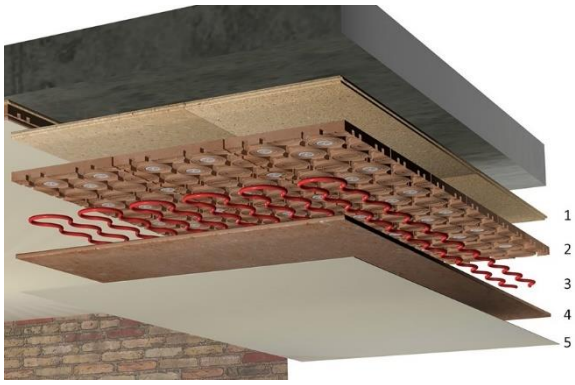
Clay climate - dry construction system

The **water-guided system** from ArgillaTherm combines the advantages of innovative heating/cooling technology with the positive properties of clay as a building material and relies on a newly developed, globally unique and patented panel system for particularly simple and inexpensive installation.

Product manufacturing almost CO^2 neutral. 100% return to nature possible, cradle to cradle.

Sandwich construction



Components

1. OSB 3 / ESB-Plus P5 boards or in buildings with increased fire protection requirements cement-bonded chipboards with tongue and groove as substructure
2. High performance clay modules according to DIN 18948 and clay - compensation panels according to DIN 18948
3. Polybutene pipe "Hot & Cool" according to DIN 16968, PB 12 x 1.3mm, oxygen tight according to DIN 4726
4. Clay plaster "Thermo" according to DIN 18947 for surface heating and cooling systems with integrated mesh or natural lime base plaster 66-20 for surface heating and cooling systems with integrated mesh
5. Clay paint according to DVL TM 06 as sprayable and brushable ready-mix **or** mineral paint 689-20 as sprayable and brushable ready-mix

The heart of the system

High Performance Clay Modules

for easy & coupling-free installation of heating/cooling pipes.
Highly absorbent, dimensionally stable, crack-free, without the use of grid fabrics.
Moisture absorption according to standard = 107g/m² in 12 hours
Moisture absorption after 7 days > 500g/m²
Tested and certified.

composition:
clays (≥ 35%), sands, brick dust, miscanthus fibres
1m² = 7.23 pieces high-performance clay modules

Technical data of the high-performance clay modules

Dimensions	372 x 372 x 25 mm
Weight per module	5,05 kg
Weight per m² (7.23 pieces)	36,5 kg
max. pipe consumption per m²	11 m
Building material class	A 1
Thermal conductivity	High (1,05 W/mK)
Moisture absorption and release in 12 hours	> 100 grams per m²

Systempartner

In order to be able to offer complete systems on the market, various cooperation agreements have been concluded with leading German manufacturers.

ArgillaTherm only uses system components that are subject to current standards and have been tested accordingly.

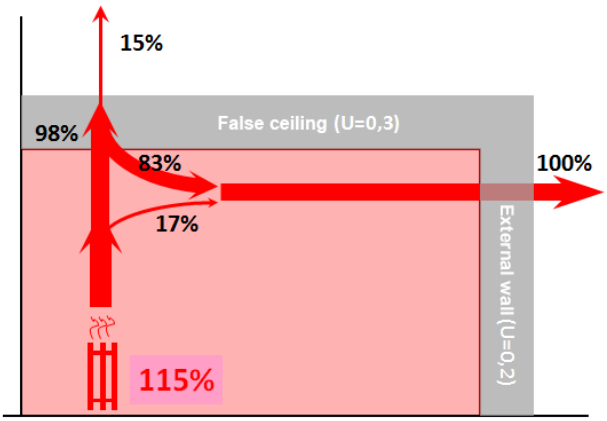
Firma Gräfix	Lime plasters & paints	Special design
Firma Claytec	Clay plasters & paints	Special design
Firma Viega	Heating/cooling pipe	Special design
Firma Eberle	Control engineering	Standard products with specially stored control programs
Firma Spax	Fixings	Standard products
Firma Protektor	Ceiling suspension	Standard products, axle mass according to test statics
Firma Liaver	Acoustic system	Standard products

System tests carried out

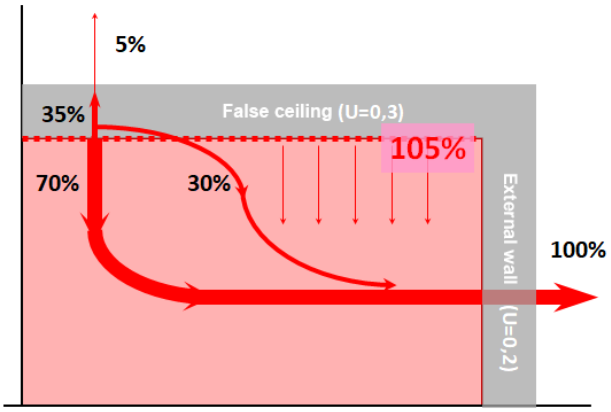
DIN EN 1264	Test for room area integrated heating & cooling systems with water flow to determine the heating / cooling capacity	MFPA Weimar
DIN EN 14037	Test for heating surfaces freely suspended from the ceiling with water flow to determine the heating power	WSPLab Stuttgart
DIN EN 14240	Test for cooling surfaces freely suspended from the ceiling with water flow to determine the cooling capacity	WSPLab Stuttgart
DIN 4102	Test for the classification of building materials according to their reaction to fire performance in fire resistance classes	MFPA Leipzig
DIN 18948	Requirements, performance characteristics and test methods for factory-made clay panels	MFPA Weimar
DIN 4726	Testing the oxygen tightness of plastic pipes	MPA Dortmund

Sandwich construction for thermal and mechanical decoupling

Comparison; heating systems with a high proportion of convection / ceiling heating systems with direct connection to the masonry (usually wet systems) compared to the ceiling heating from ArgillaTherm



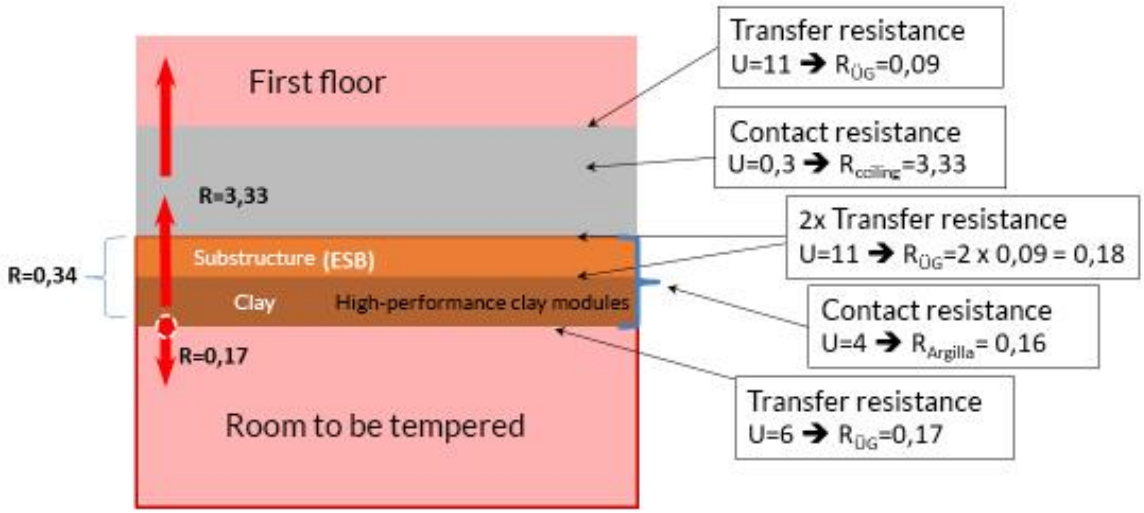
Heating systems with a high proportion convection or core activation



Ceiling heating from ArgillaTherm

The vagabonding heat on a typical winter day can be described by two parts: 1) The part that is stored in the false ceiling and 2) the part that escapes to the upper floor. Due to the sandwich construction, both proportions are significantly lower with ArgillaTherm's ceiling heating compared to heating systems with a high proportion of convection/ core activation.

Details about the thermal resistance due to the **sandwich construction** of the ArgillaTherm ceiling heating



The transfer resistance downwards is only about half of the total resistance upwards (transfer and contact resistances). Therefore about 2/3 of the heat goes directly into the room and 1/3 into the clay layer of the ArgillaTherm system building board. From there, a large part comes back again, because the resistance into the floor above is much higher than back into the clay panel.

Heating, Cooling, automatic humidity control, permanent room air cleaning and optionally via additional modules a pleasant acoustics with only one surface.

System flow temperatures

Depending on the heating power requirement, occupancy density and spread at

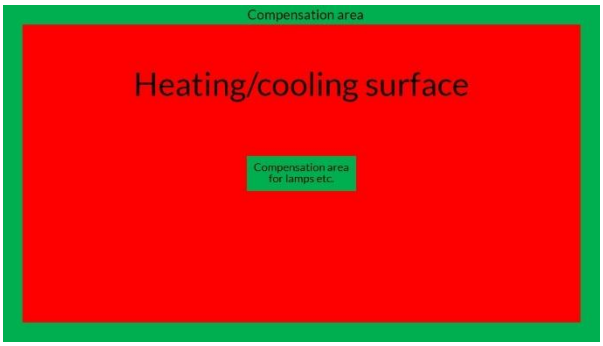
Heating: 25 – 45°C

Cooling: 8 – 22°C

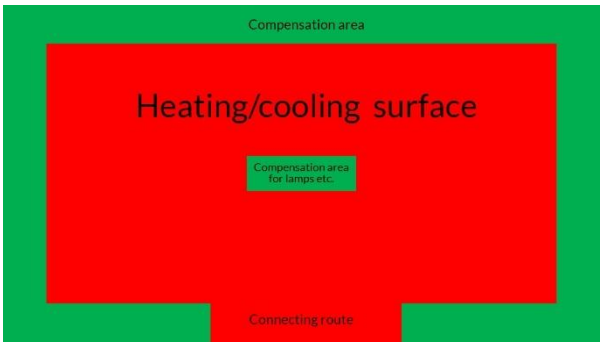
Reaction time / thermal inertia

Depending on the heating system, the response time is about 5-10 minutes, the high performance clay modules including clay plaster covering are completely tempered after about 60 minutes. If the energy supply is interrupted, the system keeps the surface temperature relatively constant for about 60 minutes, depending on the environment, due to the enormously high storage capacity of the high-performance clay modules. When heat pumps are used, interruptible heating current tariffs (heat pump tariffs) can therefore be used without buffer storage without any problems.

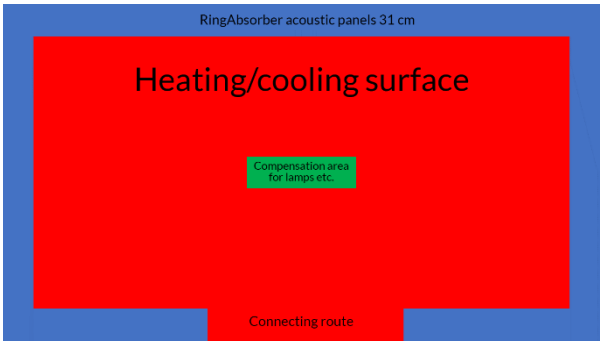
Variant ceiling heating/cooling with full surface coverage



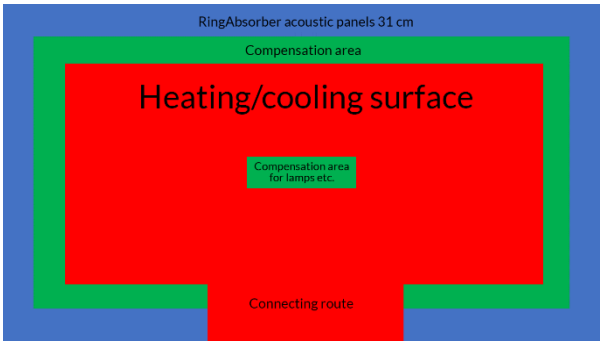
Maximum heating/cooling capacity



Reduced heating/cooling capacity

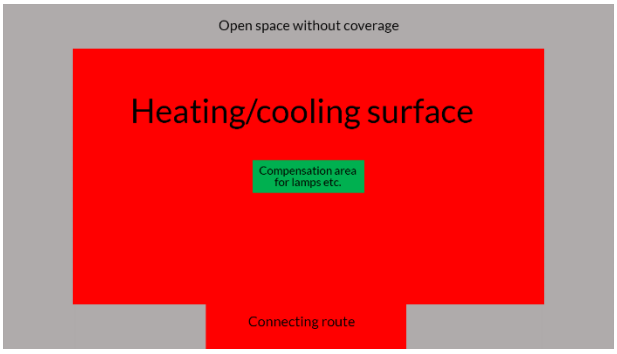


Maximum heating/cooling capacity with RingAbsorber acoustic panels

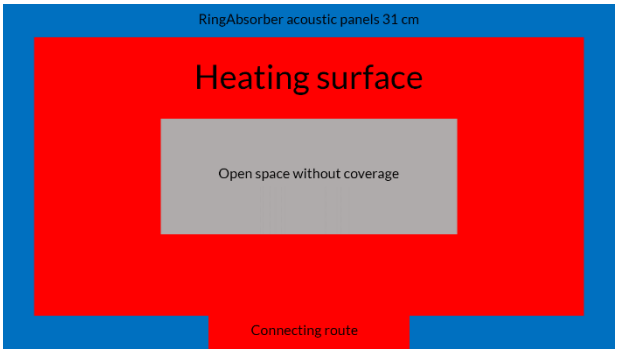


Reduced heating/cooling capacity with RingAbsorber acoustic panels

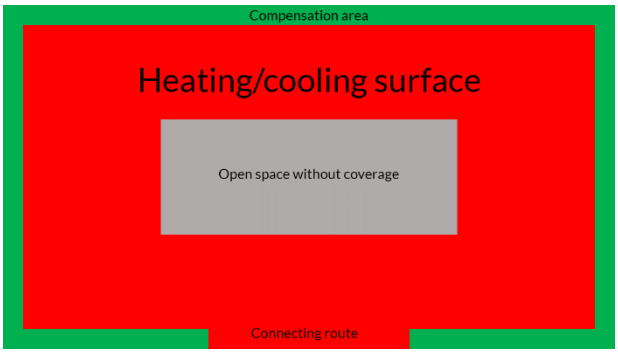
Variant ceiling heating/cooling with partial coverage



Interior partially covered ceiling without compensation area



External partially covered ceiling without compensation area with RingAbsorber acoustic panels



External partially covered ceiling without compensation area

Variant examples of partially covered ceiling without compensation area

External partially covered ceiling without compensation area

Internal partially covered ceiling without compensation area

Installation examples

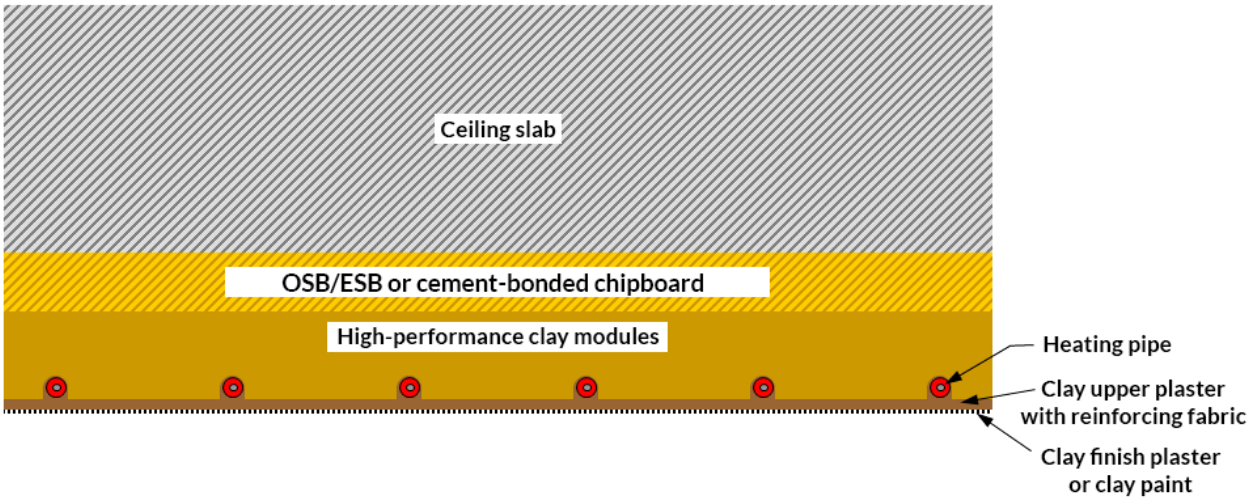
Fixing with substructure formwork and various ceiling outlets

Full ceiling coverage with direct mounting

Partial ceiling covering, remaining area was lined with GK panels

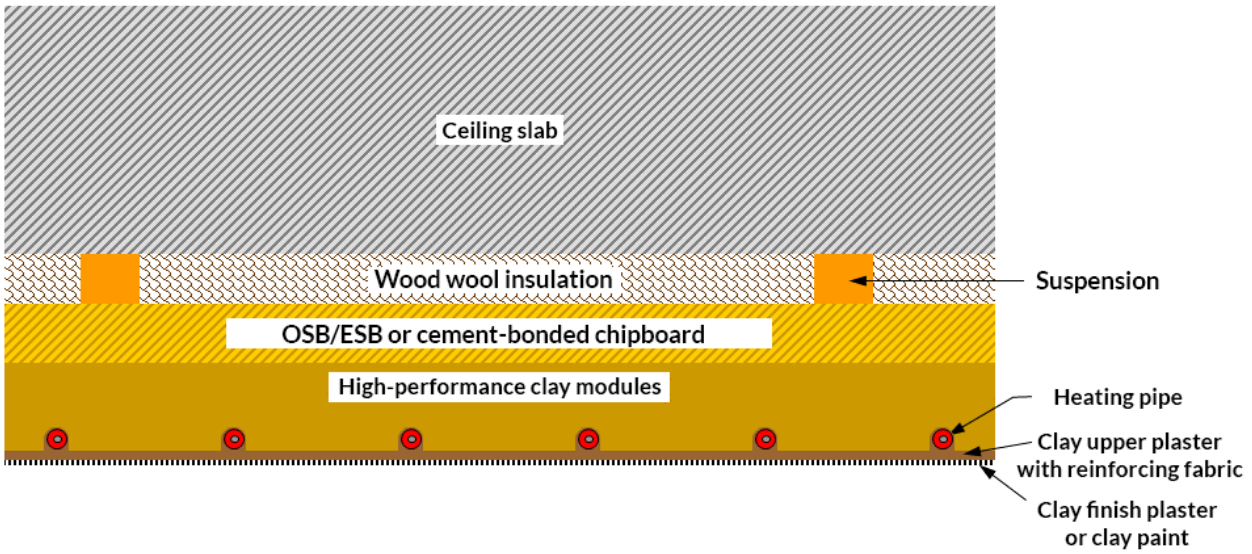
Mounting variants / system structure

Example 1: direct fastening with OSB/ESB or cement-bonded chipboards on the ceiling / installation height 52mm



The surface coating can be done as described with clay plaster and clay paint, and with lime plaster and lime paint. The decisive factor is the permeability of the cover material, so that the sorption capacity of the high-performance clay modules is not significantly affected.

Example 2: Fixing with substructure formwork, cavity insulation and OSB/ESB or cement-bonded chipboards / installation height 52mm plus suspension

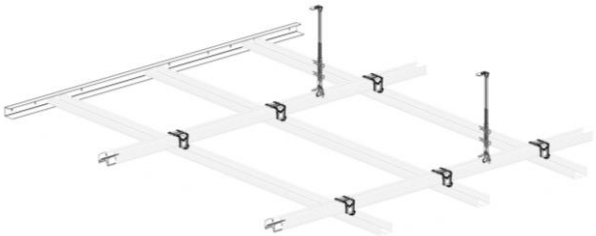


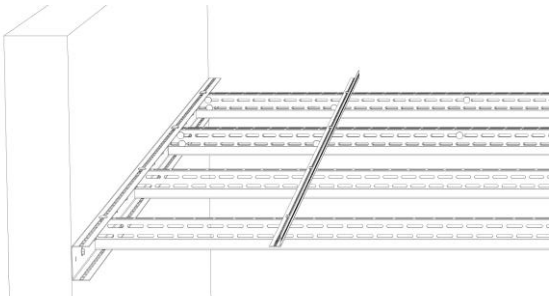
The surface coating can be done as described with clay plaster and clay paint, and with lime plaster and lime paint. The decisive factor is the permeability of the cover material, so that the sorption capacity of the high-performance clay modules is not significantly affected.

Example 3: Statically tested metal ceiling suspension in lightweight construction

a) with nonius connectors for ceiling mounting
75kg Load capacity (for UK from 22mm OSB/ESB boards)
Axial dimension CD basic profile = 600mm
Axial dimension CD support profile = 600mm
Distance Nonius-Pendant = 600mm
85kg Load capacity (for UK from 18mm CETRIS boards)
Axial dimension CD basic profile = 550mm
Axial dimension CD support profile = 550mm
Distance Nonius-Pendant = 550mm

b) self-supporting with wall mounting for significant reduction of impact sound





Technical planning and basics

When planning and designing the ArgillaTherm ceiling system, the relevant regulations and standards must be taken into account.

DIN EN 12831	Method for calculating the standard heating load
DIN EN 1264	Room area integrated heating and cooling systems with water flow
DIN EN 14037	Determination of the heat output for suspended water-flow ceiling systems
DIN EN 14240	Determination of the cooling capacity for suspended water flow ceiling systems
DIN EN ISO 11855	Environmentally compatible building planning - planning, design, installation and control of surface-integrated radiant heating and cooling systems
DIN 16968	Polybutene (PB) pipes, general quality requirements
DIN 4726	Plastic pipelines, limit value for diffusion tightness
VDI 2035	Avoidance of damage in hot water heating systems
DIN EN 60730	Automatic electrical regulation and control devices
DIN 18947	Requirements for clay plaster mortar for plastering walls and ceilings
DIN 18948	Requirements, applications, performance characteristics and test methods for factory made clay building boards
DVL TM 06	Technical data sheet for clay thin-layer coatings of walls and ceilings

The work of the trades involved in the construction process must be coordinated accordingly.

Planning: Energy Consultant/Architect/Planner

Performing trades: Heating installer/drywall installer/construction company

Design of ceiling heating

The average surface temperature for ceiling systems with a height of up to 3 metres should not exceed 32°C according to the standard specification. With the wSYSTEM this value is achieved with a flow temperature of 38°C, the output is then 70 watt/m².

For ceiling heights above 3 meters, the average surface temperature can be higher and should be adjusted according to DIN EN ISO 7730.

The wSYSTEM ceiling heating system is designed with a standard flow temperature of 35°C (corresponds to a capacity of 60 watt/m²), so that there is a reserve without compromising on comfort.

Lower heating outputs are achieved either by reducing the system temperatures or by reducing the surface area of high-performance clay modules while maintaining the same system temperatures. The remaining areas are covered with clay compensation panels.

Heat output ≙ Flow temp. - room temp. x factor 4 (tested according to DIN EN 14037)

The wSYSTEM is to be executed with a special oxygen-tight PB 12x1.3mm pipe from ArgillaTherm.

Features	Interpretation Variant I	Interpretation Variant I I
Pipe dimensions	12 x 1,3 mm	12 x 1,3 mm
max. length per heating circuit	80 m	100 m
max. flow rate per heating circuit	72 l/h ≙ 0,9l per linear metre	90 l/h ≙ 0,9l per linear metre
Pressure difference	150 mbar	250 mbar

Standard design ceiling heating at 60 W/m², room target temperature 20°C

The spread between flow and return should be 5K. The flow rates required for this are set automatically when using the maximum lengths and are given in the table above. For shorter heating circuit lengths, these should be reduced accordingly (hydraulic compensation).

Example: Design variant I with 60W/m2:
The heating circuit has a pipe length of 48m.
==> The required flow rate is: 48 x 0,9l = 43 l/h

Example: Design variant II with 60W/m2:
The heating circuit has a pipe length of 85m.
==> The required flow rate is: 85 x 0,9l = 76 l/h

With a flow temperature of 35°C, the average ceiling temperature is 2.5 K below the average value of the heating water. When the flow temperature increases, this value rises proportionally. The values that are important for the heating capacity output are listed in the following table.

Forward Temperature in°C	Return Temperature in °C	Ceiling Temperature in °C	Room Temperature in °C	Heating capacities Watt/m²
45,0	36,7	36,7	20	100
42,5	35,0	35,0	20	90
40,0	33,3	33,3	20	80
37,5	31,7	31,7	20	70
35,0	30,0	30,0	20	60
32,5	28,3	28,3	20	50
30,0	26,7	26,7	20	40
27,5	25,0	25,0	20	30

Flow temperatures and heating capacities for ceiling mounting

With regard to power output, the system was tested according to DIN EN 1264 and DIN EN 14037.

Self-heating effect of the high performance clay modules

The heat generated in the room during the day rises to the ceiling by convection (warm air). Heat sources can be e.g. people, electrical devices or incident solar energy. ArgillaTherm's highly compressed clay modules store this heat energy and the sandwich construction prevents the heat from migrating to the ceiling. If the room temperature falls below the temperature of the clay layer, the stored energy is released back into the room in the form of thermal radiation. The heating period is thus reduced by up to 6 weeks in the transition periods. Detailed information about this under: Lehmbau Handbook, building material science, techniques of loam architecture; Prof. Dr. Gernot Minke.

Design and application of ceiling cooling

The wSYSTEM is ideally suited for use in summer by circulating cold water in the pipes for room cooling. The maximum circuit lengths and the required volume flow (0.9l/h per running meter) are identical to the heating operation and do not have to be changed.

Due to the uniquely large moisture storage (> 500g/m²), the system is also suitable for use in buildings with passive cooling by night ventilation.

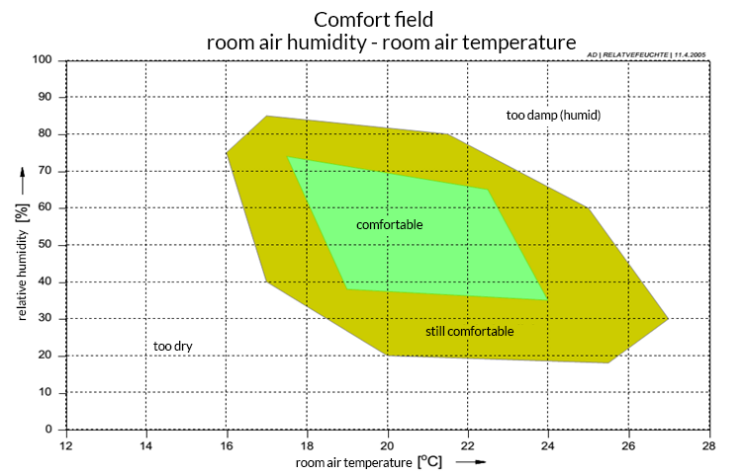
Application areas:

- o Ceiling cooling in buildings without mechanical air dehumidification
- o Ceiling cooling in buildings with mechanical air dehumidification
- o Ceiling cooling in buildings with passive cooling by night ventilation

Ceiling cooling in buildings <u>without</u> mechanical air dehumidification

Pleasant and quiet reduction of the room air temperature, without increasing the relative humidity content of the room air and buffering the humidity surge times.

By using the high performance clay modules and the resulting uniquely large moisture storage (> 500g/m²), the relative room air humidity is kept constant. For tested values see test report of MFPA-Weimar.



For each degree of temperature reduction, the room air humidity increases by approximately 6% of the initial value. If this value rises above 50 %, the natural "absorption instinct" of the clay minerals in the modules is activated and, as the room air humidity falls, the absorbed moisture is released back into the room.
In this way, the room temperature is lowered and the moisture content of the room air is kept constant without the use of mechanical air dehumidification.

The use of dew point monitors or dew point controls is recommended, but should not be used under normal conditions in our latitudes.

For chilled ceilings with high power requirements or moisture turnover, we generally recommend using the ArgillaTherm natural lime plaster system for surface coating.

Ceiling cooling in buildings <u>with</u> mechanical air dehumidification

Buffering of moisture peak times (e.g. at group meetings, when showering or cooking) due to the uniquely large moisture storage (> 500g/m²). Punctual condensation water deposits due to uneven flushing of the room with pre-dried air are excluded.

An air exchange with a reference variable of 1000ppm CO^2 in the room and a ΔT (room temperature - supply air/drying) of 14k is sufficient to remove the accumulated moisture and can be used <u>in all latitudes</u> (under tropical conditions).

water vapour content [g/m³] and dew point [C°] of the air

air temperature [°C]	relative humidity [%] 10	20	30	40	50	60	70	80	90	100	°C
0	0,5	1,0	1,5	1,9	2,4	2,9	3,4	3,9	4,4	4,8 0,0	0
1	0,5	1,0	1,6	2,1	2,6	3,1	3,6	4,2	4,7	5,2 1,0	1
2	0,6	1,1	1,7	2,2	2,8	3,3	3,9	4,5	5,0 0,5	5,6 2,0	2
3	0,6	1,2	1,8	2,4	3,0	3,6	4,2	4,8	5,4 1,5	6,0 3,0	3
4	0,6	1,3	1,9	2,5	3,2	3,8	4,5	5,1 0,9	5,7 2,5	6,4 4,0	4
5	0,7	1,4	2,0	2,7	3,4	4,1	4,8	5,4 1,9	6,1 3,5	6,8 5,0	5
6	0,7	1,5	2,2	2,9	3,6	4,4	5,1 1,0	5,8 2,8	6,5 4,5	7,3 6,0	6
7	0,8	1,6	2,3	3,1	3,9	4,7	5,4 1,9	6,2 3,8	7,0 5,5	7,8 7,0	7
8	0,8	1,7	2,5	3,3	4,1	5,0 0,7	5,8 2,9	6,6 4,8	7,5 6,5	8,3 8,0	8
9	0,9	1,8	2,7	3,5	4,4	5,3 1,7	6,2 3,8	7,1 5,7	8,0 7,5	8,8 9,0	9
10	0,9	1,9	2,8	3,8	4,7 0,1	5,7 2,6	6,6 4,8	7,5 6,7	8,5 8,4	9,4 10,0	10
11	1,0	2,0	3,0	4,0	5,0 1,0	6,0 3,5	7,0 5,8	8,0 7,7	9,0 9,4	10,0 11,0	11
12	1,1	2,1	3,2	4,3	5,3 1,9	6,4 4,5	7,5 6,7	8,5 8,7	9,6 10,4	10,7 12,0	12
13	1,1	2,3	3,4	4,5	5,7 2,8	6,8 5,5	8,0 7,7	9,1 9,6	10,2 11,4	11,4 13,0	13
14	1,2	2,4	3,6	4,8 0,7	6,0 3,7	7,3 6,4	8,5 8,6	9,7 10,6	10,9 12,4	12,1 14,0	14
15	1,3	2,6	3,9	5,1 1,5	6,4 4,7	7,7 7,3	9,0 9,6	10,3 11,6	11,6 13,4	12,9 15,0	15
16	1,4	2,7	4,1	5,5 2,4	6,8 5,6	8,2 8,2	9,6 10,5	10,9 12,6	12,3 14,4	13,7 16,0	16
17	1,5	2,9	4,4	5,8 3,3	7,3 6,5	8,7 9,2	10,2 11,5	11,6 13,5	13,1 15,3	14,5 17,0	17
18	1,5	3,1	4,6 0,2	6,2 4,2	7,7 7,4	9,2 10,1	10,8 12,5	12,3 14,5	13,9 16,3	15,4 18,0	18
19	1,6	3,3	4,9 1,0	6,5 5,1	8,2 8,3	9,8 11,1	11,4 13,4	13,1 15,5	14,7 17,3	16,3 19,0	19
20	1,7	3,5	5,2 1,9	6,9 6,0	8,7 9,3	10,4 12,0	12,1 14,4	13,9 16,4	15,6 18,3	17,3 20,0	20
21	1,8	3,7	5,5 2,8	7,3 6,9	9,2 10,2	11,0 12,9	12,9 15,3	14,7 17,4	16,5 19,3	18,4 21,0	21
22	1,9	3,9	5,8 3,6	7,8 7,8	9,7 11,1	11,7 13,9	13,6 16,3	15,6 18,4	17,5 20,3	19,5 22,0	22
23	2,1	4,1	6,2 4,5	8,2 8,7	10,3 12,0	12,4 14,8	14,4 17,2	16,5 19,4	18,5 21,3	20,6 23,0	23
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25	2,3	4,6 0,5	6,9 6,2	9,2 10,5	11,5 13,9	13,8 16,7	16,1 19,1	18,5 21,3	20,8 23,2	23,1 25,0	25
26	2,4	4,9 1,3	7,3 7,1	9,8 11,4	12,2 14,8	14,6 17,6	17,1 20,1	19,5 22,3	22,0 24,2	24,4 26,0	26
27	2,6	5,2 2,2	7,7 8,0	10,3 12,2	12,9 15,7	15,5 18,6	18,1 21,1	20,6 23,3	23,2 25,2	25,8 27,0	27
28	2,7	5,4 3,0	8,2 8,8	10,9 13,1	13,6 16,6	16,3 19,5	19,1 22,0	21,8 24,2	24,5 26,2	27,2 28,0	28
29	2,9	5,8 3,8	8,6 9,7	11,5 14,0	14,4 17,5	17,3 20,4	20,1 23,0	23,0 25,2	25,9 27,2	28,8 29,0	29
30	3,0	6,1 4,6	9,1 10,5	12,2 14,9	15,2 18,4	18,2 21,4	21,3 23,9	24,3 26,2	27,3 28,2	30,4 30,0	30
	10	20	30	40	50	60	70	80	90	100	

A human being produces about 15.000ppm CO^2 at rest, so 25m³ of fresh air is required for the Delta 600ppm (1000ppm out & 400ppm in).

For each CO^2 one H2O is produced;

0.6 mol/h corresponds to about 11g/h per person.

At 24°C and 50% RH in the room the air has 10.9g/m³ water, at 10°C at the cooling coil in the supply air only 9.4g/m³ ≙ Delta 1.5g/m³.

Thus 37.5g (25m³ x Delta 1.5) per hour are discharged, but only about 11g per person is exhaled.

This always applies if the drying in the supply air is 14k below the target temperature of the room.

The clay climate cooling ceiling system can be used in buildings with mechanical air dehumidification under the described parameters <u>in all latitudes</u> (under tropical conditions).

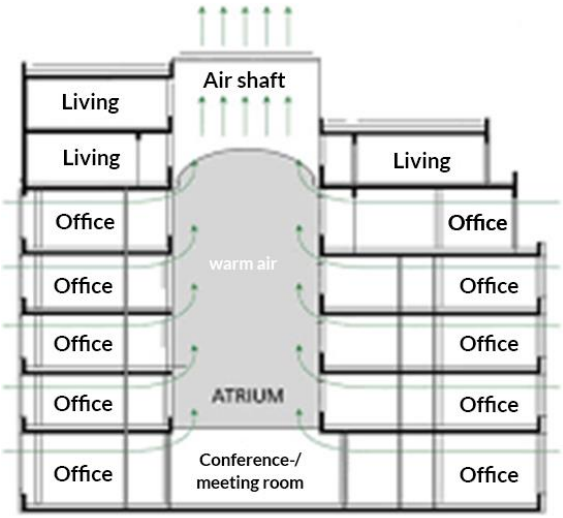
For chilled ceilings with high power requirements or moisture turnover, we generally recommend using the ArgillaTherm natural lime plaster system for surface coating.

Ceiling cooling in buildings with passive cooling by night ventilation

By integrating the high performance clay modules and the resulting uniquely large moisture storage (> 500g/m²), this system is ideally suited for use in buildings with passive cooling by night ventilation. The functionality is as follows:

Night: Charging the modules with cool moisture and convective release of the stored thermal energy from the day in the air flowing past.

Day: Release of stored moisture and absorption of room heat (mainly convective).



1g of moisture evaporation extracts the Climatic ceiling 0.625 Wh thermal energy. The release (evaporation) of 100 g/m² of moisture naturally produces 62.5 Wh/m² of evaporative cooling.

Room temperature reductions of 8°C from the peak outside temperature can be achieved without any problems.

The right building planning (cooling concept) is what counts!

- Boundary conditions of the site (climate, orientation, use)
- Building envelope (reduction of solar heat loads)
- Use (reduction of internal heat loads)
- Air shaft for using free night ventilation (chimney effect)
- Ensure transverse flow through the building

Interpretation

The cooling capacity depends on the temperature difference (room minus flow). At a room temperature of 26°C and a flow of 16°C the cooling capacity is 65 W/m2 , for example. For other pairs of values see the table below.

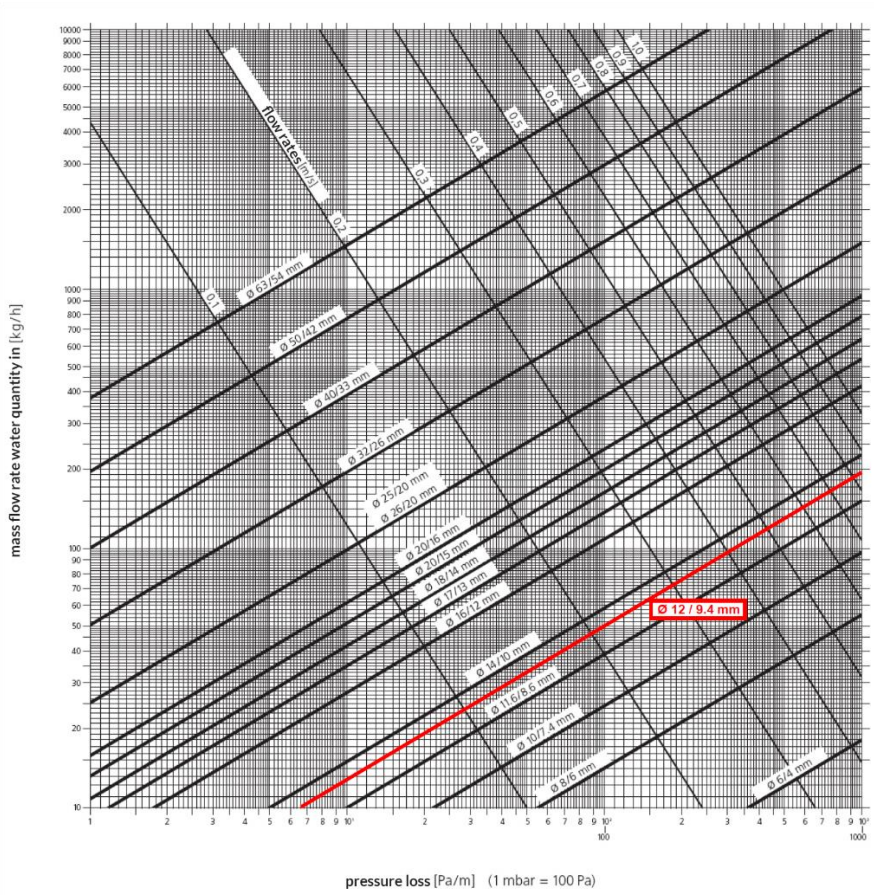
Cooling capacity ≙ Room temp. - flow temp. x factor 6.5 (tested according to DIN EN 14240)

Forward Temp.	Room temperature 18 °C	Room temperature 20 °C	Room temperature 22 °C	Room temperature 24 °C	Room temperature 26 °C
10°C	52 Watt	65 Watt	78 Watt	91 Watt	104 Watt
12°C	39 Watt	52 Watt	65 Watt	78 Watt	91 Watt
14°C	26 Watt	39 Watt	52 Watt	65 Watt	78 Watt
16°C	13 Watt	26 Watt	39 Watt	52 Watt	65 Watt
18°C		13 Watt	26 Watt	39 Watt	52 Watt
20°C			13 Watt	26 Watt	39 Watt
22°C				13 Watt	26 Watt

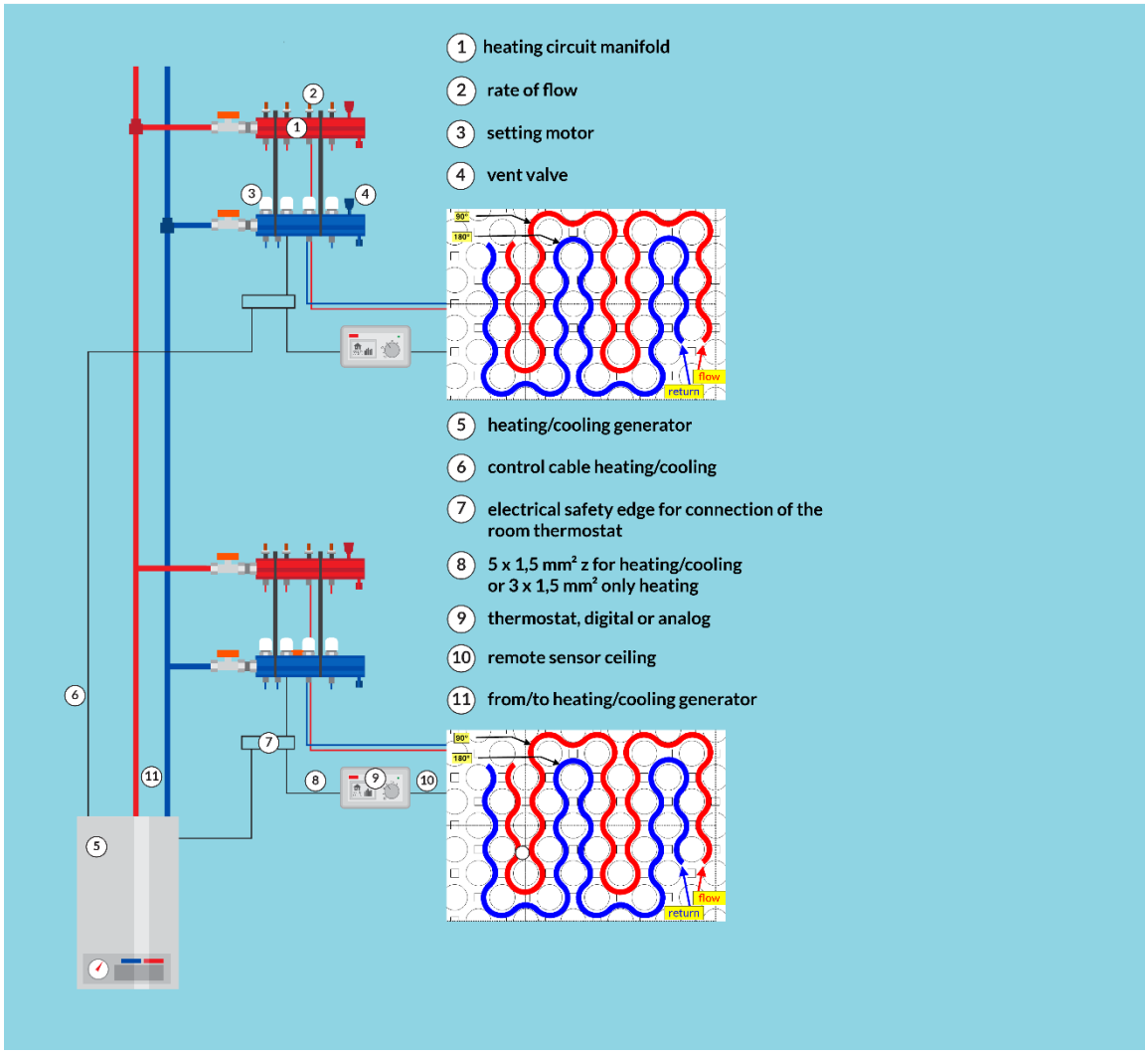
Cooling capacities at different supply and room temperatures with a volume flow of 0.9l/h per running meter.

With regard to power output, the system was tested according to DIN EN 1264 & DIN EN 14240.

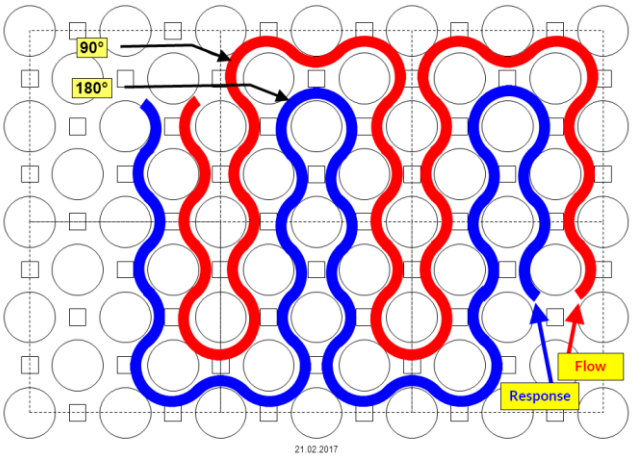
Pressure loss diagram (T = 40 °C, wall roughness ε = 0.007 mm)



Circuit diagram



Examples for pipe laying



Statics

Ceiling loads are calculated and designed according to DIN 1055. This specifies a load-bearing capacity of 1.5 or 2.0kN/m² for today's residential buildings. For older buildings with wooden beam ceilings, the load design is similar and is usually 1.5kN/m². 1kN corresponds to about 100kg.

Weight HighPerformance Clay Modules	36,50 KG/m²
Weight Clay system compensation panels	15,50 KG/m²
Weight Fixing material, pipe and lime plaster without substructure	13,00 KG/m²
Weight Fixing material, pipe and clay plaster without substructure	20,00 KG/m²
Weight Fixing material, pipe and lime plaster and 22mm OSB/ESB board	26,20 KG/m²
Weight fixing material, pipe and clay plaster and 22mm OSB/ESB board	33,20 KG/m²
Weight Fixing material, pipe and lime plaster and 18mm cement bonded chipboard	38,60 KG/m²
Weight Fixing material, pipe and clay plaster and 18mm cement bonded chipboard	45,60 KG/m²

Example: 20m² of ceiling; 50% high-performance clay modules and 50% compensation panels and a substructure of 22mm OSB boards, surface coating with lime plaster.

==> 10m² x 62,70KG (36,50KG + 26,20KG) and 10 x 41,70KG (15,50KG + 26,20KG) = 1.044 KG

==> 52,20KG/m² average weight

The maximum weight is 69.7 KG/m² (when fully covered with high-performance clay modules) and a surface coating of clay plaster.

Required materials per m² heating/cooling surface with surface coating lime plaster

OSB/ESB or cement-bonded chipboard with tongue and groove as substructure	1 m²
High-performance clay modules according to DIN 18948	7,23 Piece
Stainless steel – screw load distribution disc 5 x 50 mm & stainless steel - clamping screw 5 x 45mm	18 Piece
Polybutene pipe "Hot & Cool" according to DIN 16968, PB 12 x 1.3mm	11 m
Natural lime base plaster 66-20	13 kg
Glass silk mesh fabric, MW 7 x 7mm, 105g/m², 100cm wide	1 m²
Mineral paint 689-20 as sprayable and brushable ready mixture (2 coats)	0,6 kg
Natural lime finish plaster 685-20 (optional)	*2 kg*

Required materials per m² heating/cooling surface with surface coating clay plaster

OSB/ESB or cement-bonded chipboard with tongue and groove as substructure	1 m²
High-performance clay modules according to DIN 18948	7,23 Piece
Stainless steel - screw load distribution disc 5 x 50 mm & stainless steel - clamping screw 5 x 45mm	18 Piece
Polybutene pipe "Hot & Cool" according to DIN 16968, PB 12 x 1.3mm	11 m
clay plaster „Thermo" according to DIN 18947	20 kg
Glass silk mesh fabric, MW 7 x 7mm, 105g/m², 100cm wide	1 m²
Clayfix clay paint according to DVL TM 06 as sprayable and brushable ready-mix	0,5 kg
High-grade clay plaster according to DVL TM 06 with 2mm application thickness (optional)	*3,5 kg*

Interfaces & distribution channels

1. Substructure	Installation	Distribution/Material
- Protector metal ceiling suspension - Mounting edge insulation strips and Chipboards	drywall, construction company, carpentry	drywall, construction company, carpentry
2. Heating/cooling technology level	**Installation**	**Distribution/Material**
- Installation of high performance clay modules and Clay compensation panels on UK	drywall, construction company, carpentry	SHK Wholesale Heating installer
- Laying PB pipe - Install ceiling sensor	Heating installer	SHK Wholesale Heating installer
- Installing the room thermostat - Connection ceiling sensor - Connection of servomotors/thermostats	Electrician	SHK Wholesale Heating installer
3. Surface coating	**Installation**	**Distribution/Material**
- Filling layer at slab level with loam/lime - Surface layer with clay/lime - Surface finish with clay/lime colour	Clay builder, stuccoer, plasterer, painter	Clay builder, stuccoer, plasterer, painter

Connection to existing heating systems

1. **Control station with 3- or 4-way mixer and pump.**
   The flow temperature of the existing heating system is reduced to the desired flow temperature (approx. 35°C) of the ArgillaTherm ceiling system by means of a control station. The pump provides the necessary pressure and volume flow. The heating circuit lengths and volume flows are as described on pages 8 and 9.
2. **RTL control box with flow regulation in connection with the ArgillaTherm room thermostat**
   The remote sensor measures the ceiling temperature and transmits these values to the room thermostat. The room thermostat controls the actuator in the RTL box (product recommendation is the RTL-TH Basic combination box from Simplex, art. no. F11836), which is to be installed in the return flow. Since no additional pump is used here to transport the heating water, hydraulic balancing with the existing heating system must be carried out by adjusting the pressure differences.

   The following basic parameters must be applied:

   maximum heating circuit length = 60m, volume flow per hour = 0.9l per running meter of pipe laid

   Pressure difference in heating circuit = 80mbar