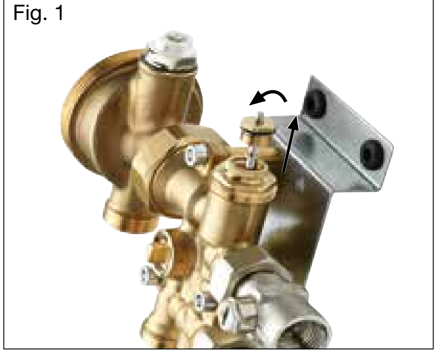
Pre setting the mixing valve

High supply temperatures, paired with high pre pressure from the supplier pump in the radiator heating circuit, may require specific pre settings (damper settings) of the mixing valve. The valve is delivered in completely opened position. The damper settings may be made under operating pressure.

Procedure according to Fig. 1 3

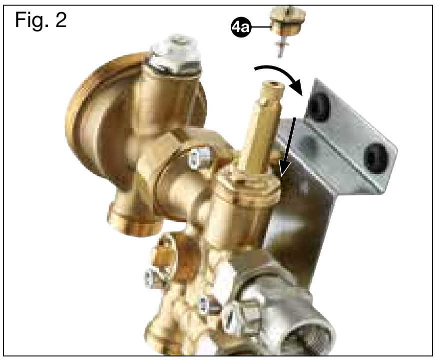
- Screw out the valve insert (Fig 1), then use the adjustment tool 4a to close the valve with approx. one rotation (Fig. 2)
- Replace the valve insert (Fig. 3).
- Check whether the required mixing temperature is consistently achieved.
- If the mixing temperature is not reached, keep closing the valve in ½ rotation steps and check the system.

Fig. 1



Screw out the valve insert

Fig. 2



Adjust the flow with the supplied adjustment tool 4a

Fig. 3

Return the valve insert

Heating circuit lengths and summary performance data of the Schlüter®-BEKOTEC-THERM ceramic thermal comfort floor in conjunction with the control unit

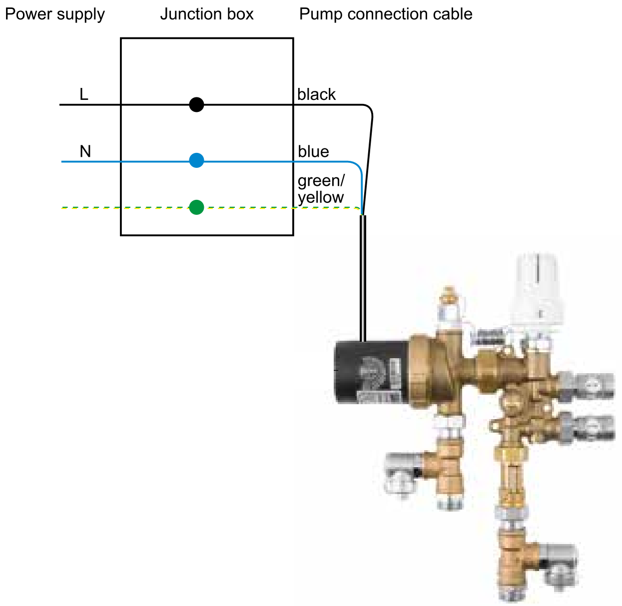
System	Installation spacing	Maximum heating circuit length	Maximum heating area	Maximum specific heat output*
mm	mm	m	m²	W/m²
16 x 2 mm	75	100	7	95
	150		15	85
	225		22	65
	300		30	45
14 x 2 mm	75	80	6	95
	150		12	85
	225		18	65
	300		24	45
12 x 1.5 mm	50	70	3.5	95
	100		7.0	90
	150		10.5	80
	200		14.0	65
	250		17.5	50
	300		21.0	40
10 x 1.3 mm	50	60	3.0	95
	100		6.0	90
	150		9.0	70
	200		12.0	55
	250		15.0	45
	300		18.0	30

* Maximum performance data for room temperatures of 20 °C, with consideration for the properties of **ceramic surface coverings**.
Please refer to the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor in conjunction with the control unit.

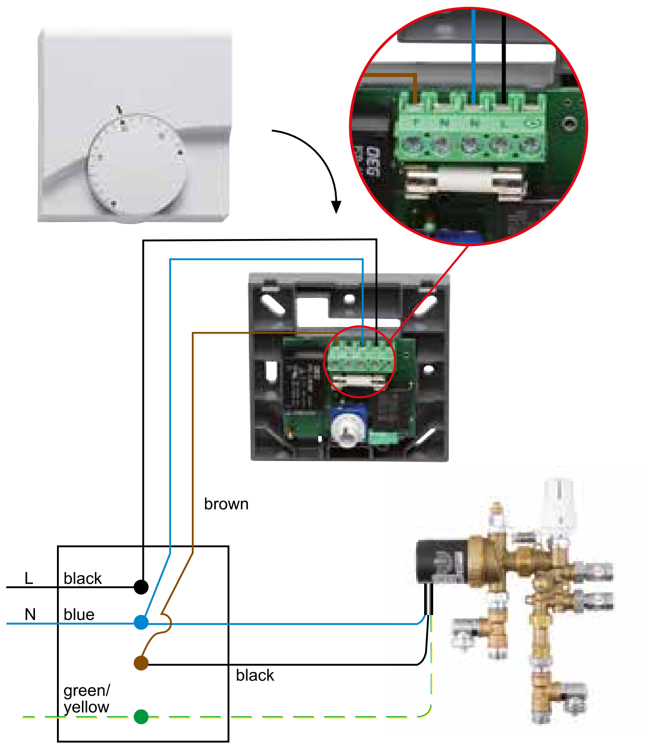
Power supply / technical data

Power supply

Control unit-BMS



Control unit-BMS/RT, switched via the corresponding interior thermostats



Switch options on/off:

- via external control

Technical data of the control unit

Technical data of the control unit	
Maximum system pressure	1 MPa (10 bar)
Max. system temperature in the radiator/ boiler circuit	110 °C
Max. system temperature in the floor heating circuit*	55 °C*
Max. differential pressure in the radiator/ boiler circuit	100 kPa (1 Bar)
Power supply	230 V / 50 Hz
Power rating of the circulating pump	4 - 27 W
Connection of radiator/boiler circuit	Interior threading 1/2“ (DN15)
Connection of the floor heating circuit	Euro cone 3/4“ (DN 20)

* The maximum supply temperature of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor must be limited in accordance with the corresponding output data.

Floor heating for individual heating circuits

Return temperature limit valve – RTB

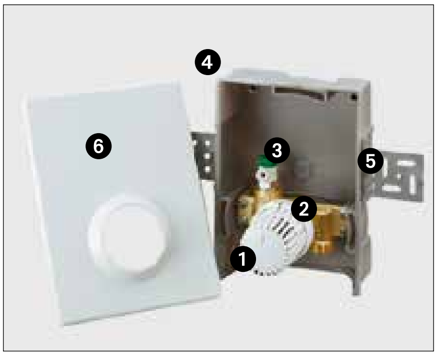
Schlüter-BEKOTEC-THERM-RTB is a return temperature limit valve for installation in the wall. The control unit is used in cases where the required low system temperatures for a heating circuit of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor are not protected with suitable temperature limiters, mixing valves or the heating system. It can be installed for the systematic temperature control of a secondary heating system for the floor. The unit is installed in combination with a heating system, using a supply temperature of max. 65 °C. Prior to installation, the control technology and hydraulic installations must be reviewed by a qualified engineer.

Schlüter®-BEKOTEC-THERM-RTB
Return temperature limit valve

Floor heating for individual heating circuits

Function – RTB

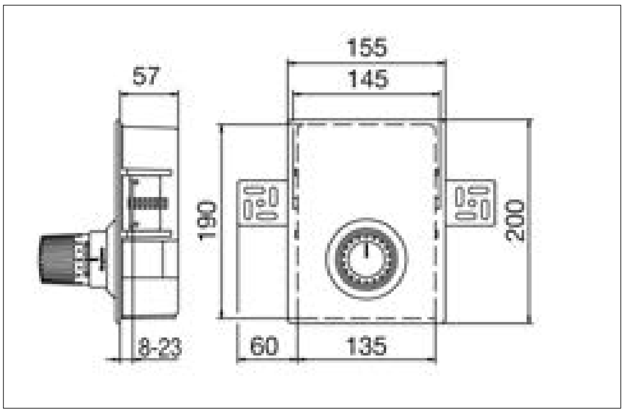
Schlüter-BEKOTEC-THERM-RTB limits the return temperature of a heating circuit. Select the installation position in such a way that the heating water first flows through the Schlüter-BEKOTEC-THERM heating circuit and then through the BEKOTEC-THERM-RTB valve. The heating medium cools down on its way from the floor surface to the return temperature limit valve. Depending on the temperature, the BEKOTEC-THERM-RTB valve and the sensor element in the BEKOTEC-THERM-RTB thermostat regulate and limit the flow. The return temperature is set at the knob ❶ of the thermostat. Changing the settings of the knob affects the floor surface temperature and, accordingly, the room temperature.

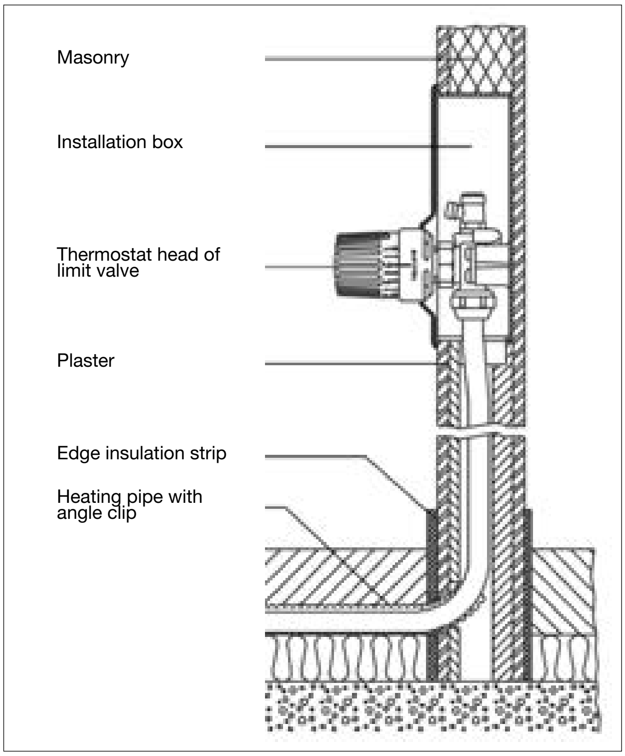


Schlüter®-BEKOTEC-THERM-RTB

❶ Thermostatic head control of the return temperature limit valve
❷ Valve to connect the heating pipes, with additional clamp attachments BTZ 2 KV ...
❸ Flushing and venting valve
❹ Installation box
❺ Attachment angle
❻ Front panel (white)

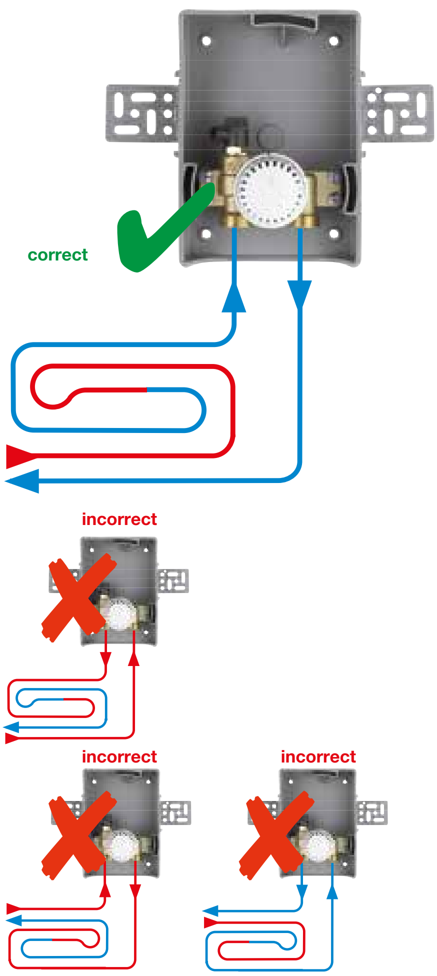
The heat up and start up instructions of the manufacturer must be observed.
The valve is operated in a room with additional radiator. In this case, the floor temperature covers the basic heat requirements, while the radiator regulates the room temperature.





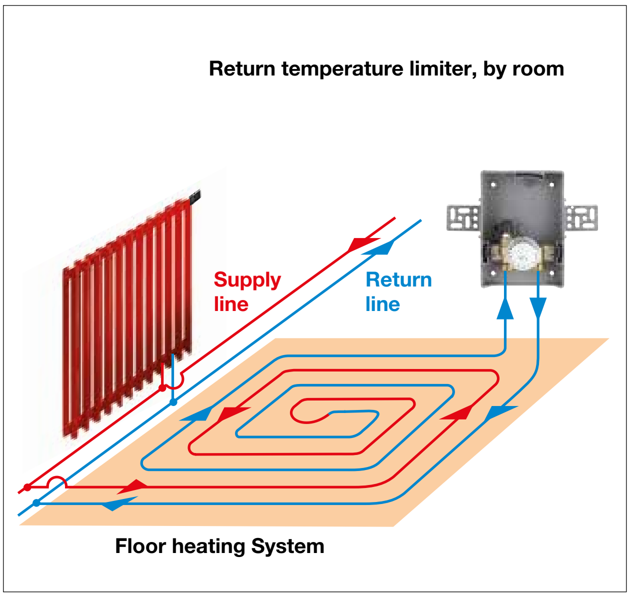
Floor heating for individual heating circuits

Installation – RTB

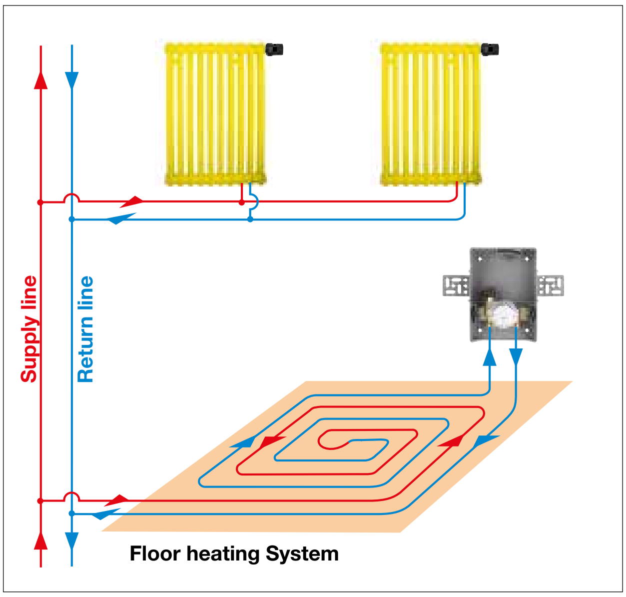


- Do not position the Schlüter-BEKOTEC-THERM-RTB thermostat in direct sunlight or near to other heat sources e.g. radiators.
- The unit is installed at least 20 cm above the finished floor (a comfortable operating height is 1.20 m), measured from the bottom edge of the installation box, which is open on the underside. Align the front edge flush with the finished wall covering. Use the supplied installation angles to align and attach the installation box. They are installed on the side.
- Slide on the protective covering to keep the valve clean.
- The final attachment is made with plaster or mortar.
- Once the connection to the supply line of the dual pipe heating system has been made, the heating circuit must be installed in a coiled pattern *(see page 27, 37, 40 or 43)*. The self-sealing connection fitting BTZ 2 AN... or the connector angle BTZ 2 AW... with ½" external threading can be used for connecting the heating circuit to the supply and return line (use special valves and connectors for single pipe systems).
- The return temperature limit valve is connected at the end of the heating circuit, using the clamp attachments for Schlüter-BEKOTEC-THERM (item no. BTZ2KV ...). The flow direction is indicated with an arrow on the body of the valve.
- In a next step, a direct connection from the valve to the return line of the dual pipe heating system is established. The self-sealing connection fitting BTZ 2 AN ... or the connector angle BTZ 2 AW ... with ½" external threading can be used for connecting the heating circuit to the supply and return line.
- The heating system is then filled and vented at the valve.
- The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is now ready to perform a pressure test according to the procedure *on page 108*.
- Set the white front panel in and align it.
- For information about settings and start up, *see page 73*.

Integrating a heating circuit into a floor level distribution



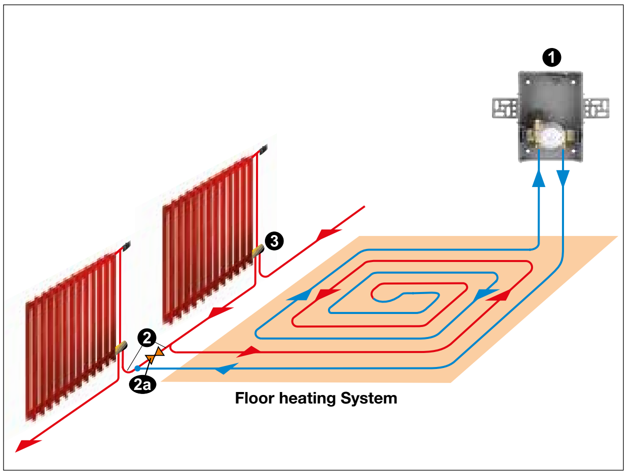
Integrating a heating circuit into a riser



Floor regulation for individual heating circuits

Installation – RTB

Integrating a heating circuit into a **single pipe heating system**



Installation in single pipe heating systems

Select the installation location in such a way that part of the heating water flows through the BEKOTEC heating circuit and another through controllable transfer sections ❷ in the existing single pipe circuit. The return temperature limit valve ❶ must be positioned in such a way that the heating water first flows through the heating circuit and then through the RTB valve.

The heating circuit return line is connected after the transfer section.

The transfer section ❷ must at least have the same pipe diameter as the existing single pipe circuit and must be equipped with a controllable valve 2a (return screw/ string control valve). The volume flow can be controlled with the settings of the limit valve 2a in accordance with the hydraulic conditions. Adjustable single pipe valves ❸ should also be installed at the radiators.

As a general rule, the hydraulic conditions of the single pipe system must be reviewed for this application.

Heating circuit lengths and output data

… in conjunction with the Schlüter-BEKOTEC-THERM-RTB return temperature limit valve

Approximate values for bathrooms with interior temperatures of **24 °C** and an average return temperature setting of approx. 35 °C, with a minimum supply temperature of **min. 50 °C**.

System pipe dimension	Installation spacing	Max. heating circuit length	Max. heating area	Spec. Heat output*	Pressure loss incl. limit valve	Volume flow
mm	mm	m	m²	W/m²	mbar	kg/h
16 x 2 mm for BEKOTEC-EN/P and EN/PF	75	90	6.5	95	40	45
	150	90	12	80	65	55
14 x 2 mm for BEKOTEC-EN 23 F	75	80	5.5	95	65	41
	150	80	11	80	85	50
12 x 1.5 mm for BEKOTEC-EN 18 FTS	100	60	5.5	90	70	30
	150	60	8.5	80	85	36
10 x 1.3 mm for BEKOTEC-EN 12 FK	100	55	5.0	90	60	49
	150	55	7.5	80	85	31

** Output data apply to ceramic surface coverings*

For additional performance data of the Schlüter-BEKOTEC-THERM systems, see the diagrams on pages 81-97

Floor heating for individual heating circuits

Setting and start up – RTB

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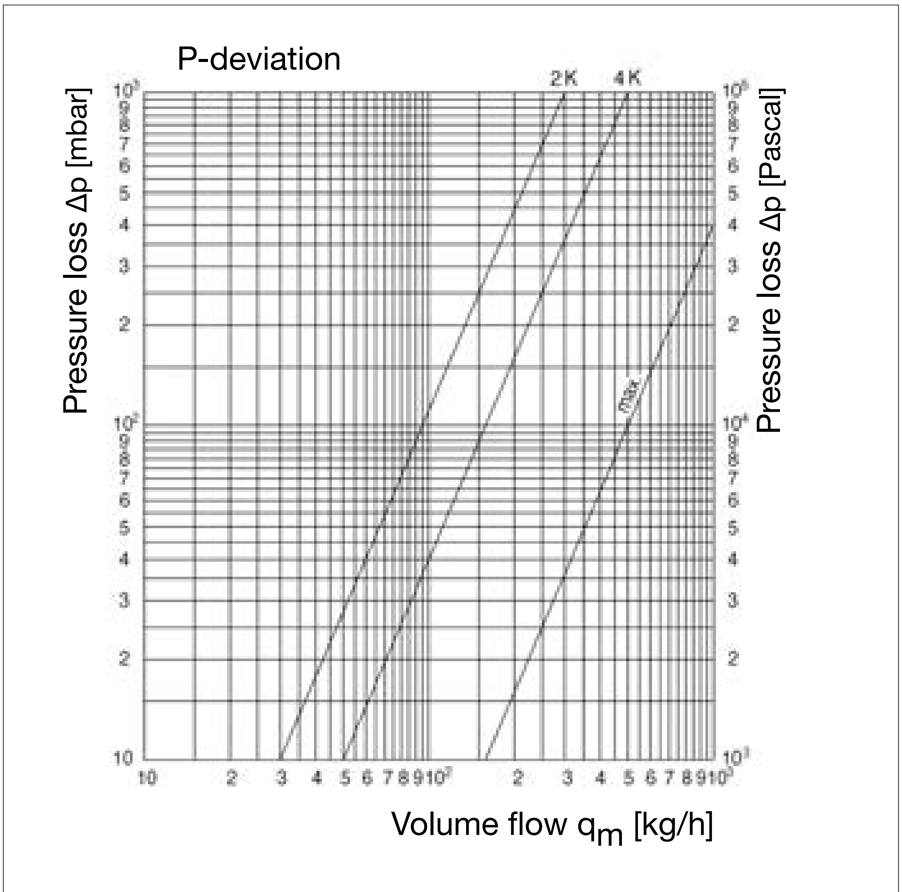
The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is ready for heating only 7 days after the installation of the floor covering. Please observe the instructions of data sheets 9.1 to 9.5, Schlüter-BEKOTEC. It is especially important not to exceed the maximum surface temperatures. Close the valves with protective caps to ensure that no heating can take place during the installation of the screed and surface covering.

Once the construction work is complete, remove the protective cap and open the thermostat head.
The recommended setting range of the thermostat is between **1.5 (approx. 25 °C)** and **2.5 (approx. 35 °C)**. The target value is set to position 3 by default.
The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is ready for heating only 7 days after the completion of the cover construction. This setting value is increased by < 0.5 every day to a maximum of 2.5, starting with setting 1 at the return temperature limit valve.

	Setting value at RTB thermostat head	Return temperature
	0	closed
Recommended setting range	1	approx. 20 °C
Recommended setting range	1.5	approx. 25 °C
Recommended setting range	2	approx. 30 °C
	2.5	approx. 35 °C
	3	approx. 40 °C

Pressure loss diagram for Schlüter-BEKOTEC-THERM-RTB 4K P deviation; factory default setting



Floor heating for individual heating circuits

Room temperature control valve with bypass – RRB

Schlüter-BEKOTEC-THERM-RRB is a room temperature control valve with bypass function for installation in the wall. It can be used for temperature control in rooms with only one heating circuit. No auxiliary energy (power connection) is required.

Prerequisite: The available heating water supply temperature may not exceed 50 °C.

The unit is installed in the wall with a BEKOTEC-THERM floor heating circuit.
The settings of the bypass valve allow for maintaining a consistent base temperature at the floor surface.

This prevents the floor from cooling off completely, and the base temperature for areas touched by bare feet can be reliably set.
The thermostat head enables an adjustable room temperature control from 7 to 28 °C.

Schlüter®-BEKOTEC-THERM-RRB
Room temperature control valve with bypass function

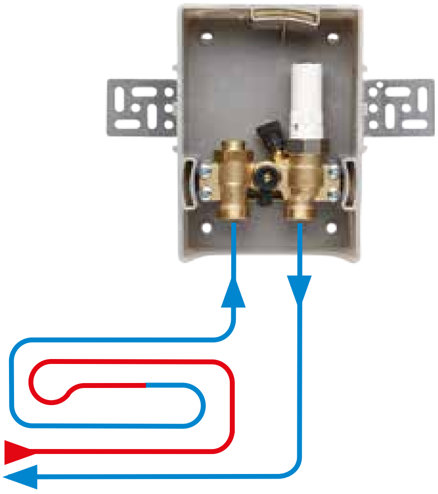
1. Thermostat head, room temperature control
2. Valve to connect the heating pipes, with additional clamp connections BTZ 2 KV ...
3. Bypass valve (for pre setting)
4. Flushing and venting valve
5. Installation box
6. Attachment angle
7. Front panel (white)

Function – RRB
Schlüter-BEKOTEC-THERM-RRB ***does not*** limit the return temperature of a heating circuit.
The flow is limited by the BEKOTEC-THERM-RRB valve depending on room temperature.
The room temperature is set at the knob ❶ of the thermostat. ***
Changing the settings of the knob affects the room temperature. The available supply temperature may not exceed 50 °C
The bypass valve ❸ can be set to maintain a consistent base temperature at the floor surface.

Installation drawing and dimensions analog to RTB, ***see page 70.***

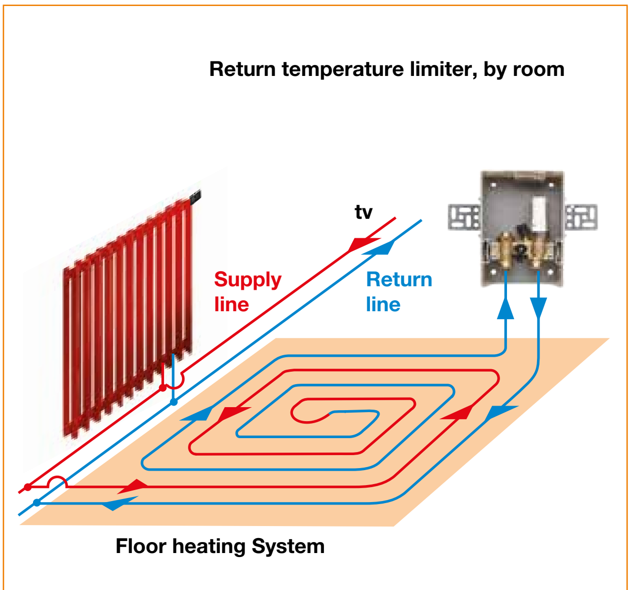
Floor heating for individual heating circuits

Installation – RRB



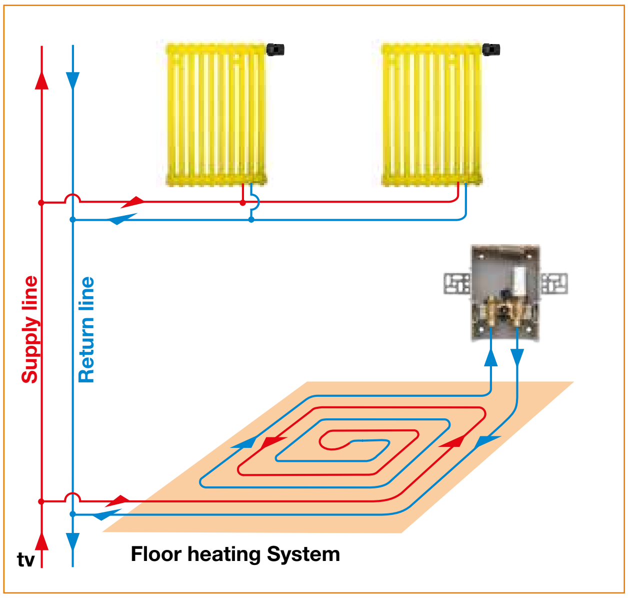
- Do not position Schlüter-BEKOTEC-THERM-RRB thermostat in direct sunlight or near to other heat sources e.g. radiators.
- The unit is installed approx. 1 1.5 m above the finished floor (a comfortable operating height is 1.20 m), measured from the bottom edge of the installation box, which is open on the underside. Align the front edge flush with the finished wall covering. Use the supplied installation angles to align and attach the installation box. They are installed on the side.
- Slide on the protective covering to keep the valve clean.
- The final attachment is made with plaster or mortar.
- Once the connection to the supply line of the dual pipe heating system has been made, the heating circuit must be installed in a coiled pattern *(see page 18, 37, 40 or 43)*.
- The thermostat using the clamp attachments for Schlüter-BEKOTEC-THERM (item no. BTZ2KV ...). The flow direction is indicated with an arrow on the body of the valve.
- In a next step, a direct connection from the valve to the return line of the dual pipe heating system is established.
- The self-sealing connection fitting BTZ 2 AN ... or the connector angle BTZ 2 AW ... with ½" external threading can be used for connecting the heating circuit to the supply and return line.
- The heating system is then filled and vented at the valve.
- The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is now ready to perform a pressure test according to the procedure on page 108.
- Set the white front panel in and align it.

Integrating a heating circuit into a floor level distribution



tv max. ≈ 50 °C

Integrating a heating circuit into a riser



tv max. ≈ 50 °C

Heating circuit lengths and output data -RRB

… in conjunction with the room temperature control valve Schlüter-BEKOTEC-THERM-RRB
Approximate values for rooms with interior temperatures of **20 °C** and a supply temperature set at **40 °C**.

System pipe dimension	Installation spacing	Max. heating circuit length	Max. Heating area	Spec. Heat output*	Pressure loss incl. control valve	Volume flow
mm	mm	m	m²	W/m²	mbar	kg/h
16 x 2 mm for BEKOTEC-EN/P and EN/PF	75	105	7	95	70	70
	150	105	14	80	120	110
14 x 2 mm for BEKOTEC-EN 23 F	75	95	7	90	110	60
	150	80	11	80	150	77
12 x 1,5 mm for BEKOTEC-EN 18 FTS	100	65	6	90	150	50
	150	60	8	80	150	52
10 x 1,3 mm for BEKOTEC-EN 12 FK	100	55	5	90	140	43
	150	55	7.5	80	160	46

** Output data apply to ceramic surface coverings*

For additional performance data of the Schlüter-BEKOTEC-THERM systems, see the diagrams on pages 81 – 97.

Floor heating for single heating circuits

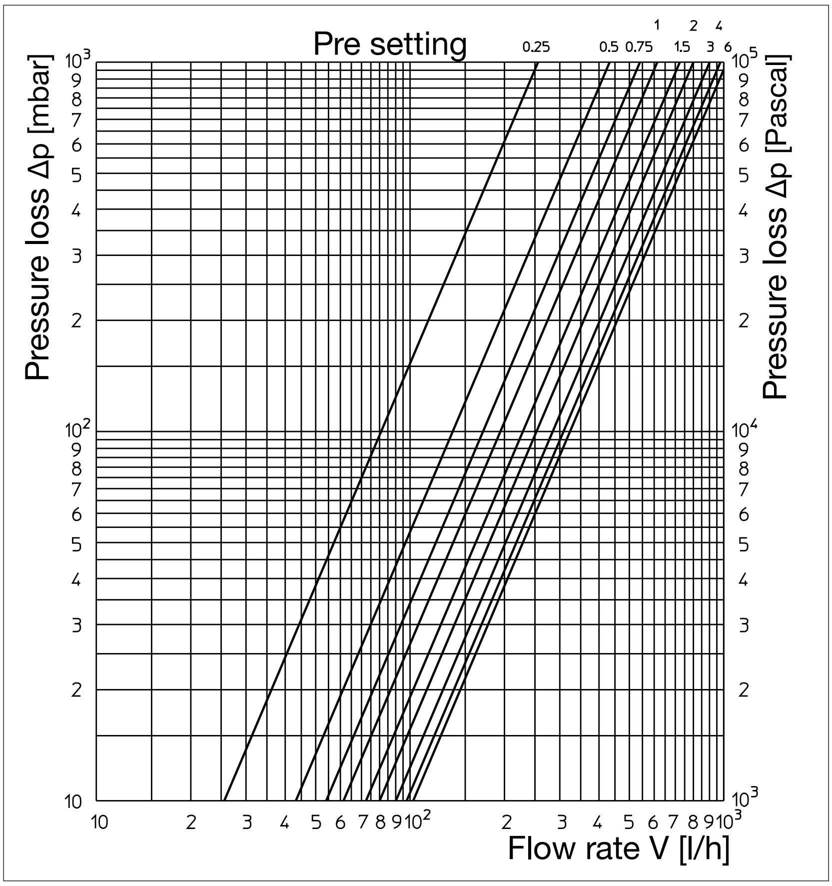
Setting and start up – RRB

The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is ready for heating only 7 days after the installation of the floor covering. Please observe the instructions of data sheet 9.1, Schlüter-BEKOTEC. It is especially important not to exceed the maximum surface temperatures. Close the valves with protective caps to ensure that no heating can take place during the installation of the screed and surface covering.

Once the construction work is complete, remove the protective cap and open the thermostat head.
The recommended setting range of the thermostat is between **3 (approx. 20 °C)** and **4 (approx. 24 °C)**. The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is ready for heating only 7 days after the completion of the cover construction. The supply temperature is increased by ≤ 5 °C a day to a maximum of 35°, starting from 25°. This temperature must then be maintained until the screed is fully cured. The covering is installed once the system has cooled down.

Setting value at RRB thermostat head	Approx. room temperature
0	closed
❄	Frost protection
1 – 5	Target value range 7 - 28 °C

Pressure loss diagram for Schlüter-BEKOTEC-THERM-RRB
Bypass closed thermostat valve fully opened.



Installation notes and system start up for various floor coverings

Ceramic tile and natural stone coverings

The uncoupling mat Schlüter-DITRA can be installed in accordance with the installation instructions of product data sheets 6.1 (DITRA 25), 6.2 (DITRA-DRAIN 4) or 6.4 (DITRA-HEAT) as soon as the screed is ready to bear weight. Gypsum based screeds can be covered as soon as they have reached a residual moisture level of 2 CM % or less.

All manufacturer specifications as well as standards and regulations such as

- DIN 18 157 Application of ceramic tiling by the thin bed method,
- DIN 18 332, Natural stone work,
- DIN 18 333, Cast stone work,
- DIN 18352, Tile and paver work
- BS 5385-3, BS 5385-4 and BS 5385-5

must be observed.

Note:
The Schlüter-DITRA uncoupling mats must be used for the installation of ceramic tile and natural stone coverings. Their assembly height of approx. 5 7 mm is to be considered in the assembly calculations. All other covering materials listed in the table are installed without the DITRA uncoupling mat, usually directly on top of the BEKOTEC screed. Keep in the installation height and final height of in mind when calculating the height of the screed with regard to **adjoining areas** with tile coverings. In addition to the applicable installation guidelines, note the permissible residual moisture content of the screed for the selected covering material. *For further information, see pages 18, 25, and 78.*

Non ceramic floor coverings

In principle, the floor coverings described in the following sections are suitable for floor heating systems. Exceptions include screeds with finished surfaces or thin layer resin screed coating systems, which are installed as a bonded assembly with the screed.
However, the area thermal insulation of the floor covering R [m2K/W] should be as low as possible and not exceed a value of R = 0.15 m² K/W.
Floor coverings with a high area thermal insulation require significantly higher operating temperatures with the same spacing of heating pipes and the same heat output (heat flow density).
Especially in the case of non ceramic coverings, high operating temperatures caused by larger thermal resistance increase the heat loss to unheated underlying areas, which adjoin soil or the outdoors.
It is frequently unknown at the time of architectural design which floor coverings will be used. In such cases, an average thermal resistance of R= 0.10m² K/W should be assumed according to DIN EN 1264-4 (BS EN 1264-4).
The corresponding heat output and operating temperatures for the various floor coverings can be found in the corresponding heat output tables and the performance diagrams on *pages 81 to 97*.
Please note the application areas as shown on pages 7 and 18, as well as the specifications of the flooring manufacturer.

Carpet, PVC, vinyl, linoleum

Check prior to installation whether the heated screed needs to be sealed according to DIN 18365, “Flooring work.” Floor coverings must bear the seal “Suitable for floor heating systems” or be approved for floor heating systems by their manufacturer. If using carpet, choose a variety with a low area thermal insulation value. Coverings with higher area thermal insulation values frequently require a higher operating temperature for the floor heating system.

- Adhesives must be suitable for floor heating systems as well as for the surface covering and the screed base.
- The residual moisture requirements for the screed must be observed *(see page 80)*.

Installation notes and system start up for various floor coverings

Non ceramic floor coverings

Parquet

Observe all manufacturer specifications when installing parquet over the Schlüter-BEKOTEC-THERM system. Consult the manufacturer and the installer about the suitability of specific parquet types and their components on a floor heating system.

The following requirements must be observed:

- The moisture content of the wood must meet the requirements of the manufacturer.
- Adhesives must be suitable for floor heating systems as well as for the surface covering and the screed base.
- If the manufacturer specifies any restrictions for the surface temperatures, suitable technical measures must be taken to comply.
- The residual moisture requirements for the screed must be observed *(see page 80)*.

Floating parquets, laminates, cork, vinyl and linoleum on support materials

Floating coatings with additional insulation between the covering and the screed increase the area thermal insulation of the floor covering. Coverings with higher area thermal insulation values frequently require a higher operating temperature for the floor heating system.

- Ask the flooring manufacturer for alternative separating layers with lower thermal resistance.
- The covering with the separating layer should not exceed a total thermal resistance of R = 0.15 m² K/W.
- Permanent attachment on the screed is preferable over floating installation.
  The manufacturer of the covering must approve the attachment to the corresponding components.
- The residual moisture requirements for the screed must be observed *(see page 80)*.

Installation notes and system start up for various floor coverings

No functional heating required according to BS EN 1264

Counter to the specifications of BS EN 1264, no functional heating is required for the Schlüter-BEKOTEC-THERM screed, since the tensions in the screed are confined to small modules within the studded BEKOTEC screed panel.

Heating up screeds with ceramic coverings

The Schlüter-BEKOTEC-THERM ceramic thermal comfort floor is ready for heating only 7 days after the installation of the floor covering. Please observe the instructions of the corresponding BEKOTEC data sheets 9.1-9.5. Increase the supply temperature by a maximum of 5 °C a day to reach the required operating temperature, starting from 25 °C water temperature.

Heating up and cure heating screeds with non ceramic coverings

The Schlüter-BEKOTEC-THERM assembly without the Schlüter-DITRA 25 uncoupling mat is ready for heating and cure heating when the screed has reached a sufficient hardness.
Weather conditions are a crucial, but often overlooked factor in the drying and curing process of the screed. The reduced screed thickness of the BEKOTEC screed is an advantage and shortens the drying time.
The screed can be heated after 7 days. All manufacturer specifications must be met.
The supply temperature is increased by < 5 °C a day to a maximum of 35 °C, starting from 25 °C.
This temperature is then maintained until the screed is fully cured.
CM measurements and surface installations can only be performed when the system is cold.

Installation readiness- residual screed moisture

Cure heating is intended to dry the screed prior to installing moisture sensitive **non** ceramic floor coverings.
Establish measuring locations in the screed that do not contain heating pipes in a perimeter of 20 cm and mark them.
The floor installer will determine the residual moisture of the screed with the CM device directly prior to installing the floor covering.
In addition to the applicable installation guidelines, note the permissible residual moisture level of the screed for the selected covering material.
The table below indicates the customary, maximum permissible moisture content for screeds.

Floor covering	Residual moisture	
	Cement screed	Gypsum based screed
Textile floor coverings*		
Elastic floor coverings* e.g. vinyl, PVC, rubber, linoleum	≤ 1.80 %	≤ 0.50 %
Parquet, cork, laminate*		

* Please observe the installation guidelines of the flooring manufacturer with regard to residual moisture in the screed. ***Note:*** *Certificate forms for heat curing can be found in Attachment V and VI.*

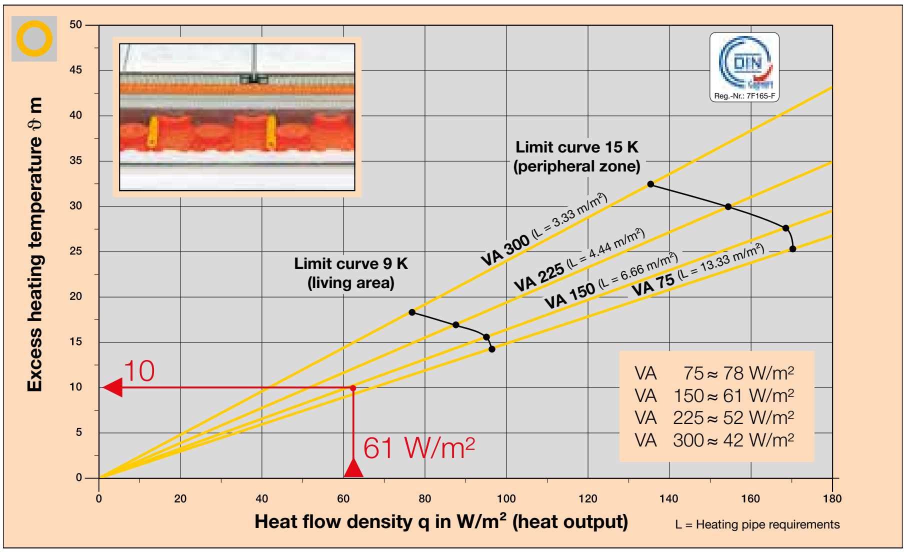
Areas with non ceramic coverings must be protected from moisture.
The uncoupling mat Schlüter-DITRA for ceramic coverings can be installed in accordance with the manufacturer's recommendations of product data sheets 6.1, 6.2 or 6.4 as soon as the moist screed is ready to bear weight.
Areas with moisture sensitive covering materials that adjoin ceramic coverings over DITRA must be protected from permeating moisture.

Product service and planning materials

Performance diagram (example)

The following pages explain the system specific results of thermal technology tests.
The individual diagrams differ by the thermal resistance factors of the corresponding surface covering. The adjoining output diagram with sample data refers to the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor with use of Schlüter-BEKOTEC-EN/P or-EN/PF.

Tested according to DIN EN 1264
Floor covering: **Ceramic tile, natural stone, cast stone and stoneware,** incl. Schlüter-DITRA 25 mat.



Example:

$\vartheta_V \triangleq$ Supply temperature = 32.5 °C

$\Delta\vartheta \triangleq$ Intended temperature splay = 5 °K

$\vartheta_i \triangleq$ Room temperature = 20 °C

$$\vartheta_m = \frac{\vartheta_V - \vartheta_R}{\ln \dfrac{\vartheta_V - \vartheta_i}{\vartheta_R - \vartheta_i}}$$

The following can be approximated:

$$\vartheta_m = \left(\vartheta_V - \frac{\Delta\vartheta}{2}\right) - \vartheta_i$$

$$\vartheta_m = \left(32.5\text{ K} - \frac{5\text{ K}}{2}\right) - 20\text{ K} = 10\text{ K}$$

Results for heat flow density
(heat output for various installation spacings)

Application

The heating output is shown as heat flow density on the lower scale (in this example: at 61 W/m²).
Moving up vertically from the desired heating output, one can determine the corresponding installation spacings of the heating pipes (75, 150, 225 or 300 mm).
When we transfer the intersection of 61 W/m² with an installation spacing of 150 to the left scale, we see the corresponding excess heating temperature of 10 °C. This temperature indicates how many degrees Celsius the heating water must exceed the desired room temperature on average. Consequently, if a room temperature of 20 °C is desired, the heating water on average must be heated to 30 °C to achieve an output of 61 W/m² with an installation spacing of 150 mm between the heating pipes.
If we stay with an excess heating temperature of 10 °C, the table shows the heating output of other spacing options between heating pipes at the intersections.

Note

To determine the necessary average heating water temperature, add the excess heating temperature to the desired room temperature.

Limit curves

Limit curve 9K (for living spaces)

This indicates at which point the maximum permissible surface temperature for living spaces is reached. For example, the surface temperature should be limited to 29 °C if a room temperature of 20 °C is desired. If the desired heat output is above the limit curve, a closer installation spacing of the heating pipes should be considered. If there is no way to bring the heating pipes closer together, the floor heating alone is not able to provide the necessary heating output.
The points on the limit curve indicate the maximum heat output of the corresponding installation spacing of the heating pipes.

Limit curve 15 K (for peripheral zones)

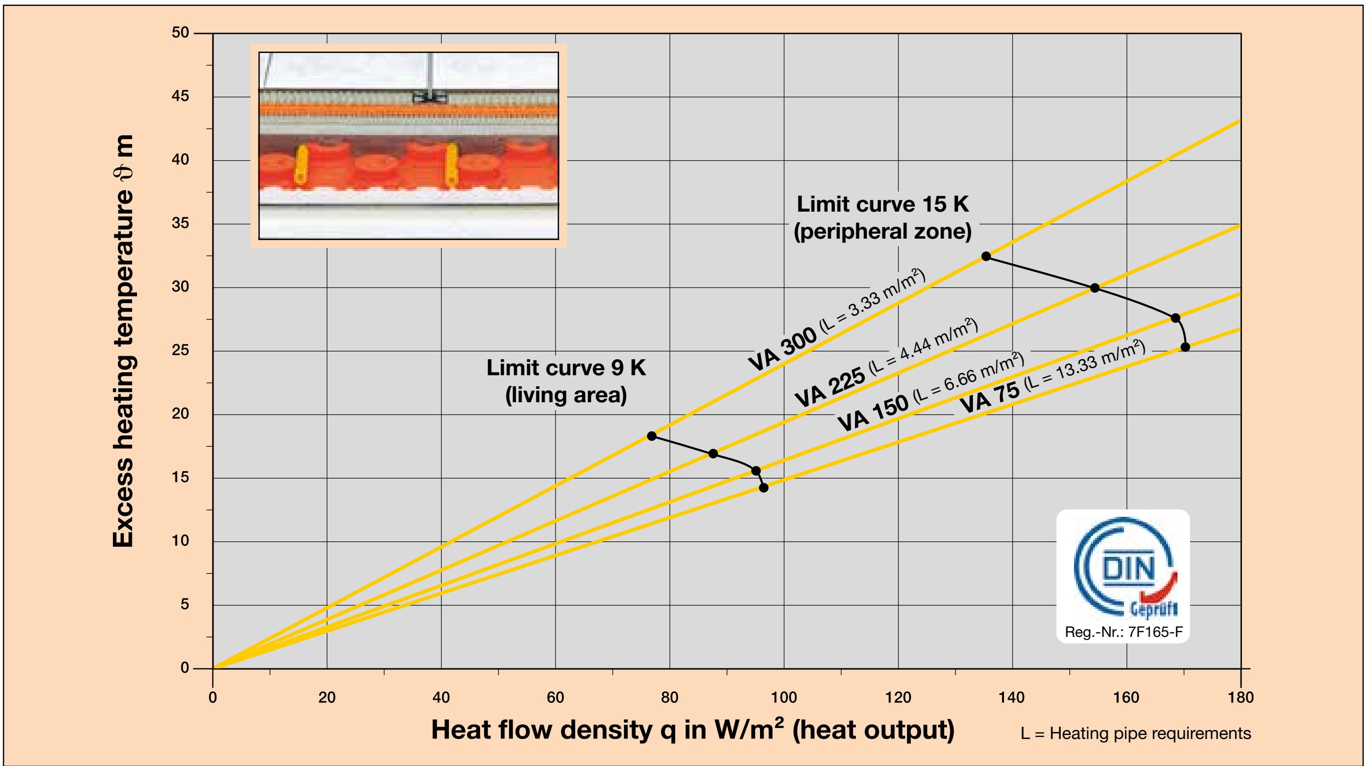
This indicates at which point the maximum permissible surface temperature for peripheral zones is reached. Peripheral zones apply e.g. to the area in front of full length windows and usually extend 1 m into the room. This allows for reaching a maximum surface temperature of 35 °C with a room temperature of 20 °C to counter the cold air coming in through large windows with higher heat output.
The points on the limit curve indicate the maximum heat output of the corresponding installation spacing of the heating pipes.

Product service and planning materials

Performance diagram: Ceramic thermal comfort floor Schlüter®-BEKOTEC-EN/P or -EN/PF, system heating pipes Ø = 16 mm

Surface cover resistance R_λ = 0 m² K/W

Floor covering: **Ceramic tile, natural stone, cast stone and stoneware**, incl. Schlüter-DITRA 25 mat



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number L.1210.P.957.SCH

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		**22.7**		**23.6**		**24.5**		**25.5**		**26.4**		**27.3**		**28.2**		**29.1**		**30.0**		**30.9**		**31.8**		**32.7**	
20	**30**	Installation spacing **VA** mm	225	225	150	150	150	150	75	75	75																
		max. heating circuit area m²	25	22	18	16	14	10	8	7	5																
		max. heating circuit length m	119	105	127	114	101	74	114	101	74																
20	**35**	Installation spacing **VA** mm	300	300	225	225	225	225	150	150	150	150	150	75	75	75	75	75	75								
		max. heating circuit area m²	30	28	25	22	20	18	17	15	14	13	10	9	8	7.5	7	5	4								
		max. heating circuit length m	107	101	119	105	96	87	121	107	101	94	74	127	114	107	101	74	61								
20	**40**	Installation spacing **VA** mm	300	300	300	300	225	225	225	225	150	150	150	150	150	150	150	150	75	75	75	75	75	75	75	75	
		max. heating circuit area m²	34	33	30	28	26	24	21	19	17	16	15	14	13	12	11	10	9	8	7	6	5	4.5	4	3	
		max. heating circuit length m	121	117	107	101	123	114	101	92	121	114	107	101	94	87	81	74	127	114	101	87	74	67	61	47	
20	**43**	Installation spacing **VA** mm	300	300	300	300	300	300	225	225	225	150	150	150	150	150	150	150	150	150	75	75	75	75	75	75	75
		max. heating circuit area m²	36	35	34	33	30	28	26	24	22	18	17	16	15	14	13	12	11	10	9	8	7.5	7	6.5	6	5.5
		max. heating circuit length m	127	124	121	117	107	101	123	114	105	127	121	114	107	101	94	87	81	74	127	114	107	101	94	87	81
		Avg. surface temp. °C		**26.7**		**27.6**		**28.5**		**29.5**		**30.4**		**31.3**		**32.2**		**33.1**		**34.0**		**34.9**					
24	**30**	Installation spacing **VA** mm	150	75	75																						
		max. heating circuit area m²	12	7	6																						
		max. heating circuit length m	87	101	87																						
24	**35**	Installation spacing **VA** mm			150	150	150	150	150	75	75	75	75														
		max. heating circuit area m²			18	16	14	12	9	8	7	6	4.5														
		max. heating circuit length m			127	114	101	87	67	114	101	87	67														
24	**40**	Installation spacing **VA** mm				150	150	150	150	150	150	150	75	75	75	75	75	75	75	75							
		max. heating circuit area m²				18	17	16	15	14	13	12	9	8	7	6.5	6	5.5	5	4.5							
		max. heating circuit length m				127	121	114	107	101	94	87	127	114	101	94	87	81	74	67							
24	**43**	Installation spacing **VA** mm						150	150	150	150	150	150	150	150	75	75	75	75	75	75	75	75				
		max. heating circuit area m²						18	17	16	15	14	13	12	11	9	8	7.5	7	6.5	6	5.5	5				
		max. heating circuit length m						127	121	114	107	101	94	87	81	127	114	107	101	94	87	81	74				

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions::

Pressure loss: max. 250 mbar

Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)

tu: 15 °C

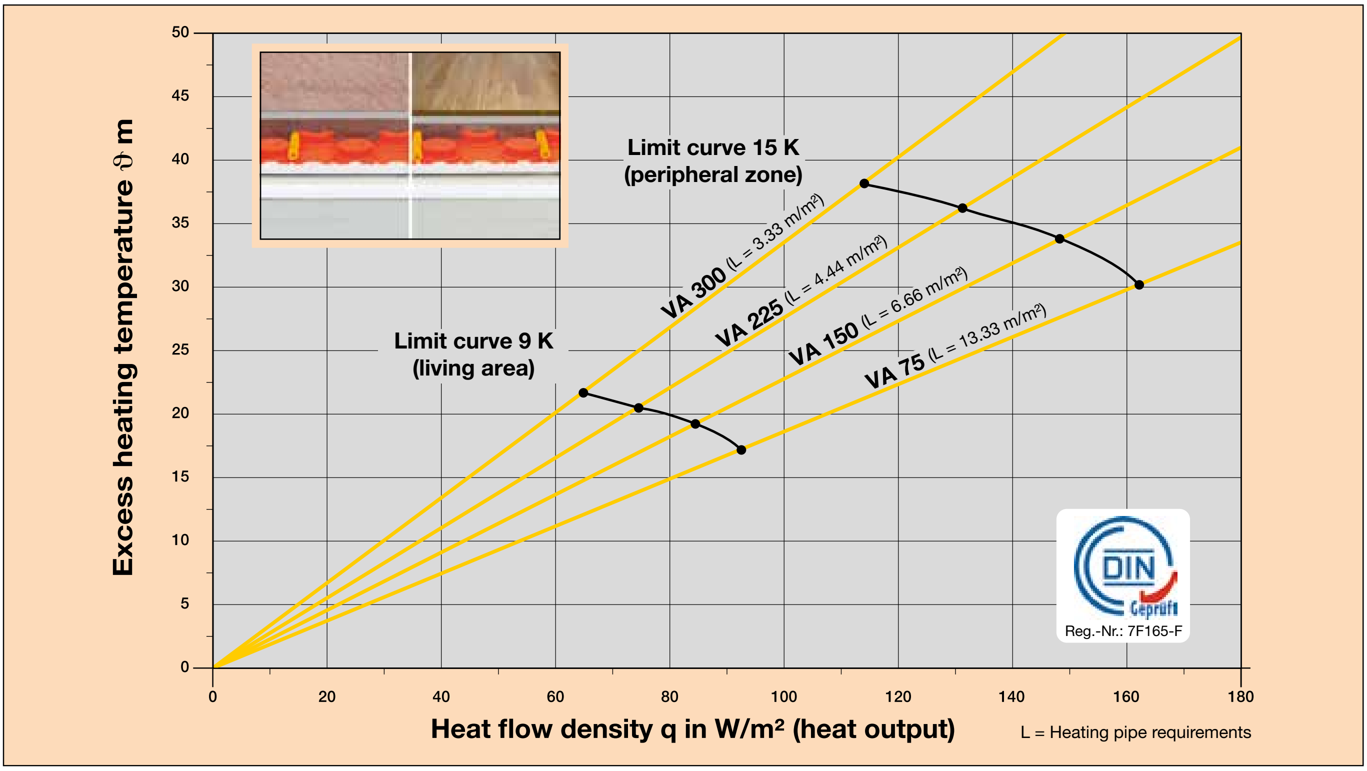
Single connection length: 3 - 4 m

Product service and planning materials

Performance diagram: Vinyl, linoleum or parquet up to approx. 8 mm Schlüter®-BEKOTEC-EN/P or -EN/PF, system heating pipes Ø = 16 mm

Surface cover resistance R_{λ} = 0.05 m² K/W

Floor covering: **Vinyl, linoleum or parquet up to approx. 8 mm,** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 380

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		**22.7**		**23.6**		**24.5**		**25.5**		**26.4**		**27.3**		**28.2**		**29.1**		**30.0**		**30.9**		**31.8**		**32.7**	
20	**30**	Installation spacing **VA** mm	150	150	150	75	75																				
		max. heating circuit area m²	16	15	13	8	7																				
		max. heating circuit length m	114	107	94	114	101																				
20	**35**	Installation spacing **VA** mm	300	300	225	225	150	150	150	75	75	75															
		max. heating circuit area m²	33	30	26	22	18	16	11	8	7	5															
		max. heating circuit length m	117	107	123	105	127	114	81	114	101	74															
20	**40**	Installation spacing **VA** mm	300	300	300	300	225	225	150	150	150	150	150	75	75	75	75	75									
		max. heating circuit area m²	35	33	28	25	23	21	18	17	15	13	10	8	7	6	5	4									
		max. heating circuit length m	124	117	101	91	110	101	127	121	107	94	74	114	101	87	74	61									
20	**43**	Installation spacing **VA** mm	300	300	300	300	300	225	225	225	150	150	150	15	150	75	75	75	75	75	75						
		max. heating circuit area m²	35	35	33	30	28	26	24	21	18	16	14	12	10	9	8	7	6	5	3.5						
		max. heating circuit length m	124	124	117	107	101	123	114	105	127	114	101	87	74	127	114	101	87	74	54						
		Avg. surface temp. °C		**26.7**		**27.6**		**28.5**		**29.5**		**30.4**		**31.3**		**32.2**		**33.1**		**34.0**		**34.9**					
24	**30**	Installation spacing **VA** mm	75																								
		max. heating circuit area m²	7																								
		max. heating circuit length m	101																								
24	**35**	Installation spacing **VA** mm		150	150	150	75	75																			
		max. heating circuit area m²		13	12	10	8	6.5																			
		max. heating circuit length m		114	87	74	114	94																			
24	**40**	Installation spacing **VA** mm					150	150	150	150	75	75	75														
		max. heating circuit area m²					16	14	12	9	8	7	5														
		max. heating circuit length m					114	101	87	67	114	101	74														
24	**43**	Installation spacing **VA** mm							150	150	150	75	75	75	75	75											
		max. heating circuit area m²							16	14	12	9	8	7	6	5											
		max. heating circuit length m							114	101	87	127	114	101	87	74											

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

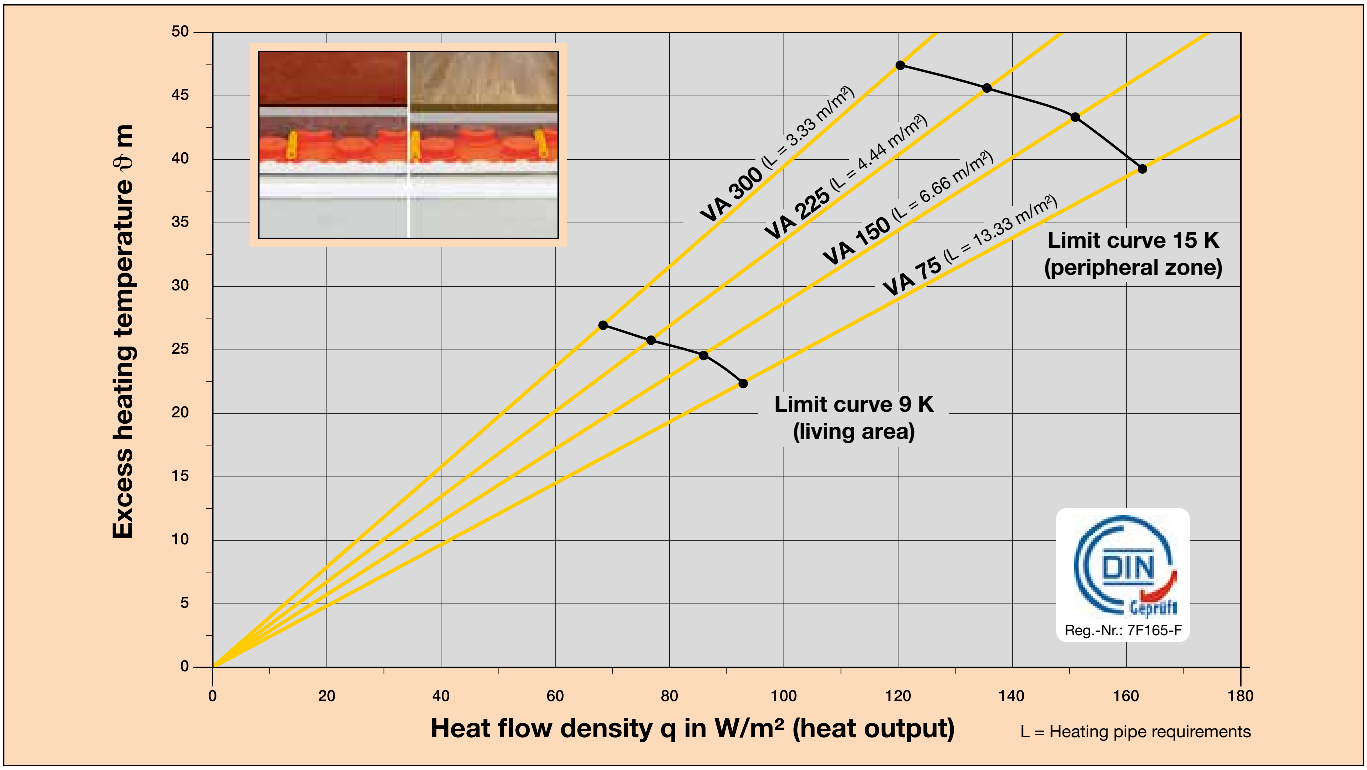
Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Carpeting up to approx. 8 mm or parquet up to approx. 15 mm Schlüter®-BEKOTEC-EN/P or -EN/PF, system heating pipes Ø = 16 mm

Surface cover resistance R_λ = 0.1 m² K/W

Floor covering: **Carpet up to approx. 8 mm or parquet up to 15 mm** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 380

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	30	Installation spacing **VA** mm	150	150	75																						
		max. heating circuit area m²	16	10	6																						
		max. heating circuit length m	114	74	87																						
20	35	Installation spacing **VA** mm	300	225	150	150	150	75	75																		
		max. heating circuit area m²	26	20	17	14	9	7	5																		
		max. heating circuit length m	94	96	121	101	67	101	74																		
20	40	Installation spacing **VA** mm	300	300	300	225	150	150	150	150	75	75	75														
		max. heating circuit area m²	33	30	27	23	18	16	13	8	8	6	4														
		max. heating circuit length m	117	107	97	110	127	114	94	61	114	87	61														
20	43	Installation spacing **VA** mm	300	300	300	225	225	225	150	150	150	75	75	75	75												
		max. heating circuit area m²	36	34	30	26	24	20	17	15	12	8	7	6	4												
		max. heating circuit length m	127	121	107	123	114	96	121	107	87	114	101	87	61												

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

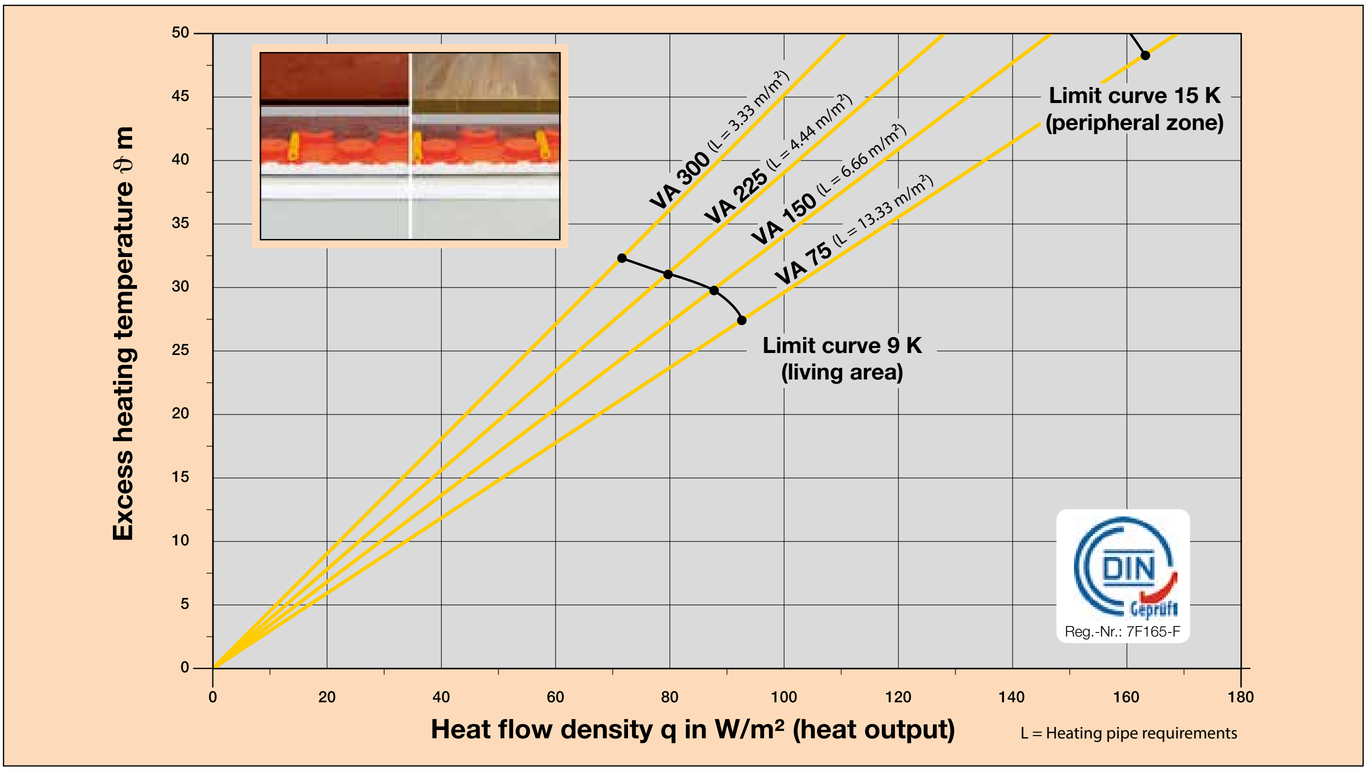
Presumed marginal conditions:

Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Parquet up to approx. 22 mm or thick carpet Schlüter®-BEKOTEC-EN/P or -EN/PF, system heating pipes Ø = 16 mm

Surface cover resistance R_λ = 0.15 m² K/W
Floor covering: **Parquet of approx. 22 mm or thick carpet** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 380

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	**30**	Installation spacing **VA** mm	150	75																							
		max. heating circuit area m²	11	6																							
		max. heating circuit length m	81	87																							
20	**35**	Installation spacing **VA** mm	225	150	150	75	75																				
		max. heating circuit area m²	24	18	14	8	5																				
		max. heating circuit length m	114	127	101	114	74																				
20	**40**	Installation spacing **VA** mm	300	300	225	150	150	150	75	75																	
		max. heating circuit area m²	32	28	23	17	14	9	7	5																	
		max. heating circuit length m	114	101	110	121	101	67	101	74																	
20	**43**	Installation spacing **VA** mm	300	300	300	225	225	150	150	75	75	75															
		max. heating circuit area m²	34	30	28	24	20	16	12	8	6	4															
		max. heating circuit length m	121	107	101	114	96	114	87	114	87	61															

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

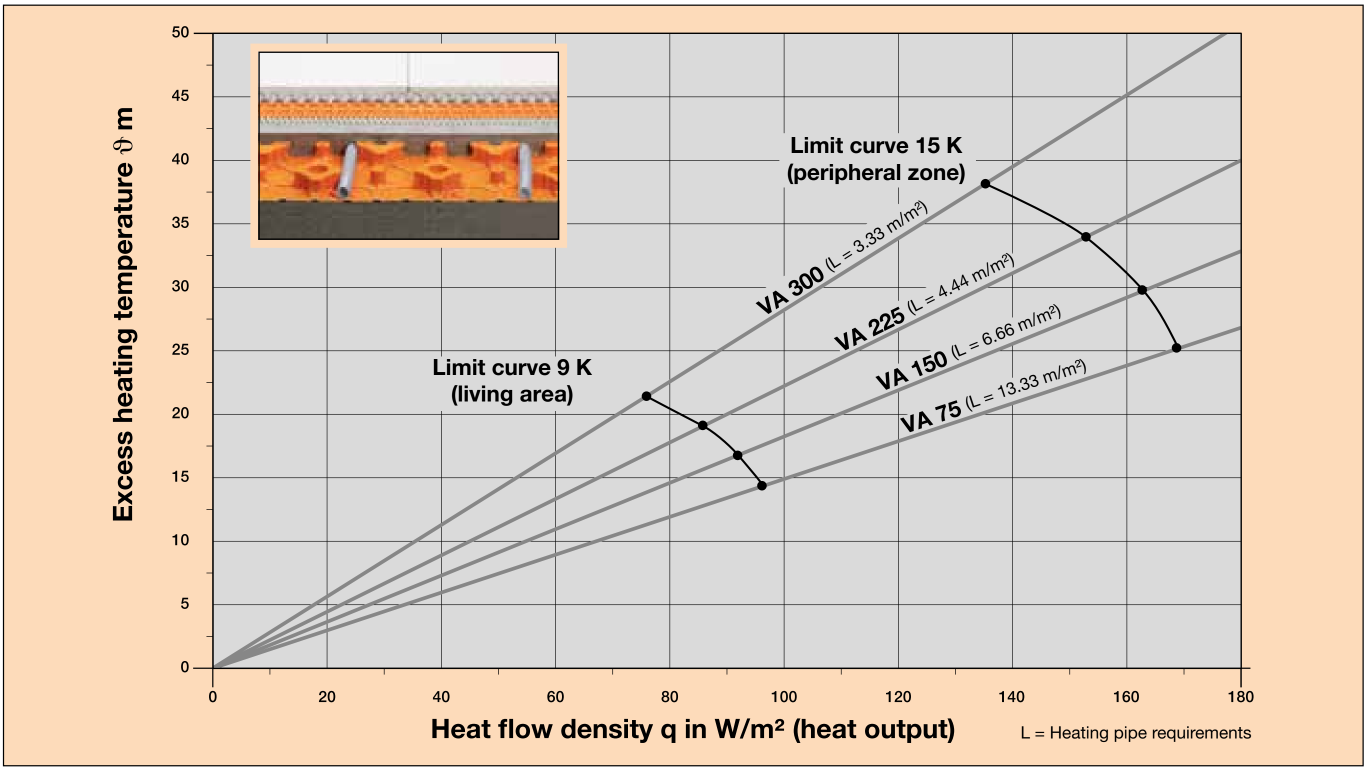
Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0,75 m²KW / (1,33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Ceramic thermal comfort floor Schlüter®-BEKOTEC-EN 23 F, system heating pipes Ø = 14 mm

Surface cover resistance R_λ = 0 m² K/W

Floor covering: **Ceramic tile, natural stone, cast stone and stoneware** incl. Schlüter-DITRA 25 mat.



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number L.1210.P.950.SCH

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**145**
		Avg. surface temp. °C		**22.7**		**23.6**		**24.5**		**25.5**		**26.4**		**27.3**		**28.2**		**29.1**		**30.0**		**30.9**		**31.8**		**32.7**	
20	**30**	Installation spacing **VA** mm	225	225	150	150	150	75	75	75																	
		max. heating circuit area m²	19	16	14	12	9	7	5	4																	
		max. heating circuit length m	92	78	101	87	67	101	74	61																	
20	**35**	Installation spacing **VA** mm	225	225	225	225	225	150	150	150	150	150	75	75	75	75	75	75									
		max. heating circuit area m²	24	22	20	18	16	15	14	12	10	7.5	7	6	5.5	5	4	3.5									
		max. heating circuit length m	114	105	96	87	79	107	101	87	74	57	101	87	81	74	61	54									
20	**40**	Installation spacing **VA** mm	300	300	300	300	225	225	150	150	150	150	150	150	150	150	75	75	75	75	75	75	75	75			
		max. heating circuit area m²	30	27	25	23	20	18	16	15	14	13	12	11	9	8	8	7	6.5	6	5.5	5	4.5	3.5			
		max. heating circuit length m	107	97	91	84	96	87	114	107	101	94	87	81	67	61	114	101	94	87	81	74	67	54			
20	**43**	Installation spacing **VA** mm	300	300	300	300	300	225	225	225	225	150	150	150	150	150	150	150	150	75	75	75	75	75	75	75	75
		max. heating circuit area m²	33	30	28	26	24	24	22	20	18	16	14	13	12	11	10	9	8	8	7	6.5	6	5	4.5	4	3.5
		max. heating circuit length m	117	107	101	94	87	114	105	96	87	114	101	94	87	81	74	67	61	114	101	94	87	74	67	61	54
		Avg. surface temp. °C		**26.7**		**27.6**		**28.5**		**29.5**		**30.4**		**31.3**		**32.2**		**33.1**		**34.0**		**34.9**					
24	**30**	Installation spacing **VA** mm	75	75	75																						
		max. heating circuit area m²	5.5	5	4																						
		max. heating circuit length m	81	74	61																						
24	**35**	Installation spacing **VA** mm			150	150	150	150	75	75	75	75	75														
		max. heating circuit area m²			14	12	10	8	7	6	5.5	4	2.5														
		max. heating circuit length m			101	87	74	61	101	87	81	61	41														
24	**40**	Installation spacing **VA** mm				150	150	150	150	150	150	150	75	75	75	75	75	75	75	75							
		max. heating circuit area m²				16	15	14	12	11	10	9	7	6.5	6	5.5	5	4	3	2.5							
		max. heating circuit length m				114	107	101	87	81	74	67	101	94	87	81	74	61	47	41							
24	**43**	Installation spacing **VA** mm						150	150	150	150	150	150	150	150	75	75	75	75	75	75	75					
		max. heating circuit area m²						16	15	14	13.5	12	11	10	9	8	7.5	7	6.5	6	5	4					
		max. heating circuit length m						114	107	101	97	87	81	74	67	114	107	101	94	87	74	61					

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

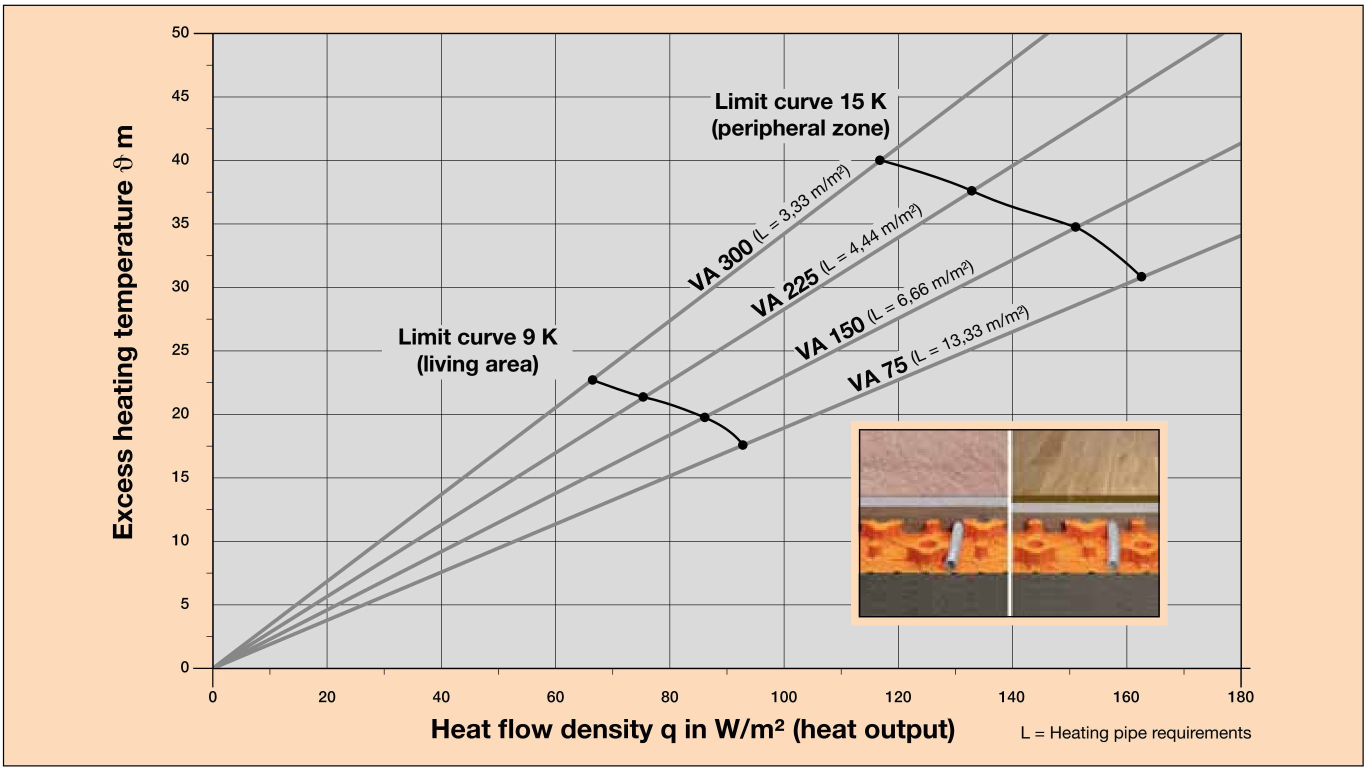
Pressure loss: max. 250 mbar
Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)
tu: 15 °C
Single connection length: 3 - 4 m

Product service and planning materials

Performance diagram: Vinyl, linoleum or parquet up to approx. 8 mm Schlüter®-BEKOTEC-EN 23 F, system heating pipes Ø = 14 mm

Surface cover resistance R_λ = 0.05 m² K/W

Floor covering: **Vinyl, linoleum or parquet up to approx. 8 mm,** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 379

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**145**
		Avg. surface temp. °C		**22.7**		**23.6**		**24.5**		**25.5**		**26.4**		**27.3**		**28.2**		**29.1**		**30.0**		**30.9**		**31.8**		**32.7**	
20	**30**	Installation spacing **VA** mm	150	150	150	75	75																				
		max. heating circuit area m²	13	12	8	6	4.5																				
		max. heating circuit length m	94	87	61	87	67																				
20	**35**	Installation spacing **VA** mm	300	225	225	225	150	150	75	75	75	75															
		max. heating circuit area m²	26	24	20	18	14	11	8	7	6	3.5															
		max. heating circuit length m	94	114	96	87	101	81	114	101	87	54															
20	**40**	Installation spacing **VA** mm	300	300	300	225	225	225	150	150	150	150	75	75	75	75	75										
		max. heating circuit area m²	28	25	24	22	20	17	15	13	11	8	8	7	6	5	3										
		max. heating circuit length m	101	91	87	105	96	83	107	94	81	61	114	101	87	74	47										
20	**43**	Installation spacing **VA** mm	300	300	300	300	225	225	225	150	150	150	150	150	75	75	75	75	75								
		max. heating circuit area m²	30	28	26	24	22	20	18	16	14	13	11	8.5	7.5	7	6	5	4								
		max. heating circuit length m	107	101	94	87	105	96	87	114	101	94	81	64	107	101	87	74	61								
		Avg. surface temp. °C		**26.7**		**27.6**		**28.5**		**29.5**		**30.4**		**31.3**		**32.2**		**33.1**		**34.0**		**34.9**					
24	**30**	Installation spacing **VA** mm	75																								
		max. heating circuit area m²	6																								
		max. heating circuit length m	87																								
24	**35**	Installation spacing **VA** mm		150	150	75	75	75	75																		
		max. heating circuit area m²		13	10	8	6	4	3																		
		max. heating circuit length m		94	74	114	87	61	47																		
24	**40**	Installation spacing **VA** mm					150	150	150	75	75	75	75														
		max. heating circuit area m²					13	11	8	7	6	5	3														
		max. heating circuit length m					94	81	61	101	87	74	47														
24	**43**	Installation spacing **VA** mm							150	150	150	75	75	75	75	75											
		max. heating circuit area m²							13	11	9	7.5	6.5	5.5	5	3											
		max. heating circuit length m							94	81	67	107	94	81	74	47											

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

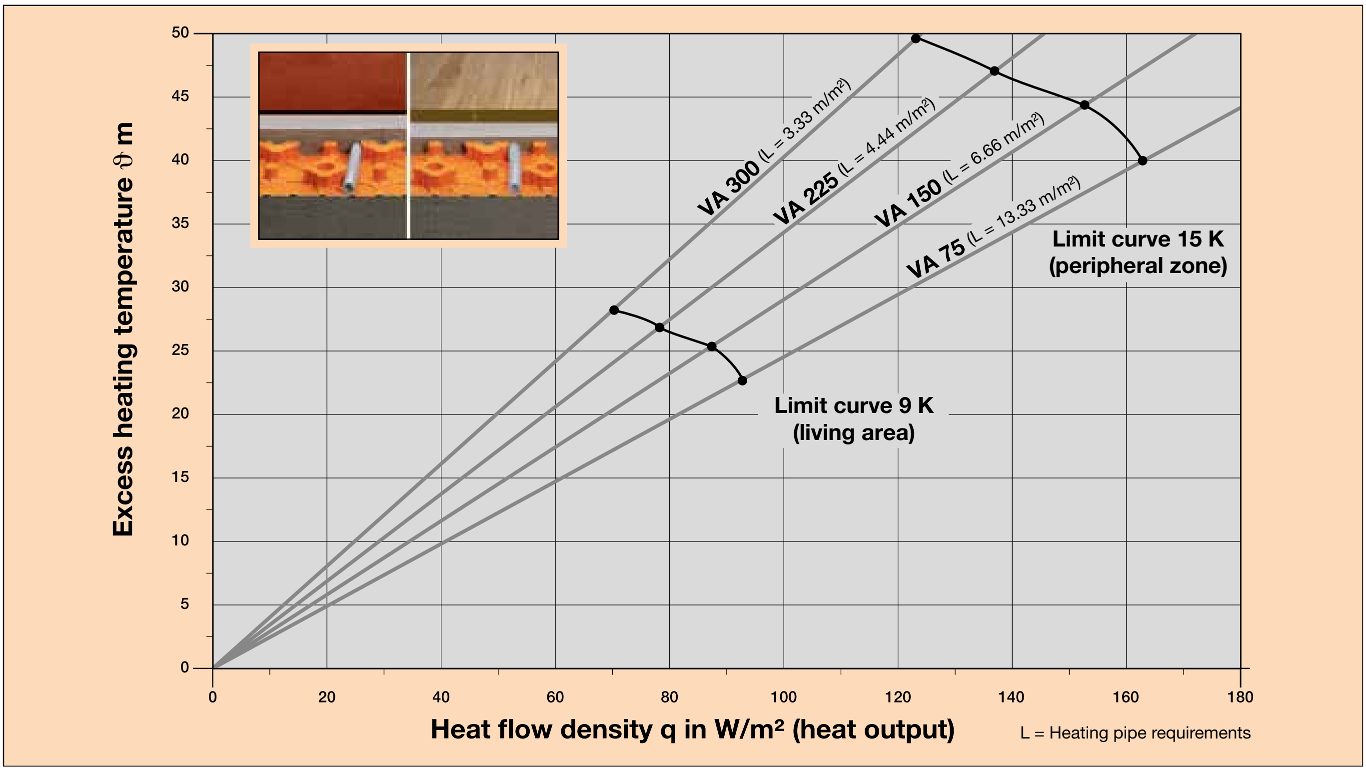
Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Carpeting up to approx. 8 mm or parquet up to approx. 15 mm Schlüter®-BEKOTEC-EN 23 F, system heating pipes Ø = 14 mm

Surface cover resistance R_{λ} = 0.1 m² K/W

Floor covering: **Carpet up to approx. 8 mm or parquet up to 15 mm** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 379

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	30	Installation spacing **VA** mm	150	75	75																						
		max. heating circuit area m²	12	7	5																						
		max. heating circuit length m	87	101	74																						
20	35	Installation spacing **VA** mm	225	225	150	150	75	75	75																		
		max. heating circuit area m²	21	18	15	11	8	6	3																		
		max. heating circuit length m	101	87	107	81	114	87	47																		
20	40	Installation spacing **VA** mm	300	300	225	225	150	150	150	75	75	75	75														
		max. heating circuit area m²	28	25	22	19	16	13	10	7	6	4.5	3														
		max. heating circuit length m	101	91	105	92	114	94	74	101	87	67	47														
20	43	Installation spacing **VA** mm	300	300	300	225	225	150	150	150	150	75	75	75	75												
		max. heating circuit area m²	30	27	24	22	19	16	14	12	8	7	6	4.5	3												
		max. heating circuit length m	107	97	87	105	92	114	101	87	61	101	87	67	47												

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

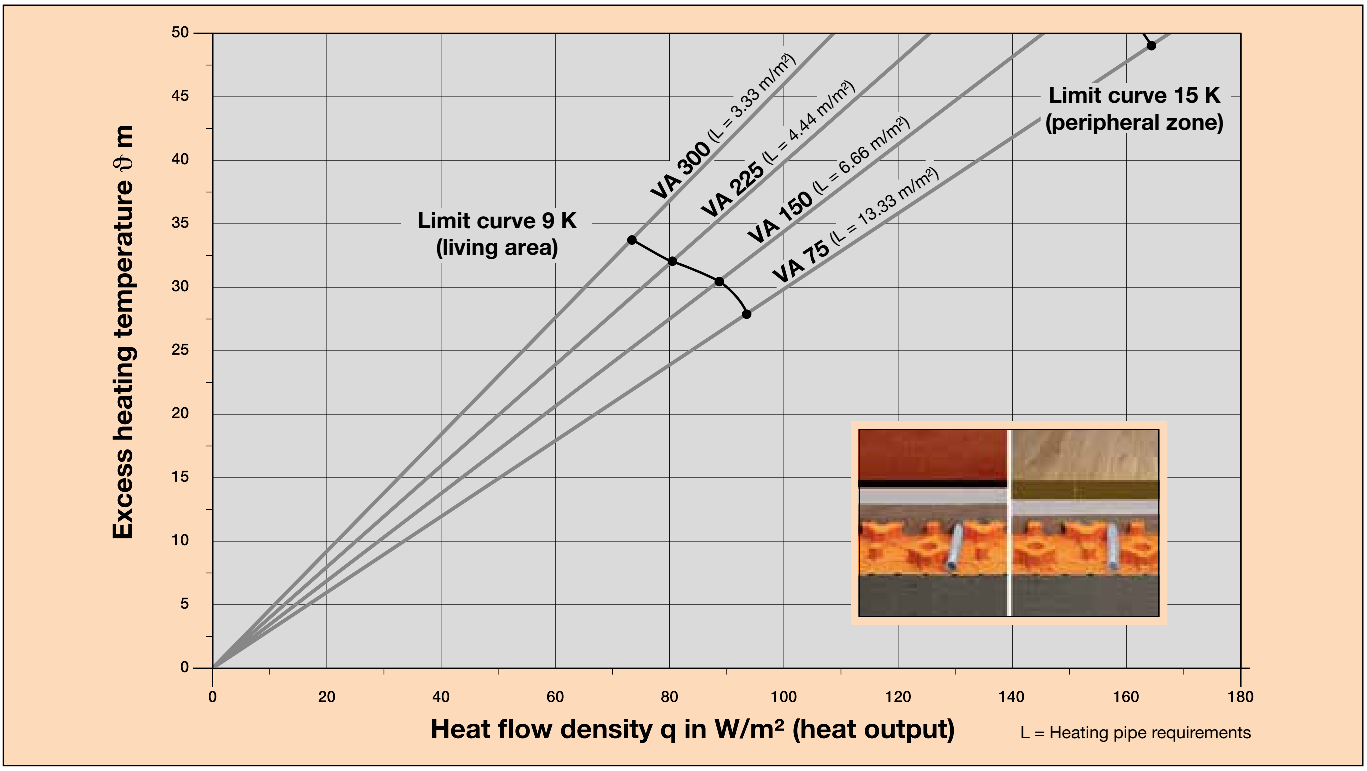
Pressure loss: max. 250 mbar
Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)
tu: 15 °C
Single connection length: 3 - 4 m

Product service and planning materials

Performance diagram: Parquet up to approx. 22 mm or thick carpet Schlüter®-BEKOTEC-EN 23 F, system heating pipes Ø = 14 mm

Surface cover resistance R_λ = 0.15 m² K/W

Floor covering: **Parquet of approx. 22 mm or thick carpet** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 379

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	**30**	Installation spacing **VA** mm	150	75																							
		max. heating circuit area m²	10	6																							
		max. heating circuit length m	74	87																							
20	**35**	Installation spacing **VA** mm	225	150	150	75	75																				
		max. heating circuit area m²	20	15	9	7	4																				
		max. heating circuit length m	96	107	67	101	61																				
20	**40**	Installation spacing **VA** mm	300	225	225	150	150	75	75	75																	
		max. heating circuit area m²	27	24	19	15	11	7.5	6	3																	
		max. heating circuit length m	97	114	92	107	81	107	87	47																	
20	**43**	Installation spacing **VA** mm	300	300	225	225	150	150	75	75	75	75															
		max. heating circuit area m²	30	27	23	20	16	13	8	7	5	3															
		max. heating circuit length m	107	97	110	96	114	84	114	101	74	47															

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

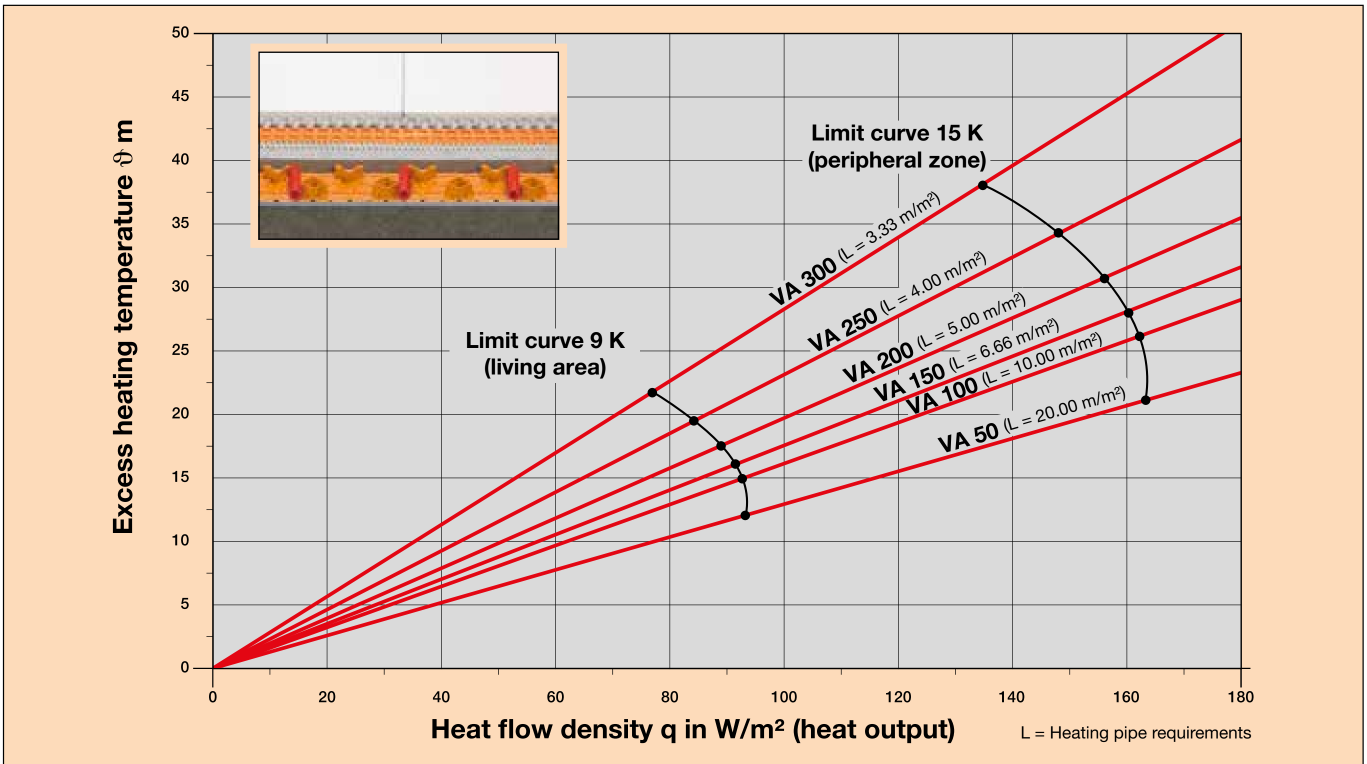
Presumed marginal conditions:

Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Ceramic thermal comfort floor Schlüter®-BEKOTEC-EN 18 FTS, system heating pipes Ø = 12 mm

Surface cover resistance R_λ = 0 m² K/W
Floor covering: **Ceramic tile, natural stone, cast stone and stoneware**, incl. Schlüter-DITRA 25 mat.



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number L.1210.P.949.SCH

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		**22.7**		**23.6**		**24.5**		**25.5**		**26.4**		**27.3**		**28.2**		**29.1**		**30.0**		**30.9**		**31.8**		**32.7**	
20	**30**	Installation spacing **VA** mm	250	200	200	150	150	100	100	50	50	50															
		max. heating circuit area m²	17	15	12	10	8	6	5.5	4	3.5	3															
		max. heating circuit length m	75	82	67	74	61	67	62	87	77	67															
20	**35**	Installation spacing **VA** mm	250	250	250	200	200	150	150	150	150	150	100	100	100	100	50	50	50	50							
		max. heating circuit area m²	21	19	18	16	14	12	11	10	8	7	7	6	5	4	4	3.5	3	2.5							
		max. heating circuit length m	91	84	80	87	77	87	81	74	61	54	77	67	57	47	87	77	67	57							
20	**40**	Installation spacing **VA** mm	300	300	250	250	200	200	150	150	150	150	150	150	100	100	100	100	100	100	100	100	50	50	50	50	50
		max. heating circuit area m²	25	22	20	19	17	15	14	13	12	11	10	9	8	7	6.5	6	5.5	5	4.5	4	4	3.5	3	3	2.5
		max. heating circuit length m	91	81	87	83	92	82	101	94	87	81	74	67	87	77	72	67	62	57	52	47	87	77	67	67	57
20	**43**	Installation spacing **VA** mm	300	300	300	300	250	250	200	150	150	150	150	150	150	150	100	100	100	100	100	100	100	100	100	50	50
		max. heating circuit area m²	26	24	22	20	19	18	16	14	13	12	11	10.5	10	9	8	7	6.5	6	6	5.5	5	4.5	4	3.5	3.5
		max. heating circuit length m	93	87	81	74	83	80	87	100	94	87	81	77	74	67	87	77	72	67	67	62	57	52	47	77	77
		Avg. surface temp. °C		**26.7**		**27.6**		**28.5**		**29.5**		**30.4**		**31.3**		**32.2**		**33.1**		**34.0**		**34.9**					
24	**30**	Installation spacing **VA** mm	100	100	100	50	50																				
		max. heating circuit area m²	5	4.5	3	3	2																				
		max. heating circuit length m	57	52	37	67	47																				
24	**35**	Installation spacing **VA** mm				150	150	150	100	100	100	50	50	50													
		max. heating circuit area m²				9	8	7	6	5	4	3.5	3	2.5													
		max. heating circuit length m				67	61	54	67	57	47	77	67	57													
24	**40**	Installation spacing **VA** mm					150	150	150	150	150	150	150	100	100	100	100	50	50	50	50						
		max. heating circuit area m²					12	11	10	9	8	7	6	6	5	4.5	4	4	3.5	3	2.5						
		max. heating circuit length m					87	81	74	67	61	54	47	67	57	52	47	87	77	67	57						
24	**43**	Installation spacing **VA** mm							150	150	150	150	150	150	150	100	100	100	100	100	50	50	50				
		max. heating circuit area m²							12	11.5	11	10	9	8	7	7	6	5	4.5	4	4	3.5	3				
		max. heating circuit length m							87	84	81	74	67	61	54	77	67	57	52	47	87	77	67				

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

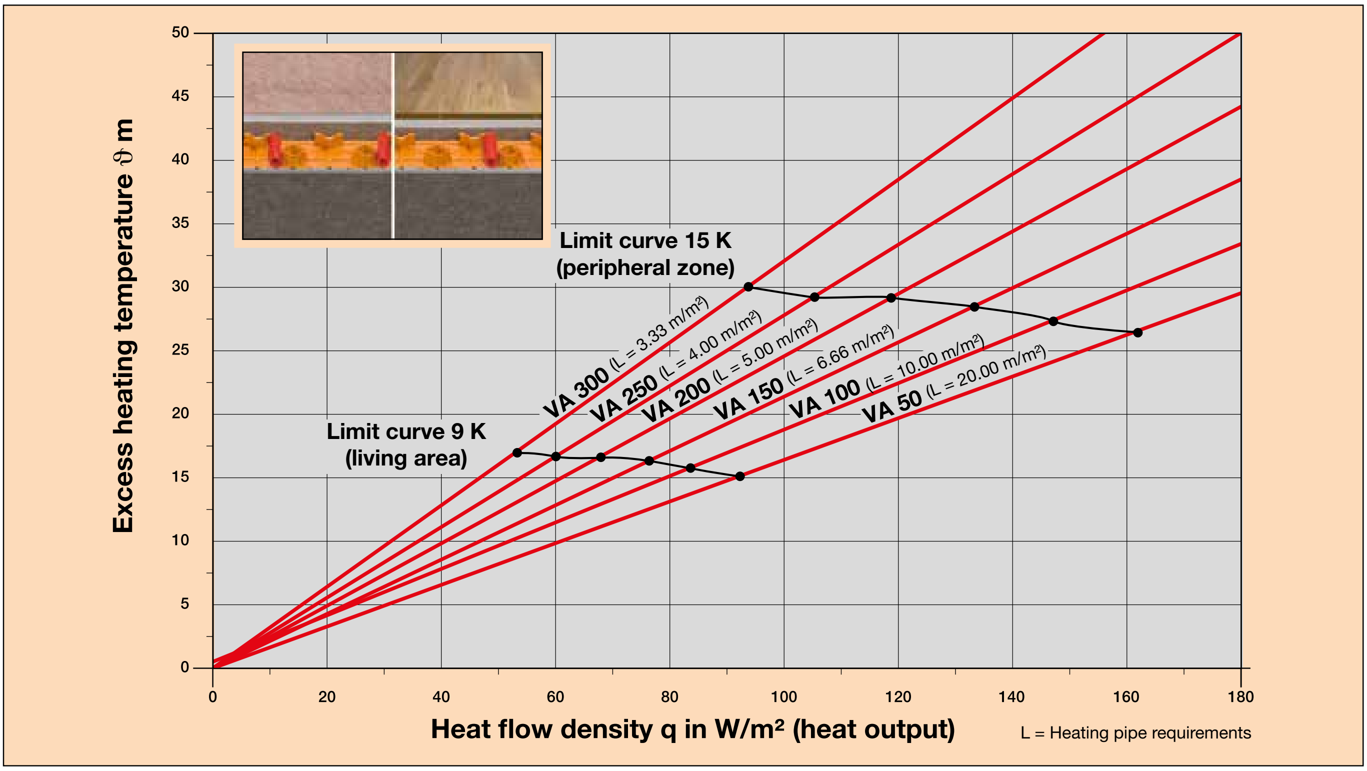
Presumed marginal conditions:
Pressure loss: max. 250 mbar
Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)
tu: 15 °C
Single connection length: 3 - 4 m

Product service and planning materials

Performance diagram: Vinyl, linoleum or parquet up to approx. 8 mm Schlüter®-BEKOTEC-EN 18 FTS, system heating pipes Ø = 12 mm

Surface cover resistance R_λ = 0.05 m² K/W

Floor covering: **Vinyl, linoleum or parquet up to approx. 8 mm** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 378

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	30	Installation spacing **VA** mm	200	150	100	100	50	50																			
		max. heating circuit area m²	12	10	7	5.5	4	3																			
		max. heating circuit length m	67	74	77	62	87	67																			
20	35	Installation spacing **VA** mm	250	250	200	200	150	150	100	100	50	50	50														
		max. heating circuit area m²	19	18	16	15	10	8.5	7	6	4	3	2.5														
		max. heating circuit length m	83	79	87	82	74	64	77	67	87	67	57														
20	40	Installation spacing **VA** mm	300	250	250	200	200	200	150	150	150	150	100	100	100	50	50	50									
		max. heating circuit area m²	22	19	18	17	15	13	11	10	9	7.5	6	5	4	3.5	3	2.5									
		max. heating circuit length m	81	83	79	92	82	72	81	74	67	57	67	57	47	77	67	57									
20	43	Installation spacing **VA** mm	300	300	300	250	250	200	200	150	150	150	150	150	100	100	100	100	50	50	20						
		max. heating circuit area m²	24	23	22	19	18	16	14	13	12	11	9.5	7.5	6.5	5.5	5	3.5	3.5	3	2.5						
		max. heating circuit length m	87	84	81	83	79	87	77	94	87	81	71	57	72	62	57	42	77	67	57						
		Avg. surface temp. °C		26.7		27.6		28.5		29.5		30.4		31.3		32.2		33.1		34.0		34.9					
24	30	Installation spacing **VA** mm	50	50																							
		max. heating circuit area m²	3.5	3																							
		max. heating circuit length m	77	67																							
24	35	Installation spacing **VA** mm		150	150	100	100	50	50																		
		max. heating circuit area m²		9	8	7	5	4	2.5																		
		max. heating circuit length m		67	61	77	57	87	57																		
24	40	Installation spacing **VA** mm					150	150	150	100	100	50	50	50													
		max. heating circuit area m²					10	9	7.5	6	5	4	3	2.5													
		max. heating circuit length m					74	67	57	67	57	87	67	57													
24	43	Installation spacing **VA** mm							150	150	150	100	100	100	50	50	50										
		max. heating circuit area m²							10	9	8	6	5	4	3.5	3	2.5										
		max. heating circuit length m							74	67	61	67	57	47	77	67	57										

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

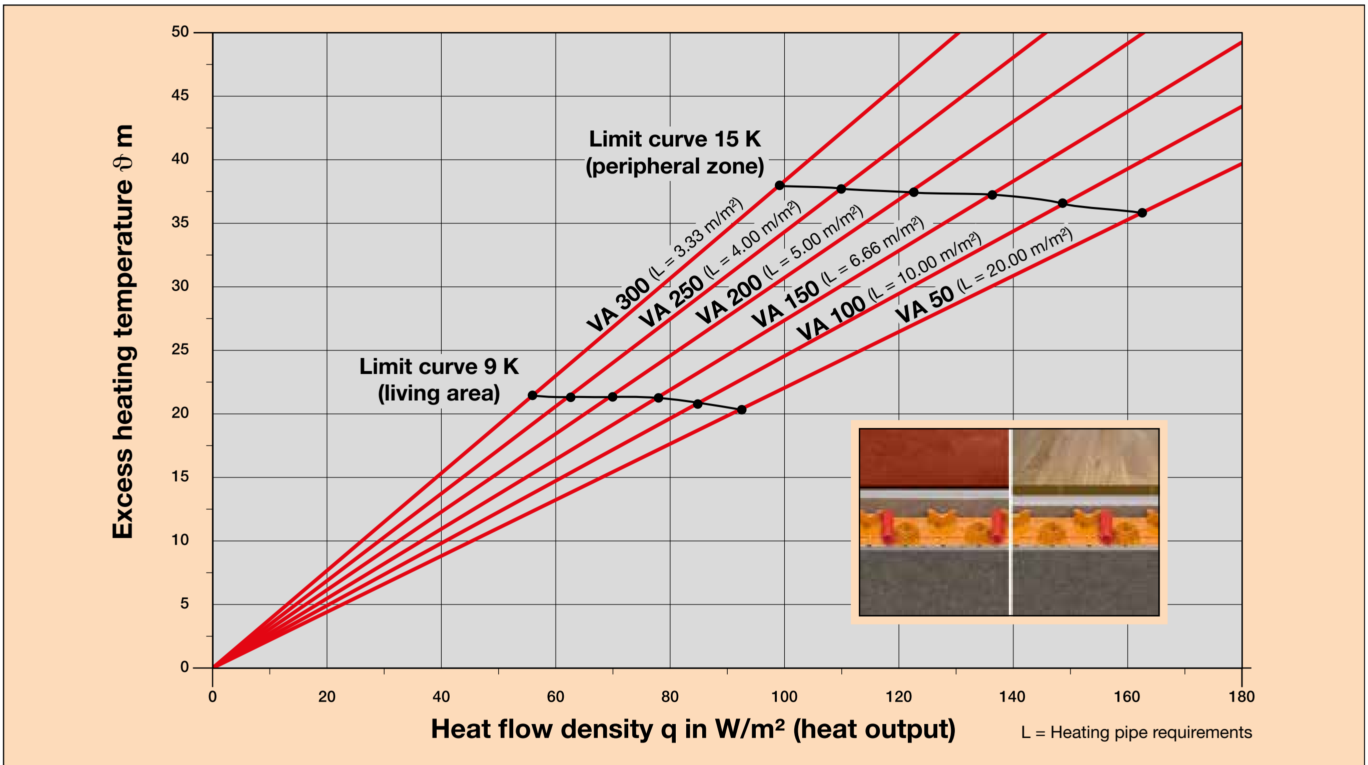
Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Carpeting up to approx. 8 mm or parquet up to approx. 15 mm Schlüter®-BEKOTEC-EN 18 FTS, system heating pipes Ø = 12 mm

Surface cover resistance R_λ = 0.1 m² K/W

Floor covering: **Carpet up to approx. 8 mm or parquet up to 15 mm** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 378

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	**30**	Installation spacing **VA** mm	150	100	50																						
		max. heating circuit area m²	10	7	3.5																						
		max. heating circuit length m	74	77	77																						
20	**35**	Installation spacing **VA** mm	250	200	150	150	100	50	50																		
		max. heating circuit area m²	16	14	12	9	7	4	3																		
		max. heating circuit length m	71	77	87	67	77	87	67																		
20	**40**	Installation spacing **VA** mm	300	250	250	200	200	150	150	100	100	50	50														
		max. heating circuit area m²	20	18	16	14	12	10	8	7	5	4	3														
		max. heating circuit length m	74	79	71	77	67	74	61	77	57	87	67														
20	**43**	Installation spacing **VA** mm	300	300	250	250	200	200	150	150	150	100	100	50	50												
		max. heating circuit area m²	24	22	19	18	16	14	11	10	7	6	4.5	4	3												
		max. heating circuit length m	87	81	83	79	87	77	81	74	54	67	52	87	67												

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

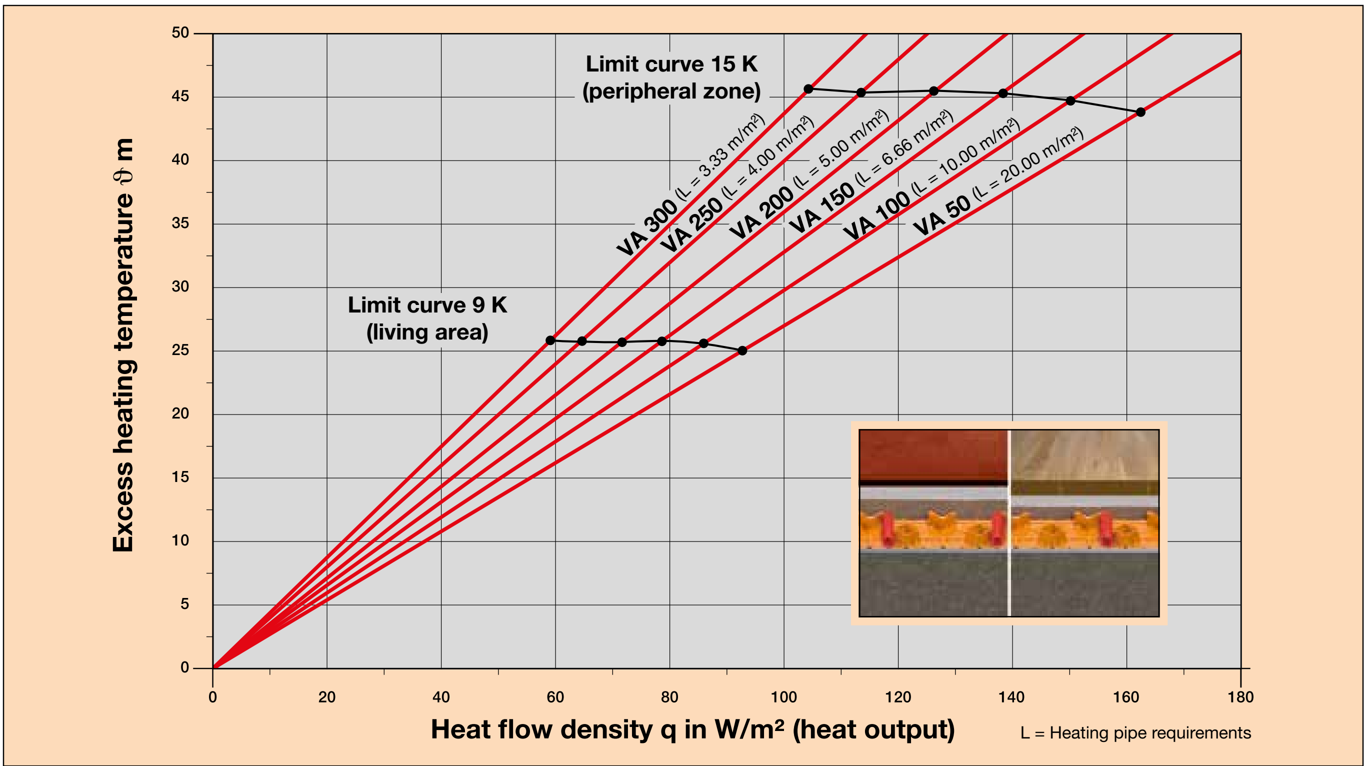
Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Parquet up to approx. 22 mm or thick carpet Schlüter®-BEKOTEC-EN 18 FTS, system heating pipes Ø = 12 mm

Surface cover resistance R_λ = 0.15 m² K/W

Floor covering: **Parquet of approx. 22 mm or thick carpet** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 378

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	**30**	Installation spacing **VA** mm	100	50																							
		max. heating circuit area m²	6	3.5																							
		max. heating circuit length m	67	77																							
20	**35**	Installation spacing **VA** mm	200	150	150	100	50																				
		max. heating circuit area m²	14	11	7.5	5	3.5																				
		max. heating circuit length m	77	81	57	57	77																				
20	**40**	Installation spacing **VA** mm	300	250	200	150	150	100	100	50																	
		max. heating circuit area m²	20	17	14	12	9	7	4	3																	
		max. heating circuit length m	74	75	77	87	67	77	47	67																	
20	**43**	Installation spacing **VA** mm	300	300	250	200	150	150	100	100	50	50															
		max. heating circuit area m²	24	22	19	16	13	10	8	6	4.5	3															
		max. heating circuit length m	87	81	83	87	94	74	87	67	97	67															

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

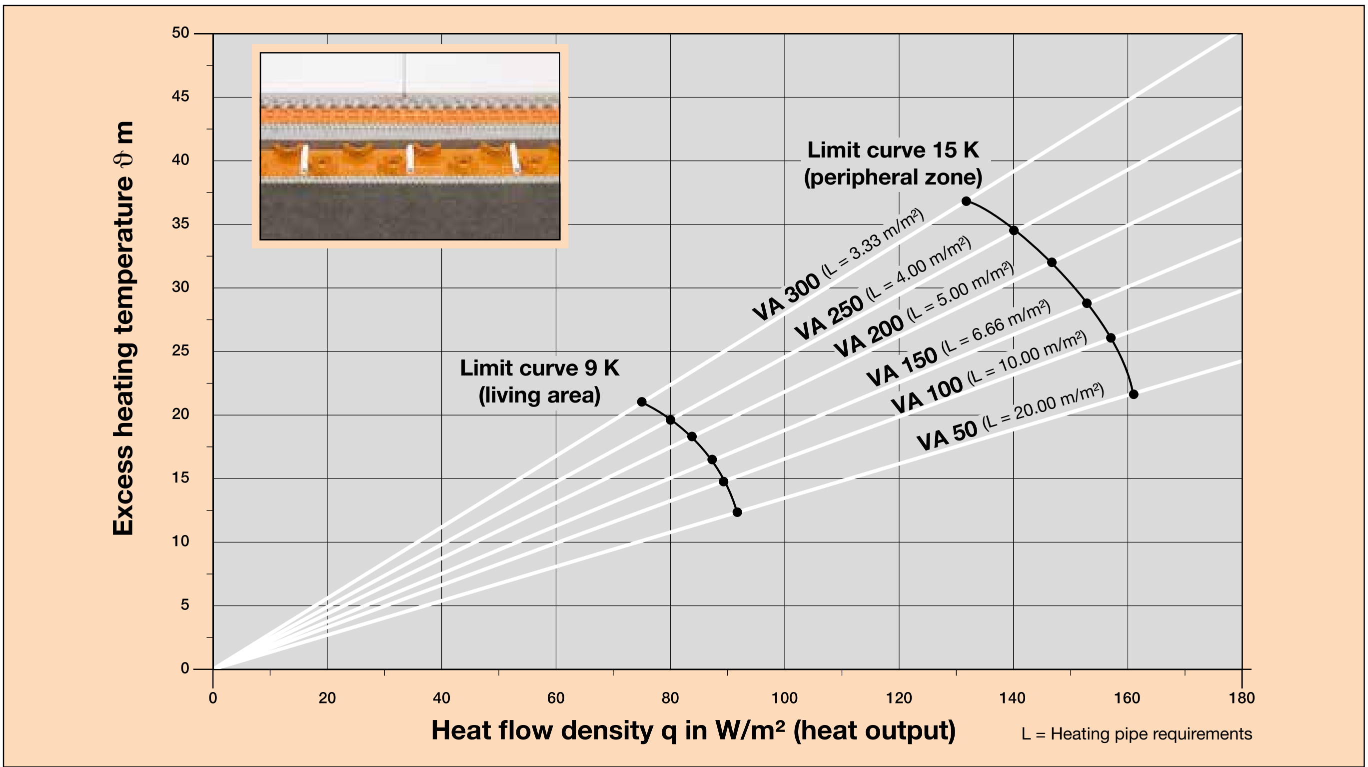
Presumed marginal conditions:

Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Ceramic thermal comfort floor Schlüter®-BEKOTEC-EN 12 FK, system heating pipes Ø = 10 mm

Surface cover resistance R_λ = 0 m² K/W
Floor covering: **Ceramic tile, natural stone, cast stone and stoneware,** incl. Schlüter-DITRA 25 mat.



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number L.1210.P.943.SCH

Room temp. °C	Supply temp °C		Living area															Peripheral zone									
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	30	Installation spacing **VA** mm	250	200	200	150	150	100	100	50	50																
		max. heating circuit area m²	13	11	9	7	6	5	4.5	3.5	3																
		max. heating circuit length m	60	62	52	54	47	57	52	77	67																
20	35	Installation spacing **VA** mm	250	250	250	200	200	150	150	150	150	150	100	100	100	100	50	50	50								
		max. heating circuit area m²	19	17	15	13	12	9	8	7	6	5	5	4.5	3.5	3	3.5	2.5	2.5								
		max. heating circuit length m	83	75	67	72	74	67	61	54	47	41	57	52	42	37	77	57	57								
20	40	Installation spacing **VA** mm	300	300	250	200	200	200	150	150	150	150	150	150	100	100	100	100	100	100	100	100	50	50	50	50	50
		max. heating circuit area m²	20	18	17	14	13	12	11	10	9	8.5	8	7.5	7	6	5.5	5	4.5	4	3.5	3	3	3	2.5	2	2
		max. heating circuit length m	74	67	75	77	72	67	81	74	67	64	61	57	77	67	62	57	52	47	42	37	67	67	57	47	47
20	43	Installation spacing **VA** mm	300	300	300	300	250	250	200	150	150	150	150	150	150	150	100	100	100	100	100	100	100	100	100	50	50
		max. heating circuit area m²	21	20	19	18	17.5	14	13	11	10	9.5	9	8.5	7.5	6.5	6.5	6	6	5.5	5	4.5	4	3.5	3	3.5	3
		max. heating circuit length m	77	74	71	67	77	63	72	74	74	71	67	64	57	51	72	67	67	62	57	52	47	42	37	77	67
		Avg. surface temp. °C		26.7		27.6		28.5		29.5		30.4		31.3		32.2		33.1		34.0		34.9					
24	30	Installation spacing **VA** mm	100	100	100	50	50																				
		max. heating circuit area m²	4.5	4	3	2.5	2																				
		max. heating circuit length m	52	47	37	57	47																				
24	35	Installation spacing **VA** mm				150	150	150	100	100	100	50	50														
		max. heating circuit area m²				7	6	5	4.5	4	3	2.5	2														
		max. heating circuit length m				54	47	41	52	47	37	57	47														
24	40	Installation spacing **VA** mm					150	150	150	150	150	150	150	100	100	100	50	50	50	50							
		max. heating circuit area m²					10	9.5	9	8	7	6	5	5	4.5	4	3	2.5	2.5	2							
		max. heating circuit length m					74	71	67	61	54	47	41	57	52	47	67	57	57	47							
24	43	Installation spacing **VA** mm							150	150	150	150	150	150	150	100	100	100	100	100	50	50	50				
		max. heating circuit area m²							11	10	9.5	8.5	7.5	7	6	5.5	5	4.5	4	3.5	3	2.5	2				
		max. heating circuit length m							81	74	71	64	57	54	47	62	57	52	47	42	67	57	47				

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

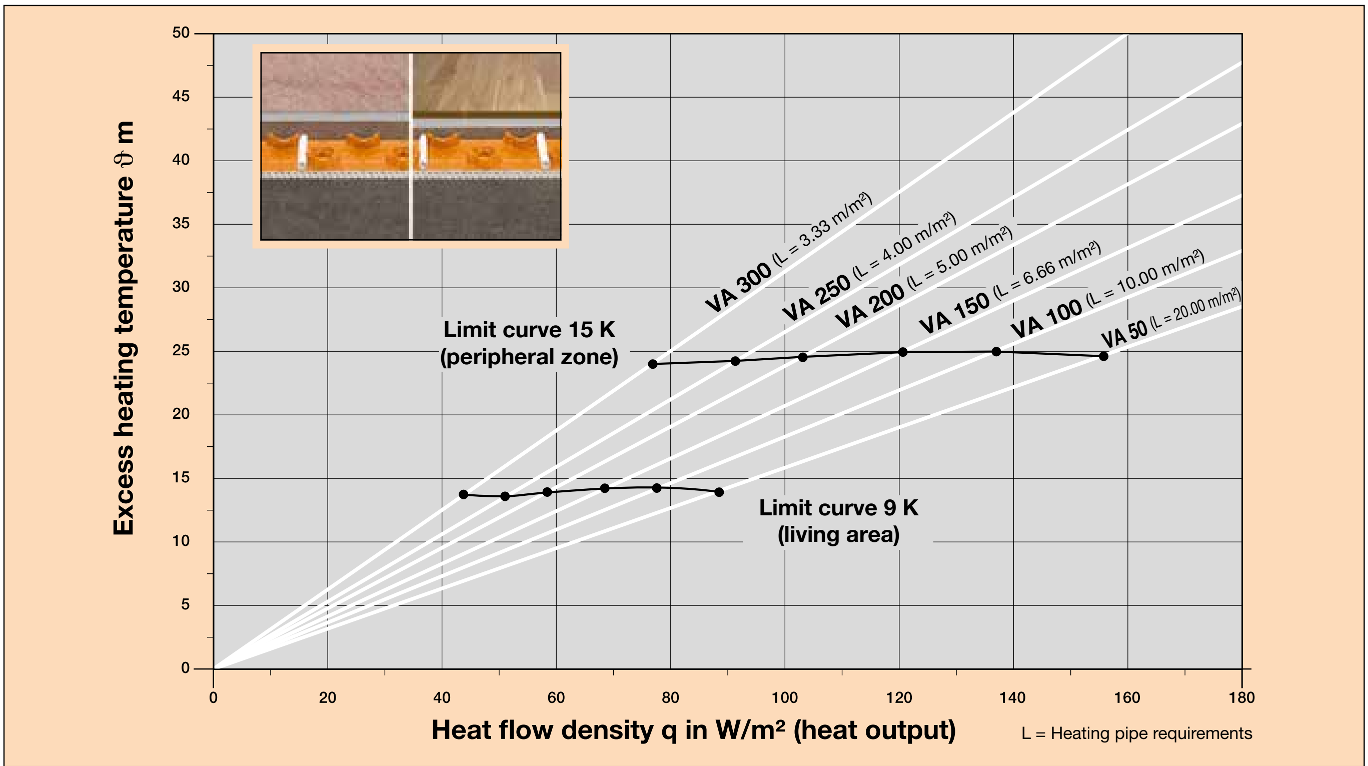
Presumed marginal conditions:
Pressure loss: max. 250 mbar
Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)
tu: 15 °C
Single connection length: 3 - 4 m

Product service and planning materials

Performance diagram: Vinyl, linoleum or parquet up to approx. 8 mm Schlüter®-BEKOTEC-EN 12 FK, system heating pipes Ø = 10 mm

Surface cover resistance R_λ = 0.05 m² K/W

Floor covering: **Vinyl, linoleum or parquet up to approx. 8 mm** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 377

Room temp. °C	Supply temp °C		Living area														Peripheral zone										
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		**22.7**		**23.6**		**24.5**		**25.5**		**26.4**		**27.3**		**28.2**		**29.1**		**30.0**		**30.9**		**31.8**		**32.7**	
20	**30**	Installation spacing **VA** mm	200	150	100	100	50	50																			
		max. heating circuit area m²	10	8.5	5.5	4	2.5	2																			
		max. heating circuit length m	57	57	62	47	57	47																			
20	**35**	Installation spacing **VA** mm	250	250	200	200	150	150	100	100	50	50	50														
		max. heating circuit area m²	16	14	11	9	8	6	5	4	3	2.5	2														
		max. heating circuit length m	71	63	62	52	61	47	57	47	67	57	47														
20	**40**	Installation spacing **VA** mm	300	250	250	200	200	200	150	150	150	150	100	100	100	50	50	50									
		max. heating circuit area m²	17	15	14	13	12	10	9	8	6.5	5.5	5	4	3	2.5	2	2									
		max. heating circuit length m	64	67	63	72	67	57	67	61	51	44	57	47	37	57	47	47									
20	**43**	Installation spacing **VA** mm	300	300	300	250	250	200	200	150	150	150	150	150	100	100	100	50	50	50							
		max. heating circuit area m²	21	20	19	17	15	13	12	10	9	8	7	5.5	5	4.5	3.5	3	2.5	2							
		max. heating circuit length m	77	74	71	75	67	72	67	74	67	61	54	44	57	52	42	67	57	47							
		Avg. surface temp. °C		**26.7**		**27.6**		**28.5**		**29.5**		**30.4**		**31.3**		**32.2**		**33.1**		**34.0**		**34.9**					
24	**30**	Installation spacing **VA** mm	50																								
		max. heating circuit area m²	2.5																								
		max. heating circuit length m	57																								
24	**35**	Installation spacing **VA** mm		150	150	100	100	50	50																		
		max. heating circuit area m²		7	6.5	5	3.5	3	1.5																		
		max. heating circuit length m		54	51	57	42	67	37																		
24	**40**	Installation spacing **VA** mm					150	150	150	100	100	50	50	50													
		max. heating circuit area m²					8	7	5.5	4.5	3.5	3	2.5	2													
		max. heating circuit length m					61	54	44	52	42	67	57	47													
24	**43**	Installation spacing **VA** mm							150	150	150	100	100	100	50	50	50										
		max. heating circuit area m²							8	7	5.5	5	4	3.5	3	2.5	2										
		max. heating circuit length m							61	54	44	57	47	42	67	57	47										

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

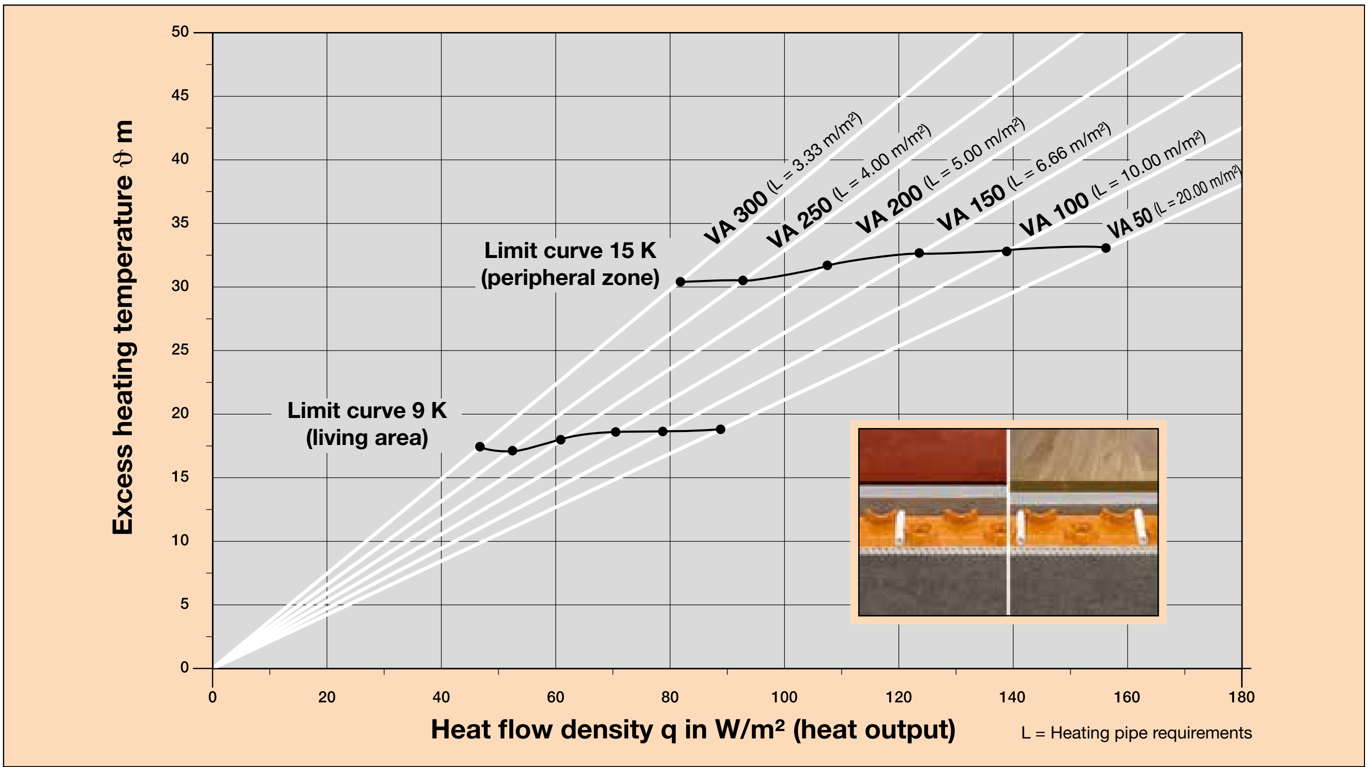
Pressure loss: max. 250 mbar
Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)
tu: 15 °C
Single connection length: 3 - 4 m

Product service and planning materials

Performance diagram: Carpeting up to approx. 8 mm or parquet up to approx. 15 mm Schlüter®-BEKOTEC-EN 12 FK, system heating pipes Ø = 10 mm

Surface cover resistance R_λ = 0.1 m² K/W

Floor covering: **Carpet up to approx. 8 mm or parquet up to 15 mm** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 377

Room temp. °C	Supply temp. °C		Living area														Peripheral zone										
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	**30**	Installation spacing **VA** mm	150	100	50																						
		max. heating circuit area m²	7	5	2.5																						
		max. heating circuit length m	54	57	57																						
20	**35**	Installation spacing **VA** mm	250	200	150	150	100	50	50																		
		max. heating circuit area m²	14	11	9	6	5	3.5	2.5																		
		max. heating circuit length m	63	62	67	47	57	77	57																		
20	**40**	Installation spacing **VA** mm	300	250	250	200	200	150	150	100	100	50	50														
		max. heating circuit area m²	16	15	14	12	9	8	6	5	3.5	3	2														
		max. heating circuit length m	61	67	63	67	52	61	47	57	42	67	47														
20	**43**	Installation spacing **VA** mm	300	300	250	250	200	200	150	150	150	100	100	50	50												
		max. heating circuit area m²	21	20	17	15	12	10	9	7	5	5	3.5	3	2.5												
		max. heating circuit length m	77	74	75	67	67	57	67	54	41	57	42	67	57												

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

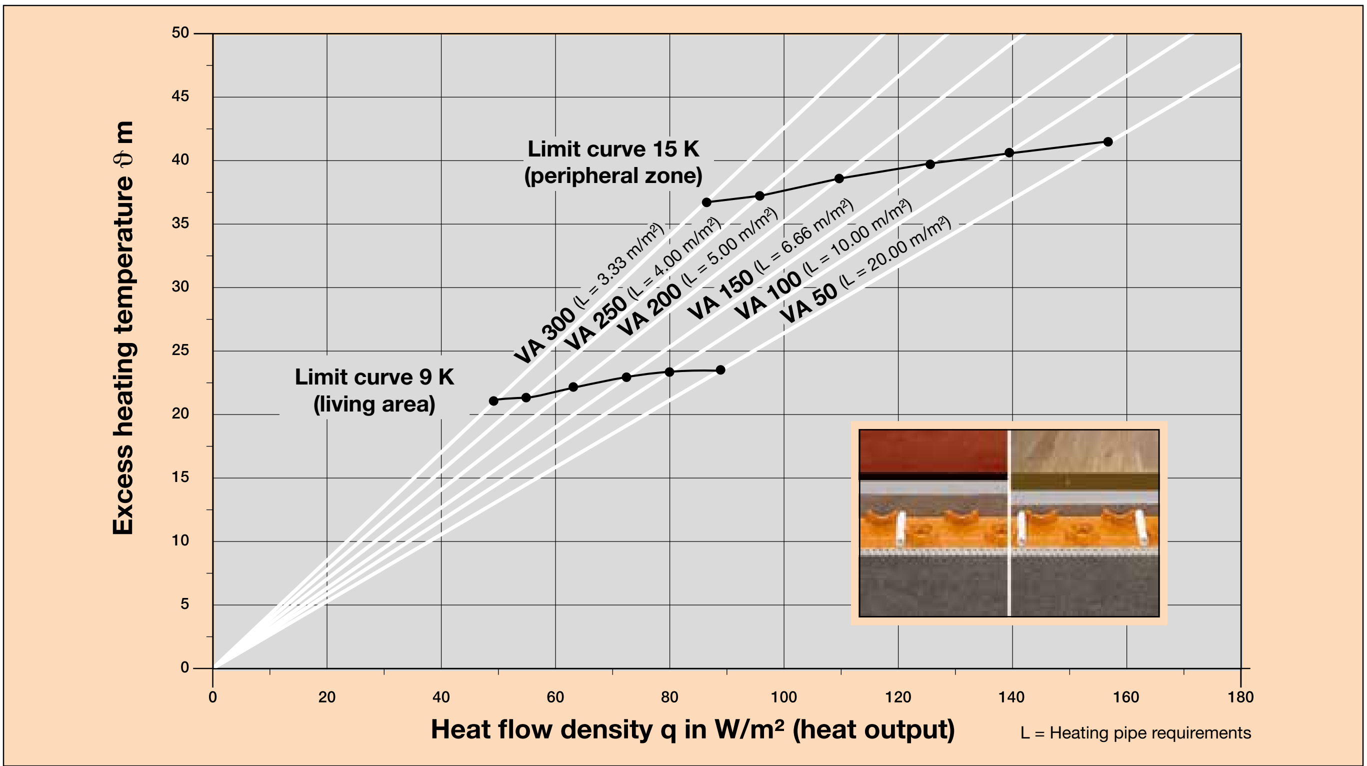
Pressure loss:	max. 250 mbar	tu:	15 °C
Sub insulation R/(U):	0.75 m²KW / (1.33 W/m²K)	Single connection length:	3 - 4 m

Product service and planning materials

Performance diagram: Parquet up to approx. 22 mm or thick carpet Schlüter®-BEKOTEC-EN 12 FK, system heating pipes Ø = 10 mm

Surface cover resistance R_2 = 0.15 m² K/W

Floor covering: **Parquet of approx. 22 mm or thick carpet** (observe manufacturer recommendations).



Performance test according to DIN EN 1264, Stuttgart University, IGE, Test report number HB 12 P 377

Room temp. °C	Supply temp °C		Living area														Peripheral zone										
		Heat flow density W/m² (spec. heat output W/m²)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
		Avg. surface temp. °C		22.7		23.6		24.5		25.5		26.4		27.3		28.2		29.1		30.0		30.9		31.8		32.7	
20	**30**	Installation spacing **VA** mm	100	50																							
		max. heating circuit area m²	4.5	2.5																							
		max. heating circuit length m	52	57																							
20	**35**	Installation spacing **VA** mm	200	150	150	100	50																				
		max. heating circuit area m²	12	8	5.5	3.5	2.5																				
		max. heating circuit length m	67	61	44	42	57																				
20	**40**	Installation spacing **VA** mm	300	250	200	150	150	100	50																		
		max. heating circuit area m²	16	15	12	9	6.5	5	2.5																		
		max. heating circuit length m	61	67	67	67	51	57	57																		
20	**43**	Installation spacing **VA** mm	300	300	250	200	150	150	100	100	50	50															
		max. heating circuit area m²	21	18	15	12	10	7	6	4.5	3	2															
		max. heating circuit length m	77	67	67	67	74	54	67	52	67	47															

Limit curve living area/peripheral zone

Data does not replace precise planning according to DIN EN 1264.

Presumed marginal conditions:

Pressure loss: max. 250 mbar
Sub insulation R/(U): 0.75 m²KW / (1.33 W/m²K)
tu: 15 °C
Single connection length: 3 - 4 m

Product service and planning materials

Certified quality

Schlüter-BEKOTEC-THERM is a certified and externally monitored floor heating system.
As part of the certification program for floor heating systems, we are authorised to include the DIN test mark with the registration number 7F165 in our product documentation. Thermal technology testing according to DIN EN 1264, reg. no. HB03 P094 and HB03 P095 was conducted by the independent, accredited DIN CERTCO recognised test laboratory Forschungsgesellschaft HLK, HVAC Laboratory at Stuttgart University.
The heating pipe made of PE RT is based on the corresponding test and monitoring requirements of DIN 16833. It is approved, certified and registered by DIN CERTCO under the registration no. 3V270PE RT. This registration documents that the Schlüter-BEKOTEC-THERM-HR system heating pipe meets the requirements for piping systems for floor heating systems and connections to heating systems.

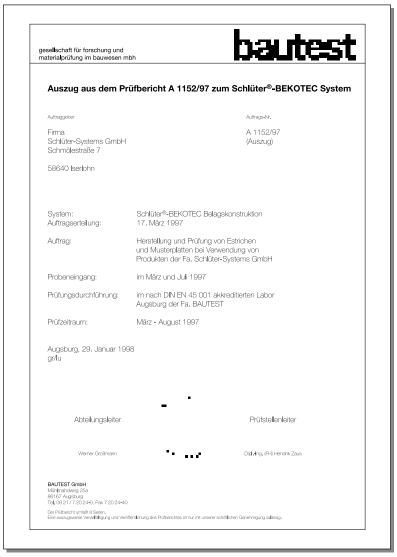
BVF

Schlüter-Systems is a member of the German Association for Area Heating Systems (BVF)

DIN CERTCO

ZERTIFIKAT

Schlüter®-heating system certificate



gesellschaft für forschung und materialprüfung im bauwesen mbh

bautest

Auszug aus dem Prüfbericht A 1152/97 zum Schlüter®-BEKOTEC System

Auftraggeber

Firma
Schlüter-Systems GmbH
Schmölestraße 7

58640 Iserlohn

Auftrags-Nr.

A 1152/97
(Auszug)

System: Schlüter®-BEKOTEC Belagskonstruktion
Auftragserteilung: 17. März 1997

Auftrag: Herstellung und Prüfung von Estrichen und Musterplatten bei Verwendung von Produkten der Fa. Schlüter-Systems GmbH

Probeneingang: im März und Juli 1997

Prüfungsdurchführung: im nach DIN EN 45 001 akkreditierten Labor Augsburg der Fa. BAUTEST

Prüfzeitraum: März - August 1997

Augsburg, 29. Januar 1998
gr/lu

Abteilungsleiter
Werner Großmann

Prüfstellenleiter
Dipl.-Ing. (FH) Hendrik Zaus

BAUTEST GmbH
Mühlmahdweg 25a
86167 Augsburg
Tel. 08 21 / 7 20 24-0, Fax 7 20 24-40

Der Prüfbericht umfaßt 8 Seiten.
Eine auszugsweise Vervielfältigung und Veröffentlichung des Prüfberichtes ist nur mit unserer schriftlichen Genehmigung zulässig.

Zertifizierte BVF SIEGEL-QUALITÄT www.bvf-siegel.de

Endurance test and confirmation of the load transfer required according to DIN 1055 by test report A1152/97. The independent and DIN EN 45001 accredited laboratory of the **Society for research and material inspection at construction engineering** of Augsburg performed these tests.

DIN CERTCO

ZERTIFIKAT

Schlüter heating pipe certificate

IFF-GUTACHTER-TEAM

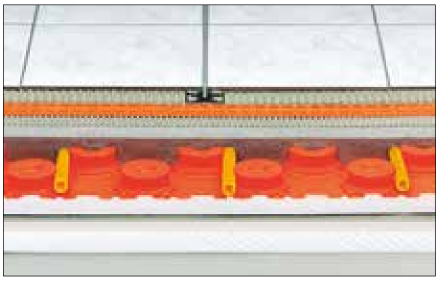
HEUER · BECKER · GAGEWI

GUTACHTEN

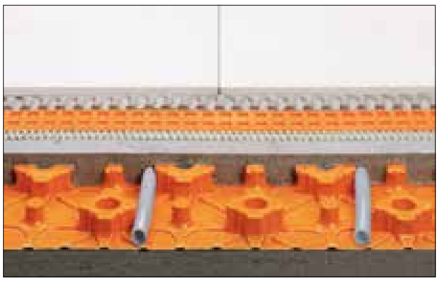
The verification of the practical installation of the entire system, including the surface covering, was performed by the **iff technical expert team for construction and floor technology** in Koblenz.

Innovative system solutions

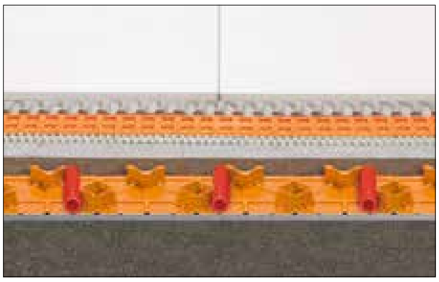
Application and scope



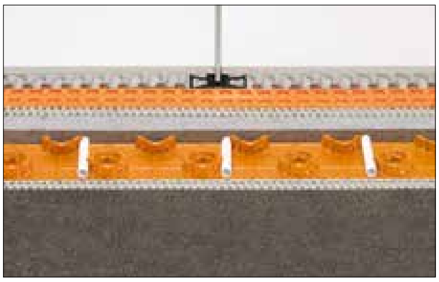
Schlüter®-BEKOTEC-EN
System heating pipe Ø = 16 mm



Schlüter®-BEKOTEC-BEKOTEC-EN F
System heating pipe Ø = 14 mm



Schlüter®-BEKOTEC-EN FTS
System heating pipe Ø = 12 mm



Schlüter®-BEKOTEC-EN FK
System heating pipe Ø = 10 mm

The purpose of this technical brochure and the supplementary materials is to explain the planning and installation of the Schlüter-BEKOTEC-THERM ceramic thermal comfort floor in simple and general terms.

The description refers to the various areas of application *(see pages 10 and 18)*. Surface coverings made of ceramic tiles or natural stone are discussed separately with regard to their suitability for and the installation of floor heating systems. If installing non ceramic surface coverings, the applicable installation guidelines and manufacturer recommendations must be observed for each material. In particular, installers must determine the readiness and residual moisture of the screed in conjunction with the selected surface covering.

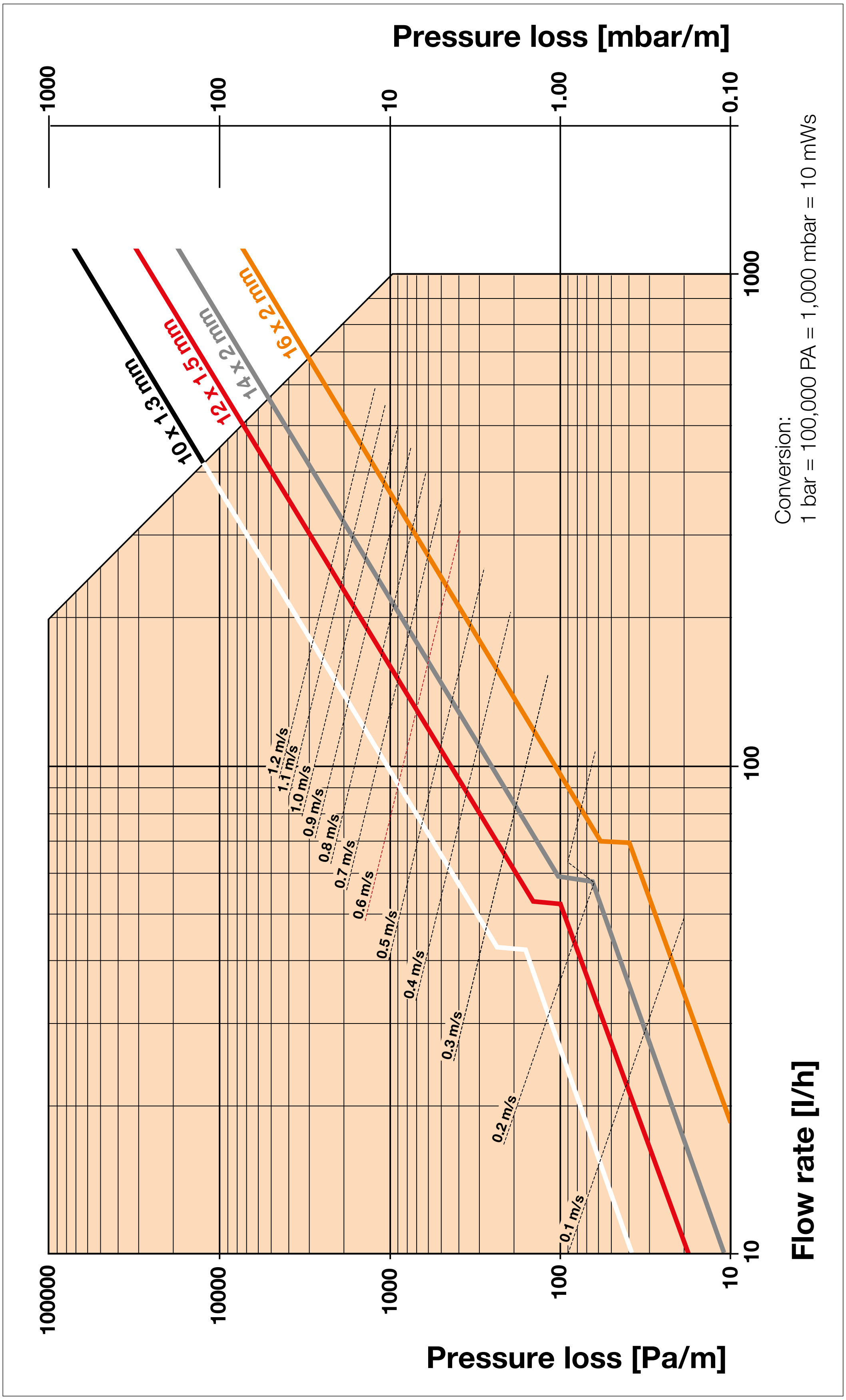
The applicable technical construction regulations (EnEV, DIN standards, VOB, information sheets, national requirements etc.) must be observed.

All technical statements, recommendations, drawings and images are based on our current theoretical and practical knowledge. They are intended as general information and do not represent design specifications or design services. The information does not release designers and installers from the responsibility to carry out their own plans and specifications. All applicable national regulations, approvals, and standards must be observed.
Schlüter-Systems KG reserves the right to change these documents at any time without citing technical or commercial reasons.
The current documents shall be deemed to represent the current state of the art of Schlüter-Systems KG.

No guarantee for typographic errors.

Attachment I.I

Pressure loss diagram, system pipes



Attachment I.II

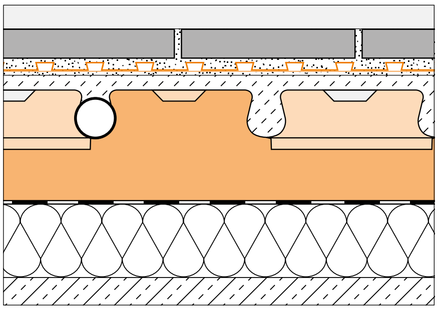
Impact sound measurement

Sound measurements

Applicable standards: prEN 20140-8/ISO/DIS 717-2/DIN 4109

Testing institute:
Acoustics laboratory of CSTC Belgium

Structure:
Concrete base
Insulation layer
BEKOTEC
Screed
Thin bed tile adhesive
DITRA 25
Thin bed tile adhesive
Ceramic tiles



Requirements for multi story buildings with apartments and work spaces ≤ 53 dB

Insulation layer (test material)	Area: 4.17 m x 4.20 m	
	tested values in dB (acc. to test certificate)	* calculated sound values in dB
Raw concrete slab	75	
BEKOTEC without sub insulation		66
BEKOTEC with polystyrene 22/20	48	
BEKOTEC with BTS		56

* Values were determined and estimated on a comparative area

Attachment II.I

Project specification sheet

Construction project::
Name: ____________________
Address: ____________________
Postal code, city: ____________________
Phone/ fax: ____________________
E mail: ____________________

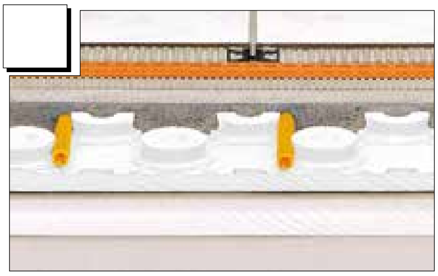
Developer:
Name: ____________________
Address: ____________________
Postal code, city: ____________________
Phone/ fax: ____________________
E mail: ____________________

Architect:
Name: ____________________
Address: ____________________
Postal code, city: ____________________
Phone/ fax: ____________________
E mail: ____________________

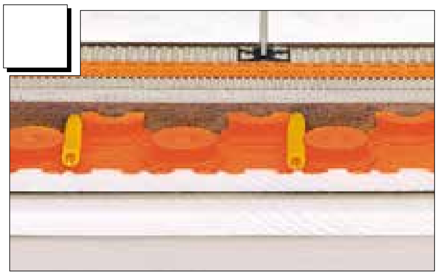
System installation contractor:
Name: ____________________
Address: ____________________
Postal code, city: ____________________
Phone/ fax: ____________________
E mail: ____________________

Selected system (please check)**:**

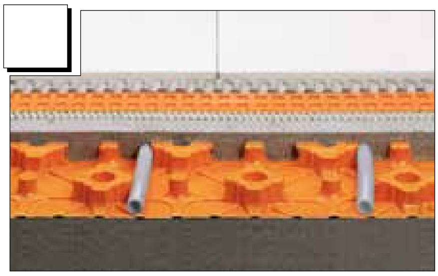
With **Schlüter-BEKOTEC-EN 2520 P**
For traditional sand and cement screed



With **Schlüter-BEKOTEC-EN 1520 PF**
for flowing screeds



With **Schlüter-BEKOTEC-EN 23 F**
Made of high impact structured polystyrene



Selected control technology

- ❑ Room sensor for heating/cooling
- ❑ Timer unit
- ❑ Room sensor for heating/cooling WL (wireless)
- ❑ Timer unit

Project support

- ❑ Material calculation / Quotation for Schlüter-BEKOTEC-THERM components
- ❑ Floor heating design, table format: Engineering cost: ____________ €
- ❑ Heating load calculation (Attachment I.II required) Engineering cost: ____________ €
- ❑ Control module extension timer/ digital clock Engineering cost: ____________ €

Submitted documents and drawings

- ❑ U value as shown in Attachment I.II, otherwise according to the Energy Savings Directive (EnEV)
- ❑ Drawings, scale 1:50 / 1:100
- ❑ Drawing in DXF/ DWG format
- ❑ Heating load calculation as per DIN EN 12831
- ❑ Specify air circulation, otherwise according to DIN EN 12831, Attachment 1, Table 6
- ❑ Air circulation with HVAC equipment, please indicate for each room in the drawing

Attachment II.I

Project specification sheet

Construction project:: Name: ______________________
Address: ______________________
Postal code, city: ______________________
Phone/ fax: ______________________
E mail: ______________________

Developer: Name: ______________________
Address: ______________________
Postal code, city: ______________________
Phone/ fax: ______________________
E mail: ______________________

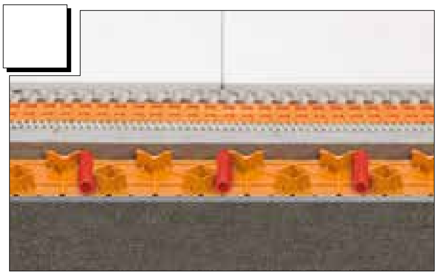
Architect: Name: ______________________
Address: ______________________
Postal code, city: ______________________
Phone/ fax: ______________________
E mail: ______________________

System installation contractor: Name: ______________________
Address: ______________________
Postal code, city: ______________________
Phone/ fax: ______________________
E mail: ______________________

Selected system (please check)**:**

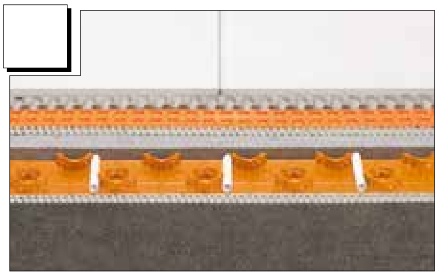
With **Schlüter-BEKOTEC-EN 18 FTS**
with integrated sound insulation

☐



With **Schlüter-BEKOTEC-EN 12 FK**
Adhered directly to the screed

☐



Selected control technology

- ❑ Room sensor for heating/cooling
- ❑ Timer unit
- ❑ Room sensor for heating/cooling WL (wireless)
- ❑ Timer unit

Project support

- ❑ Material calculation / Quotation for Schlüter-BEKOTEC-THERM components
- ❑ Floor heating design, table format: Engineering cost: ____________ €
- ❑ Heating load calculation (Attachment I.II required) Engineering cost: ____________ €
- ❑ Floor heating design drawing (Attachment I.II required): Engineering cost: ____________ €

Submitted documents and drawings

- ❑ U value as shown in Attachment I.II, otherwise according to the Energy Savings Directive (EnEV)
- ❑ Drawings, scale 1:50 / 1:100
- ❑ Drawing in DXF/ DWG format
- ❑ Heating load calculation as per DIN EN 12831
- ❑ pecify air circulation, otherwise according to DIN EN 12831, Attachment 1, Table 6
- ❑ Air circulation with HVAC equipment, please indicate for each room in the drawing

Attachment II.I

Project specification sheet

Floor coverings:

- ❑ Tiles = ______________________________(rooms)
- ❑ Carpet = ______________________________(rooms)
- ❑ Parquet = ______________________________(rooms)
- ❑ Other = ______________________________(rooms)

Known non covered areas (air space, bath tub, shower)**:**

Room: ______________ Size: ______ m²
Room: ______________ Size: ______ m²
Room: ______________ Size: ______ m²

Location of distributor (please enter into the sketch or drawing if possible)**:**

Basement: __________________ Position
Ground level: __________________ Position
Upper floor: __________________ Position
Loft: __________________ Position

Internal temperatures according to DIN EN 12831 (enter in drawing)**:**

Living room/dining areas/kitchen/bedrooms	20 °C
Staircases	15 °C
Bathrooms	24 °C

Differing interior temperatures, if desired for your project:

Room: ____________________ Ti =_______ °C
Room: ____________________ Ti =_______ °C
Room: ____________________ Ti =_______ °C
Room: ____________________ Ti =_______ °C

Information about the heating system	**Supply temperature**
❑ Approx. supply temp of heat pump: 30-45 °C	_________ °C
❑ Thermal solar system with heating support	_________ °C
❑ Condensed heat generator (boiler) (natural gas/oil), approx. supply temp: 35-50 °C	_________ °C
❑ Utility supplied heat (e.g. municipal utility plant)	_________ °C
❑ Low temperature heat generator (natural gas/oil), approx. supply temp: 75 °C	_________ °C
❑ _________________________	_________ °C

Offer/ drawing required by: ______________________

Architect/developer: ______________________ Date: ______________________________

Signature: ______________________________

Note: *All calculations, specifications and dimensions are intended to support the project design, but cannot serve as project plans in their own right. They must be reviewed and adapted at the sole responsibility of a qualified engineer to verify suitability for a specific purpose.*

Attachment II.II

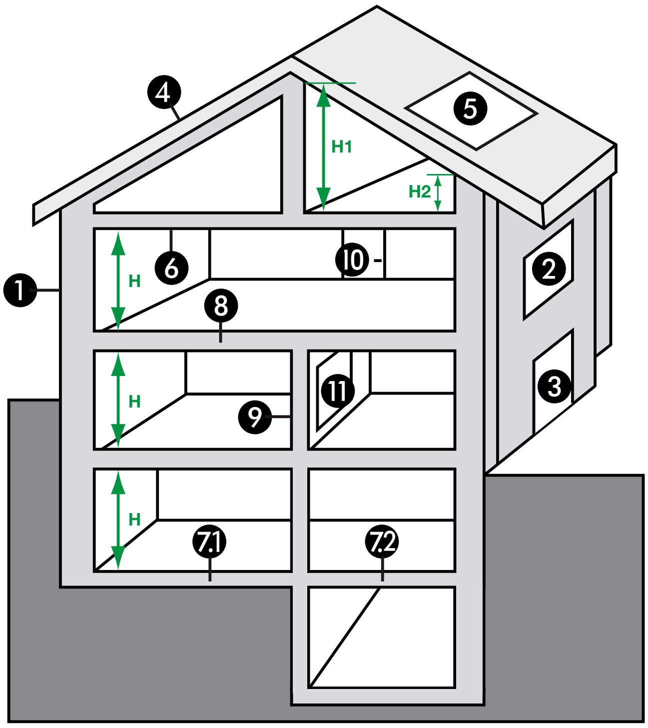
Building description

- ❑ New structure pursuant to EnEV
- ❑ Existing structure ____ Year built: ________
- ❑ Renovation pursuant to EnEV. Year built: __

Winter gardens (or similar) require Attachment I. III!

Please enter thicknesses of layers if U value is unknown	U values W/(m² K) for your project *1			
	Base-ment	Ground Floor	Top Floor	Loft
➡ **1 External wall 1.1 __________ cm**				
Layer 1 ________________ cm material				
Layer 2 ________________ cm material				
Layer 3 ________________ cm material				
Layer 4 ________________ cm material				
➡ **1 External wall 1.2 __________ cm**				
Layer 1 ________________ cm material				
Layer 2 ________________ cm material				
Layer 3 ________________ cm material				
Layer 4 ________________ cm material				
➡ **2 External window *2**				
➡ **3 External door**				
➡ **4 Roof**				
➡ **5 Roof light *2**				
➡ **6 Ceiling adjacent to unheated space**				
7.1 Floor adjoining ground (earth)				
7.2 Floor adjacent to unheated space				
8 Floor adjacent to heated space				
9 Internal wall ____________ cm				
10 Internal door				
11 Internal window				

Ceiling height [m]				
	Base-ment	Ground Floor	Top Floor	Loft
H				
H				
H				
H				
H1				
H2				



➡ ***Mandatory field (if component exists)***

*1 *Project specific U values are required for technical calculations on our heating system*

*2 *If U values and window sizes are unknown, please complete Attachment I.III – Window specifications*

Maximum surface temperatures according to DIN EN 1264

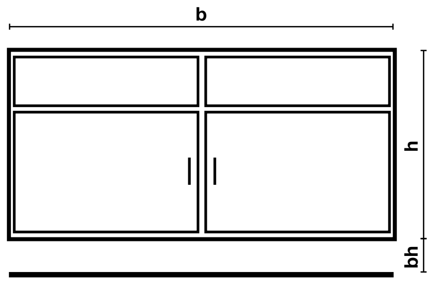
Living zone:	29 °C
Peripheral zone:	35 °C
Bathrooms:	33 °C

Your desired maximum floor surface temperatures, if different/required

Living zone:________ °C
Peripheral zone: ____ °C
Bathrooms:________ °C

Attachment II.III

Window specifications



Project no.: ______________________________

Construction project: ______________________

						... or	... Enter information here if K value total is unknown			
Floor level	**Room**	**Window position no.***	**Window width b [m]**	**Window height h [m]**	**Parapet height bh [m]**	**Total K value** [W/m²K]**	**Manufacturing date*****	**Single glass/K value*****	**Double glass/K value*****	**Triple glass/K value*****

** Please number the windows with reference to positions in the drawings.*
*** Total K value refers to windows and frames.*
**** This information is generally found in printed or embossed form on the metal connector between the glass panes. The label often also shows the K value of the window without the frame.*

Further information on winter garden/conservatory
Type of utilisation:
- ❑ Fully used residential space with desired interior temperature of __________°C
- ❑ Base temperature __________°C
- ❑ Floor heating only (other heating is covered by existing radiators/convection heaters)

Transition from winter garden/conservatory to building:
- ❑ Open design
- ❑ Closed design
- ❑ Winter garden is not connected to building

Roof area of winter garden/conservatory is:
- ❑ Fully made of glass with a K value of_______[W/(m² K)]
- ❑ _________% made of glass (K1) /__________% ceiling cover (K2)... with a K value of K1__________ [W/(m² K)] / K2__________[W/(m² K)]
- ❑ Insulated with a K value of _________ [W/(m² K)]
- ❑ Non-insulated with a K value of _________ [W/(m² K)]

Additional heaters are:
- ❑ Not planned
- ❑ Planned - output of radiators/convection heaters: __________ W.

Attachment III

Filling, flushing and venting the Schlüter®-BEKOTEC-THERM heating circuits

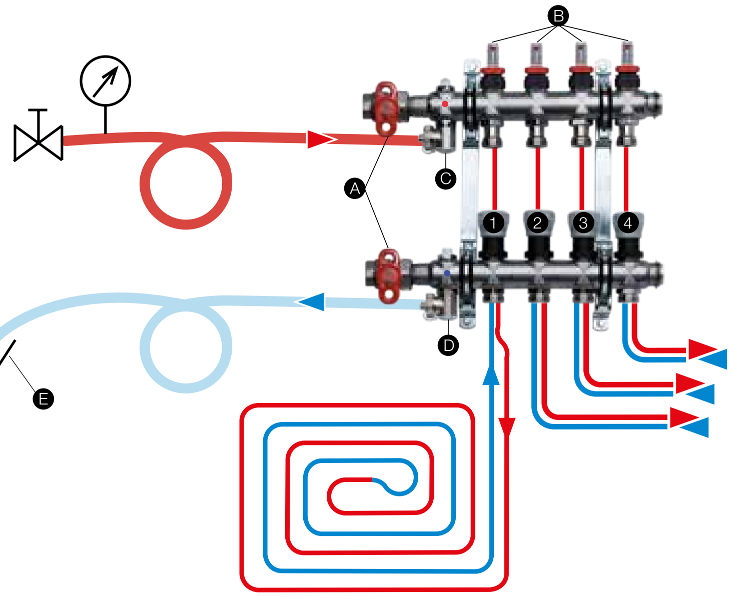
I. Preconditions

1. The leak seal test has been recorded in accordance with the specifications of DIN EN 1264-4.
2. The entire system is disconnected from all power sources and protected from frost.
3. Filling, flushing and venting should be monitored by a qualified technician.
   The subcontractor should specify a fixed procedure for filling and flushing, using the available system specifications.
4. The available connection pressure and the flow velocity are guaranteed based on the use of suitable filling equipment.
5. The connection to the water supply must comply with the applicable regulations.
6. The fill water quality meets the requirements of VDI Guideline 2035 or has been passed through a water processing unit.

II. Procedure to fill and vent the Schlüter-BEKOTEC-THERM systems. The system must be filled and flushed in accordance with the following pattern.

Close the ball valves A at the heating circuit distributor.
Open the flow meters B as described on page 50.
Slowly and carefully fill and flush the system, circuit by circuit, working from the lowest heating circuit distributor to the next level. The safest method is to flush the heating circuits individually in sequence.
The water flow is routed through the fill/drain cock C at the supply line of the distributor bar.
The drainage is connected to the return line D and routed to an open drainage/outflow E, where the water flow is visible.
By opening and closing the manual regulation caps (1-4), every heating circuit can now be flushed individually, until no further air bubbles come through the connected drain.
The remaining air in the heating circuit distributor bar is removed through the manual venting valves. A hydraulic adjustment must be performed as described on page 50 prior to the first heating.
The requirements described in the section “Installation notes and system start up for various floor coverings” on page 78. also must be observed.

- A Ball valves
- B Flow meter
- C Filling / draining cock supply line
- D Filling / draining cock return line
- E Outflow



Attachment IV

Pressure sample report

Construction project: Address: ______________________________

Postal code, city: ______________________________

Heating Engineer: Name: ______________________________

Address: ______________________________

Postal code, city: ______________________________

Phone / Fax: ______________________________

Construction segment: ______________________________

Level/ apartment: ______________________________

____

Start of test: Date ____________________ Time____________________

Ambient temperature: ____________________°C Water temperature: ______________°C

Max. operating pressure: ____________________ bar

Requirements/prerequisites:

The leak seal of the system is verified with a water pressure test prior to installing the screed. The test pressure is double the operating pressure, and at least 6 bar. The test pressure must be restored 2 times within thirty minutes, in intervals of 10 minutes. The pressure loss in the subsequent 30 minutes may not exceed 0.6 bar (0.1 bar every 5 minutes). This pressure must be maintained during the installation of the screed.

Note: The system must be protected from freezing.

Test points

Visual inspection of all joints to verify proper installation ☐ yes ☐ no

System components such as expansion vessel
and safety valve with nominal pressures that are not at least equal
to the test pressure are to be excluded from the test ☐ yes ☐ no

System has been filled with cold water, flushed and completely vented ☐ yes ☐ no

Visual inspection of all joints to verify tightness ☐ yes ☐ no

Initial test pressure*: ____________ bar Time: ______________

* The drop of initial test pressure due to pipe expansion must be offset. Factors to consider include temperature fluctuations.

Final test pressure: ____________ bar Time: ______________

During the test period, the system was leakproof ☐ yes ☐ no

No permanent form changes of construction components were apparent.

Certification of tester:

Place / date ______________________________ Signature / Company stamp ______________________________

Attachment V

Heating up and cure heating Schlüter®-BEKOTEC-THERM with non ceramic coverings

We hereby certify that we are familiar with the following conditions of the manufacturer, **Schlüter-Systems KG, Iserlohn**:

Heating / heat curing:

The screed can be heated after 7 days. The supply temperature is increased by ≤ 5 °C a day to a maximum of 35°, starting from 25° water temperature. This temperature must then be maintained until the screed is fully cured. The covering is installed on the unheated system.

Certification / explanation

Project: ____

Company: ____

____

____

We hereby confirm that the following manufacturer requirements were met.

a) The screed was not heated within the first 7 days after the installation (differing manufacturer specifications must be observed)

b) The heating process was begun after ________ days
☐ with a supply temperature of 25 °C
☐ The screed was not heated

c) Heating table

Days of heat curing	Target supply temperature	Read supply temperature	Date, time	Reviewed by
Day 1	25 °C			
Day 2	30 °C			
Day 3	max °C			
Day 4	max °C			
Day 5	max °C			
Day 6	max °C			

The heating process was completed on ________________.

System installation contractor: ________________________ Architect / developer: ________________________

Appendix VI

Moisture CM Measurement Protocol

Client: ____

Project: ____

❑ CT (cement screed)
❑ CA (gypsum based screed)
❑ heated
❑ unheated

Screed age:______________________________________
Strength class: ___________________________________
❑ on insulation ___________________________________

Moisture content of screeds with relevance for screed readiness*

Floor covering	CT - Cement screed heated/unheated	CA - Gypsum screed heated	CA - Gypsum screed unheated
Ceramic tile/natural stone in conjunction with Schlüter®-DITRA	–	≤ 2.0 %	≤ 2.0 %
Textile and vinyl coverings, parquet and laminate	≤ 1.8 %	≤ 0.5 %	≤ 0.5 %

* Please observe the corresponding product data sheets and installation guidelines of the floor covering manufacturer regarding residual moisture in the screed.

Note: Certificate forms for heat curing can be found in *Attachment V.*

Measurement	Place	Weight (g)	Measured pressure (bar)	Water content (%)
1				
2				
3				
4				
5				

Screed area to be covered: ________________________ m^2

Comments / witness: ______________________________________

____

____

____

____
Date / Signature

____
Date / Signature of customer

Schlüter®-DITRA-HEAT-E

Electrical wall heating – Covers additional heat requirement in the bathroom

Due to their size, bathrooms are often difficult to heat with a floor heating system. In such cases, the electrical wall heating system Schlüter-DITRA-HEAT-E serves as a perfect complement to the ceramic thermal comfort floor to cover the existing heat demand. The zones to be heated can be individually adapted to the requirements of developers and users, for example by integrating a heated wall in a shower area.

- ✓ **Durable and maintenance-free.**
- ✓ **Easy to retrofit.**
- ✓ **Fast heat-up response.**
- ✓ **Simple to install.**
- ✓ **Low assembly height.**
- ✓ **Convenient complete sets.**

For more information, visit our website at:
www.ditra-heat.co.uk

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