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NEA SMART 2.0 Control System

Application TABS CCT – sCCT – IFHC
Application Control Area CA
Function – Configuration – Operating



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Development Status 04/2023

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01 Security

Pictograms and logos

Safety instructions are marked with the listed symbols.



Danger to life due to high voltage.



Safety information



Legal information



Important information which must be observed



Configurable parameter

Safety warnings and operating instructions

For your own safety and the safety of other people, please read all safety instructions and operating instructions carefully and completely before commencing assembly.

Keep the operating instructions safe and have them available.

If you have not understood the safety instructions or any individual installation instructions or find them unclear, please contact your REHAU sales office.

Non-compliance with the safety information may lead to damage to property and personal injury.

Product conformity

Hereby, REHAU Industries SE & Co. KG declares that the NEA SMART 2.0 system complies with the following EU directives and UK regulations:

Non-radio equipment types:

- 2014/30/EU; UK: 2016 No. 1091
- 2014/35/EU; UK: 2016 No. 1101
- 2011/65/EU; UK: 2012 No. 3032

Radio equipment types

- 2014/53/EU; UK: 2017 No. 1206
- 2011/65/EU; UK: 2012 No. 3032

The full text of the EU and UK declarations of conformity is available at the following internet address: www.rehau.com/neasmart2

Radio equipment types:

- Frequency: 869MHz
- Transmission power: max. +12dBm

Use in line with the specification

The NEA SMART 2.0 control system must be configured, installed and operated only as described in this technical information and in the other installation manuals for the system. Any other use is not in accordance with the specification and is therefore not permitted.

Observe all national and international routing, installation, accident prevention and safety regulations and the instructions in this technical information when installing piping systems and electrical components and equipment.

Areas of application which are not covered by this technical information (special applications) must be discussed with our application department.

Contact your REHAU sales office.



Prerequisites for personnel

- Our systems must only be installed by authorised and trained personnel.
 - Only trained and authorised personnel may work on electrical installations or pipework components.
-

General precautions

- Keep your workplace clean and free of obstructions.
- Ensure that your work space has adequate lighting.
- Keep children, pets and unauthorised persons away from tools and installation areas. This particularly applies to renovations in occupied areas.

Only for UK:

Importer address:
 REHAU Ltd.
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02 Introduction

This manual is a supplement to the NEA SMART 2.0 Service Manual for designer, installer and service partner. All information contained in the basic NEA SMART 2.0 Service Manual have to be considered, too.

This supplement describes the special features and functions of the software extension for the application „Slow reacting radiant heating and cooling systems“, namely CCT, sCCT and IFHC – summarized under the term TABS.

Used terms:

TABS :

Thermally Activated Building Systems

CCT:

Concrete core temperation – pipes are embedded in the structural base

sCCT:

Surface near CCT – pipes are embedded close to the surface of the structural base

IFHC:

Industrial Floor Heating and Cooling

HVAC:

Heating, Ventilation, Air Conditioning

Room Unit:

All NEA SMART 2.0 Room Controller or NEA SMART 2.0 Room Probes.

The functions for TABS applications in heating and cooling mode are available from software version V4.0.

You can see the software version on the integrated web pages in menu point “System” and in the mobile app in “Settings”, “General”.

If your system does not have this version, please perform an Over-the-air update.



Please note also

The NEA SMART 2.0 room controllers are available with software version 1.6 or higher, which is needed for core temperature or return temperature monitoring.

The room probes will follow with these functions.

03 General function

This chapter describes all special functions for TABS applications.

TABS applications can be combined with all other functions and applications, which are in the scope of NEA SMART 2.0 system.

03.01 What are the special requirements for TABS control?

The most important point is the higher thermal mass of all TABS, compared with floor, wall and ceiling radiant systems.

This high thermal mass could lead to overshooting of room temperature, especially when the system is started or there is a change from reduced to normal mode.

To reduce this problem, it is necessary to monitor the core temperature or the return temperature.

In some applications it is also intended to "charge" the TABS system CCT e.g. only during the night, while during daytime the HVAC system or other radiant systems take over. In this case, it is also needed to have a well-controlled charging of the core.

Additionally and particularly in the case of commercial buildings – there are often larger areas to be controlled, such as open space offices, halls or showrooms.

For such large spaces it is recommended, to use more than one room unit. See chapter 03.03.

03.02 Controls and TABS

The Building Energy Act GEG (§63) stipulates a room-by-room control of the room temperature. Exceptions apply to rooms with underfloor heating that have a usable area smaller than 6 m². In the case of non-residential buildings, a group regulation is also permitted for groups of rooms of the same type and use.

The individual room control requires the separate control of the heating surface of a room as well as a strict thermal separation of the heating surfaces of the individual rooms from each other.

The aim of individual room control is to reduce the energy consumption of buildings and to prevent and counteract overheating in rooms.



With the surface near concrete core temperature (sCCT) as a sole heating/cooling system, room-by-room control of the room temperature is possible under suitable structural conditions and appropriate use!



In the case of concrete core temperature (CCT) and industrial surface heating (IFH), room-by-room control of the room temperature as the sole heating/cooling system is not possible. The addition of a fast-reacting system is necessary to enable room-by-room regulation!

CCT concrete core temperature (TABS type E1 according to DIN EN 1264 part 1)

- The REHAU TABS control procedure runs a storage management in the solid component of the CCT
- The consideration of return / core temperature counteracts the overheating of rooms when heating
- The CCT is suitable for temperature control to cover base loads when heating and cooling
- For individual room control, the CCT needs to be supplemented with a faster-reacting H/C system

sCCT surface near concrete core temperature (TABS type F according to DIN EN 1264 part 1)

- In the case of sCCT, individual room control is possible with the REHAU TABS control process
- Due to the positioning of the tubes close to the surface, the controllability and power output are improved
- A good controllability of the sCCT is given with heating loads of well insulated buildings of maximum 30W/m²
- It should be noted that heat can be distributed laterally to neighboring rooms via the ceiling

IFHC industrial surface heating and cooling (TABS type E2 according to DIN EN 1264 part 1)

- The REHAU TABS control method for IFHC enables room temperatures to be maintained as the base load
- Due to its storage mass, the IFHC is very similar to the reaction behavior of a thermally inert CCT
- As a typical application, a basic temperature of approx. +15 °C is ensured in halls by the IFHC when heating
- In order to improve controllability, the IFHC needs to be supplemented with a faster-reacting system

03.03 Room temperature control of larger areas

Larger areas, such as open space offices, industrial halls, exhibition rooms etc. cannot be reliably controlled by means of one single room temperature sensor.

In residential applications, the same situation may occur when there are e.g. large living rooms combined with kitchen and dining areas.

It is beneficial to place room units in different places and use the mean value of all measured temperatures as an input for the control algorithm.

To enable this, the software of the controller allows defining of so-called control areas (CA). In a CA, there are several room units. The mean value of all room temperatures and the highest value of relative humidity and dew point is taken for the control algorithm.

These control areas are seen as one room in the app and in the user area of the integrated web pages.

When there are room units with display used, any set point change done on one of the room units is transferred to the other room units.



Note:

The use of control areas is not limited to TABS only. A control area may also contain other radiant systems or fan coils, in combination with TABS or without TABS.



A control area is a collection of room units, in order to get average values of room, return or core temperatures and the highest value of relative humidity. The number of control areas (CA) will be entered in Wizard in page "System Components". If there are no control areas, enter 0.

03.04 Consideration of high thermal mass

The control algorithm for TABS consists of two parts:

- A room temperature controller (Proportional-Integral)
- A core temperature controller (Proportional)

These 2 parts are combined to one control signal, where the 2 parts are weighted with different factors, depending on the TABS type.

As a consequence, even in the heat up phase when the room temperature is still quite away from its set point, the heating of the core will be reduced, when its set point (according to the design values) is reached. This is done to reduce a significant overshooting of the room temperature.

On the other hand, when the room temperature is close to the set point (or slightly a bit above), but the core temperature is too low, heating of the core will continue in a moderate way.

The default setting for the weighting factors of core and room temperature is 1:1.

If over longer periods the room temperature is above or below the set point, the weighting factor for room temperature can be increased.

The monitoring of core temperature can be done by

- directly placing a probe in the core
- or
- by attaching a probe to the return pipe of one of the circuits of the room or CA.

Core temperature probe

NEA SMART 2.0 Remote sensor (Material number 13280331001)

Return temperature probe

NEA SMART 2.0 VL/RL-sensor (Material number 13280391001)

The probes are connected to the external input "Remote Sensor NTC" of the room unit.

The setting of the external input has to be:

- P9** for core temperature measurement
- P10** for return temperature measurement



Remark:

In case that there is no possibility, to use one of the room units which are placed in the room, for this purpose (no cable to the manifold possible), you have the option to place an additional room unit only for return or core temperature measurement.

The room temperature measurement of this room unit must be disabled, to avoid that the temperature measurement of the room or the CA is distorted.

This is done in the room configuration page in installer level.

03.05 Consideration of design values

The design values can be entered during the setup of the system using the wizard. The design values indicate the flow and return temperature at the lowest outside temperature to be expected, the so-called design temperature.

The design temperature depends on the region and can be set in the range of -20 °C to -5 °C .

In one installation, the planning may provide for one TABS different design values for different areas. Up to 3 different return temperature levels can be entered. If the design values shall be used, the heat curves resulting from these values are calculated for the flow temperature and for the return temperature.

If there is a mixed circuit for TABS controlled by the NEA SMART 2.0 system, this mixed circuit uses automatically the resulting heat curve for flow temperature control.

If there are no design values, it is also possible, to enter the decisive values „slope flow“ and “slope return” for the heat curves manually.

03.06 CCT charge control: Core charging outside of room usage time

With CCT systems, the high storage capacity of the thermally activated components can be utilized in the “CCT charge control” operating mode:

The CCT is operated alternately with another system in heating or cooling mode.

- Outside the usage times of the rooms, the CCT is charged to a defined temperature level and releases the stored energy throughout the day – or, in the case of cooling, absorbs the thermal energy of the rooms.
- When the rooms are in use, there is no or only reduced charging of the core.

The purpose of this approach is that the installed heating or cooling capacity shall be used during the day exclusively or at least predominantly for other systems such as HVAC or other radiant systems.

03.07 Combinations of different systems per room or control area (CA)

It is possible to combine TABS with all other radiant heating/cooling systems such as floor, wall or ceiling as well as with fan coils and dehumidifiers.



However, the control algorithm of the NEA Smart 2.0 system does not allow to control more than one thermally activated building system (CCT, sCCT, IFHC) per room or control area (CA).

Remark:

If several systems are operated in one room at the same time, the needs-based design and hydraulic balancing of the individual systems is of particular importance.

If, due to a mismatch, the power output of one of the systems predominates, the room may overheat and, as a result, the performance of the other system or the other systems may be reduced. In combination with underfloor heating, for example, this can result in the floor surface remaining cold.

If this situation occurs, the hydraulic balancing and the setting of the parameters that are decisive for the power output must be checked and corrected if necessary.

Due to the high storage capacity of TABS, external energy input (solar radiation, people, electrical devices ...) can lead to increasing room temperatures, which cannot be prevented by the control technology despite reducing or even switching off the energy supply. Underfloor heating operated in parallel can cool down slowly.

In rooms where, for reasons of comfort, sufficient heating of the floor is always desired – e.g. in bathrooms – the desired minimum floor temperature can be maintained by using a floor temperature sensor and setting the additional input of the room controller to parameter value P02.

In this case, however, it is to be expected that a certain overheating of the room and the associated increased energy consumption will occur, at least temporarily.

03.08 Dehumidifiers and fan coils

Dehumidifiers and fan coils can be defined for rooms and control areas. A control area is equivalent to a single room, this means that a control area may contain only 1 dehumidifier and only 1 fan coil.

04 How to design the NEA SMART 2.0 control system

04.01 Definition of control areas (CA)

For areas in excess of 40 or 50 m² it is recommended to place more than 1 room unit to achieve a more reliable measurement of room temperature, humidity and return or core temperature.

It makes no sense to define control areas, which include more than one room.



Please note:

It is not possible, to assign room units to a CA, which are paired to different NEA SMART 2.0 bases of a master and slave system!

A control area is always limited to only 1 NEA SMART 2.0 base and its R-Module.

04.02 How to monitor core or return temperature

To ensure proper control behavior, return or core temperature probes – one for each room or at least one per CA – must be used.

The auxiliary input of the room units can be used for various signals, for TABS applications it can be defined for return temperature or core temperature. It is possible, to use both types within a CA.

Every measured core or return temperature is assigned to a dedicated room or control area. If the temperature sensors cannot be physically connected to their corresponding room units, the following alternative solution exists:

- Place a room unit or room probe with software version from 1.6 close to the manifold (e.g. in the manifold cabinet).
- Attach a temperature probe to the return pipe or place the temperature probe in the core.
- Enable P9 for core temperature measurement or P10 for return temperature measurement directly on room unit or in installer area of webpages in menu "Room units".
- Disable the room temperature measurement of this room unit in the configuration to exclude the air temperature inside the cabinet or around the manifold from the control input and prevent it from impacting the control process.



Note:

The return temperature measurement of a mixed circuit (U-Modul in mixed circuit configuration – analogue input AI2) has no influence on the control behaviour of TABS in heating mode.

In cooling mode the flow temperature is adapted when the return temperature drops below the defined limit (see parameter CD).

04.03 How to integrate other systems into TABS

Additional systems as radiant systems, dehumidifiers and fan coils can be integrated in rooms or control areas, which are supplied by TABS.



Please note:

A control area needs at least as many room zones (RZ) of a NEA SMART 2.0 base, as room units are combined in the CA.

But:

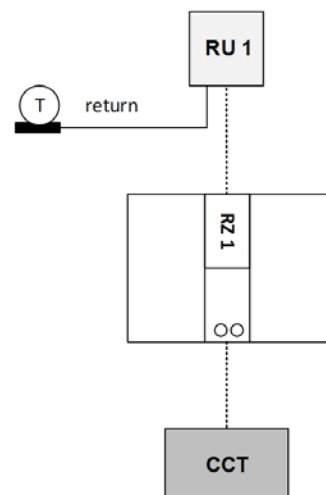
Each RZ which belongs to a CA can be used for a different system.

The next chapter shows different possibilities.

04.04 Examples for TABS applications

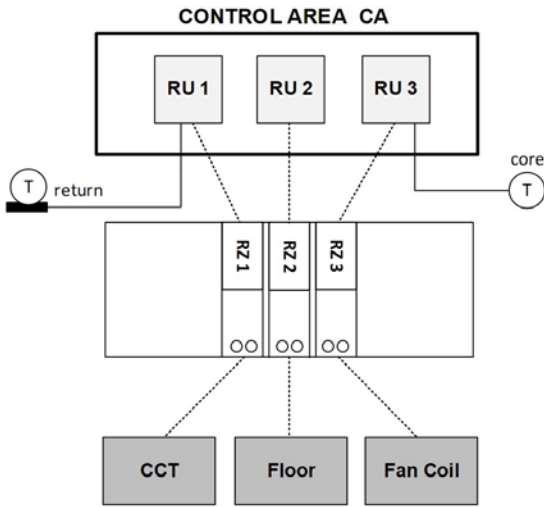
04.04.01 1 single room unit with system CCT (no control area)

1 room unit was assigned to 1 room zone with the system CCT; a return temperature sensor has been configured for the CCT system. An air dehumidifier and/or a fan coil could also be located in this room.



04.04.02 CA (3 Room Units) with CCT, floor and a fan coil

Each room unit is used for a different system (this is not mandatory). 1 return and 1 core probe is used for CCT.

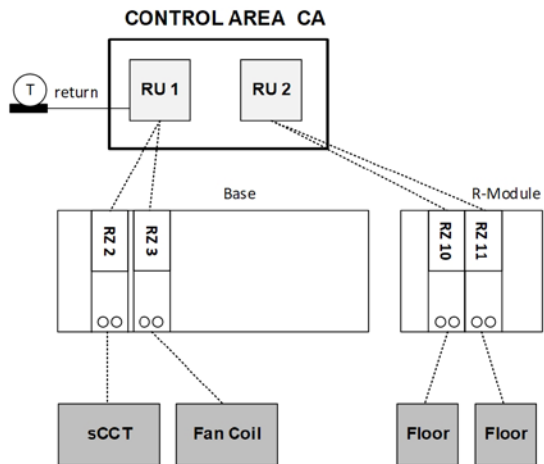


Note:

Return and core temperature measurement can be combined.

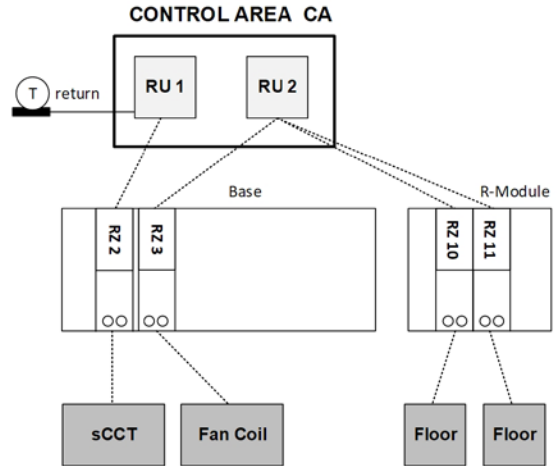
04.04.03 CA (2 room units) with sCCT, floor and a fan coil

The R-Module is located in a 2nd manifold cabinet for underfloor heating, 2 RZs are used for it. One return temperature probe is used for sCCT.



Note:

The assignment of the room units to the room zones with their different function is not important. The same function could be achieved also with this configuration (RU 2 is assigned to RZ3, too):

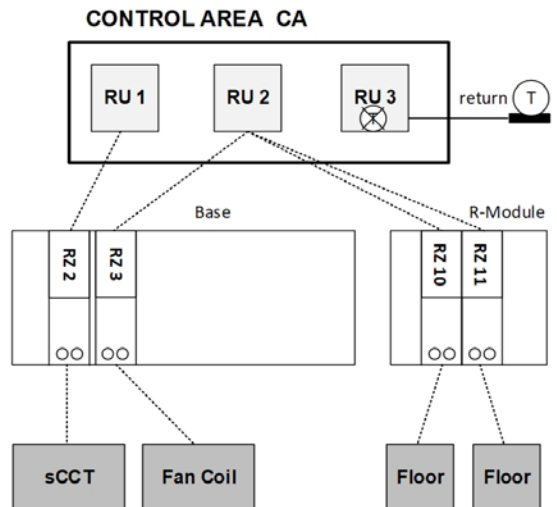


Important note:

It is not possible to define a CA with room units assigned to different bases. CAs are always limited to one base and the associated R-Module.

04.05 Additional room unit for return/core temperature measurement

RU 3 belongs to CA, but is meant for return temperature measurement only. The room temperature measurement is excluded by ticking the checkbox „Exclude Room Temperature“.



04.06 Recommended proceeding to design the system

Installations with several manifolds, with a larger number of rooms, where partly several room units are in one control area, have to be carefully designed and well documented.

It is recommended, to use an excel file, to list all used room units and their relations to rooms, manifolds and systems.

Step 1: Build a reference list of manifolds, systems and rooms

Step 2: Decide where to define a CA



Note:

A CA is always limited to only 1 NEA SMART 2.0 base and its R-Module.

Step 3: Place room units in rooms resp. CAs

Step 4: Decide whether additional room units or probes only for return or core temperature measurement – without measuring the room temperature – are needed.

Step 5: Evaluate how many room zones are needed for each single room unit / probe. Here you have to consider the used systems (floor, ceiling, wall, fan coil, CCT, sCCT, IFHC) and the number of heating circuits.

Step 6: Define the required number of base units and corresponding R-modules based on number of CAs and number of room zones and assign NEA SMART 2.0 base units and R-Modules to manifolds and circuits.

Step 7: Assign room units to room zones.

05 Installation of components

The installation of components is generally done in the same way as described in the NEA SMART 2.0 Service Manual.

05.01 Room units in control areas

When several room units are installed in a room to create a control area (CA), it is important to spread them evenly over the complete control area to get a representative information about the thermal condition of this room.

Temperature differences at certain spots of the control area to the general temperature might occur, but the influence is minimized by averaging.



Note:

Observe the general rules for placing room units. See the assembly instructions for the room units.

05.02 Core temperature probes

Core temperature probes have to be installed in a protection pipe to avoid direct contact to the concrete and to allow to replace them if defective.

The position of the temperature sensor has to be in the level of the heating pipes inside the construction element and in the middle between 2 pipes at this level.

05.03 Return temperature probes

Return temperature probes should be fixed with good thermal contact to the return pipe. To reduce the disturbing effect of air temperature, place them inside the existing pipe insulation or apply an additional appropriate insulation.

To reduce thermal transmission between manifold and return temperature probe keep a distance of minimum 10 cm to the manifold.



Note:

To get representative information about the general return temperature of the area, the circuits of the area must be balanced as designed.

06 Configuration with wizard

This chapter describes particularly the differences or additional steps, which are used for TABS.
For all other configuration steps or parameter settings, see NEA SMART 2.0 Service Manual.

06.01 Example installation

The example is an installation using sCCT (surface near concrete core temperature) and a radiant floor system for heating, consisting out of:

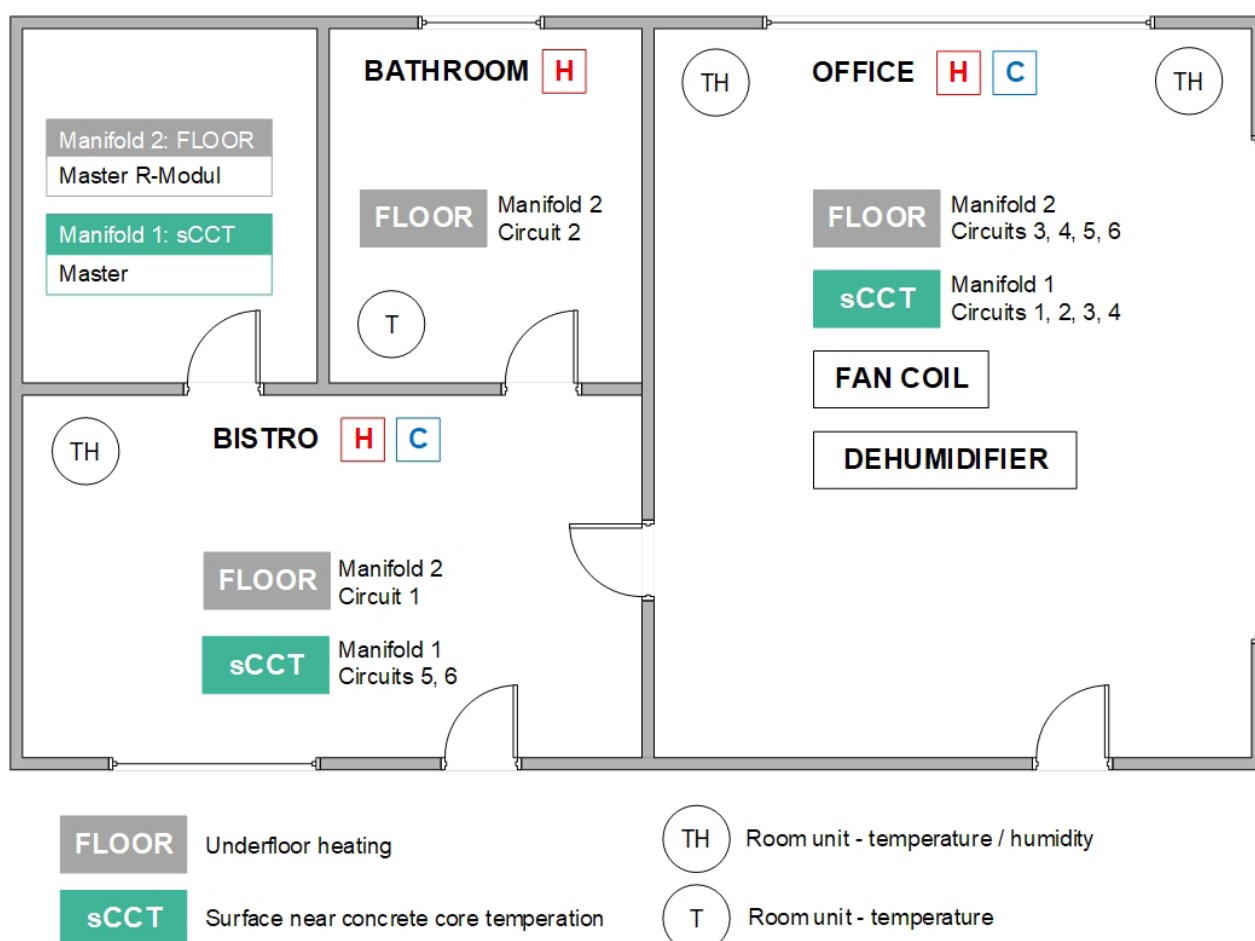
- 1 office room with sCCT for heating and cooling and underfloor heating.
This room is equipped with a dehumidifier and a fan coil for cooling
- 1 Bistro with sCCT for heating and cooling and underfloor heating.
- 1 bathroom with underfloor heating only

The NEA SMART 2.0 system controls the flow temperature for sCCT (manifold 1); at manifold 2 there is an external supply for underfloor heating.

The office room has about 150 m², and for this big room a control area is defined with 2 room units.

All room units in rooms with sCCT have a core or return temperature probe connected.

Additionally an U-Module is used in mixed circuit configuration for flow temperature control of sCCT. Another U-Module is used in fan coil / dehumidifier configuration.



06.02 Configuration in excel sheet

It is recommended to use for the configuration an excel sheet like this one below.

- Fill the columns from left to right
- Use always the same unique names
- When there are more items of one kind, integrate a number in the name to allow sorting (see manifolds)

Column 1: Line numbering

Column 2: The manifolds with their number and supplied system in the name

Column 3: System

Column 4: Circuit of manifold

Column 5: Room name

Column 6: Numbering of rooms, useful for bigger installations

Column 7: Marking of control areas

Column 8: Number of room unit (type of RU is not relevant at this stage)

Column 9: The room zone (RZ) to which the room unit is assigned

Column 10: NEA SMART 2.0 Base / R-Module (Master or slave)

1	2	3	4	5	6	7	8	9	10
Number in listing	Manifold	System	Circuit	Room	Room-number	CA	Room unit	RZ	Controller
1	M1_sCCT	sCCT	1	Office	1	1	1	1	Master
2	M1_sCCT	sCCT	2	Office	1	1	1	1	Master
3	M1_sCCT	sCCT	3	Office	1	1	2	2	Master
4	M1_sCCT	sCCT	4	Office	1	1	2	2	Master
5	M1_sCCT	sCCT	5	Bistro	2	None	3	3	Master
6	M1_sCCT	sCCT	6	Bistro	2	None	3	4	Master
7	M2_UFH	UFH	1	Bistro	2	None	3	9	Master R-Module
8	M2_UFH	UFH	2	Bathroom	3	None	4	10	Master R-Module
9	M2_UFH	UFH	3	Office	1	1	1	11	Master R-Module
10	M2_UFH	UFH	4	Office	1	1	1	11	Master R-Module
11	M2_UFH	UFH	5	Office	1	1	2	12	Master R-Module
12	M2_UFH	UFH	6	Office	1	1	2	12	Master R-Module

Some explanations

The manifolds for UFH and sCCT are in the same room, but not at the same place.

So it makes sense to use the Master for sCCT manifold only and R-Module for UFH manifold only (this makes it easier to wire the actuators):

The R-Module can serve 4 room units, 8 actuators can be connected directly.

In detail: 1 Room Unit to RZ 9 (Bistro)

1 Room Unit to RZ 10 (Bathroom)

2 Room Units to RZ11 and RZ 12 each (Office)

To Master RZ 1 and RZ 2 also 2 actuators can be connected.

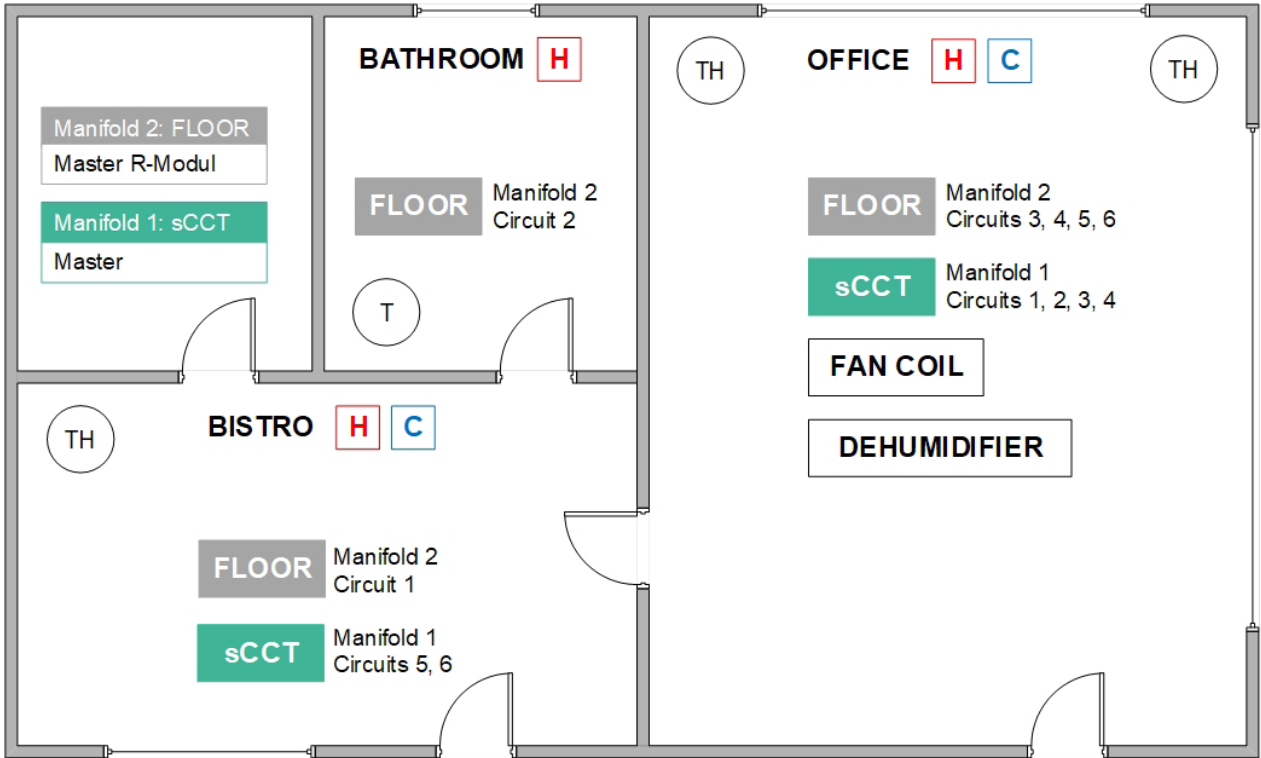
→ RU 1 and 2 of office which build CA 1 are assigned to RZ 1, 2 for sCCT and 11 and 12 for UFH

06.03 Placement of controllers



Note:

For rooms, which are cooled, room units with humidity sensor are used (in this case office and bistro).



- FLOOR** Underfloor heating
- sCCT** Surface near concrete core temperature
- TH** Room unit - temperature / humidity
- T** Room unit - temperature

06.04 Wizard sequence

06.04.01 System type

For systems with TABS you always have to choose the type "Complex".

◀ Choose system type

Before continuing with the installation, please check the following :

- All electrical connections are done and checked
- All room units are paired
- Outside temperature probes are connected / paired (optional)
- All DIP switches are set and checked
- System bus connections are done and checked
- All central controllers and extension modules are powered

Simple installation:
1 central controller (+ R-Module)

Complex installation:
more than 1 central controller,
and/or U-Module(s)

Quit

06.04.02 System components

In this page, there is the new possibility to define the number of control areas:

◀ System components

No. Base units (Master+Slave)	<input style="width: 40px;" type="text" value="1"/>
No. R-Modules	<input style="width: 40px;" type="text" value="1"/>
No. of Room Units	<input style="width: 40px;" type="text" value="4"/>
No. Control Areas (CA) i	<input style="width: 40px;" type="text" value="1"/>
No. U-Modules	<input style="width: 40px;" type="text" value="2"/>
No. Mixed circuits	<input style="width: 40px;" type="text" value="1"/>
No of pumps (local/global only!)	<input style="width: 40px;" type="text" value="1"/>
Boiler demand signal	<input checked="" type="checkbox"/>
Chiller demand signal	<input checked="" type="checkbox"/>
No. Dehumidifiers	<input style="width: 40px;" type="text" value="1"/>
No. of fan coils	<input style="width: 40px;" type="text" value="1"/>
No. Outside sensors	<input style="width: 40px;" type="text" value="1"/>
Outside temperature from server used (system has to be online)	<input checked="" type="checkbox"/>
Heating mode: Central control of flow temperature	<input type="checkbox"/>
No. Manifolds	<input style="width: 40px;" type="text" value="2"/>

Confirm



Please note:

You have to enter the number of room units, not the number of rooms!

06.04.03 TABS settings

System selection:

◀ Heating/Cooling Systems

Floor	<input checked="" type="checkbox"/>
Wall	<input type="checkbox"/>
Ceiling	<input type="checkbox"/>
CCT	<input type="checkbox"/>
sCCT	<input checked="" type="checkbox"/>
IFHC	<input type="checkbox"/>

Confirm
Quit

After you have selected one of the TABS-types you have to parametrize this system in the next screen:

◀ TABS Settings

Design temperature

sCCT

Use design values	<input checked="" type="checkbox"/>
Weight Roomtemp.	<input style="width: 40px;" type="text" value="1"/>
Weight Coretemp.	<input style="width: 40px;" type="text" value="1"/>
Heat Curve Starting point Normal mode	<input style="width: 40px;" type="text" value="21"/>
Core temp. heating absence	<input style="width: 40px;" type="text" value="18"/>
Core temp. cooling	<input style="width: 40px;" type="text" value="20"/>
Core Temperature safety distance to dew point (in K)	<input style="width: 40px;" type="text" value="2,0"/>
Core temp. minimum	<input style="width: 40px;" type="text" value="16"/>
Core temp. maximum	<input style="width: 40px;" type="text" value="40"/>
Flow temp. at design temp.	<input style="width: 40px;" type="text" value="32"/>
Slope Flow 0.27	
Return temp. level at design temperature	
Level 1	<input style="width: 40px;" type="text" value="28"/>
Slope Ret 0.17	
Level 2	<input style="width: 40px;" type="text" value="26"/>
Slope Ret 0.12	
Level 3	<input style="width: 40px;" type="text" value="24"/>
Slope Ret 0.07	

Confirm

The design temperature used (in Germany usually -15 °C) must be specified on this page.

If the design values from the design planning are to be used, the heating curves resulting from these values are calculated for the flow temperature and for the return temperatures.

The design values for 3 areas of the system with different return temperature levels can be entered.

If the NEA SMART 2.0 system controls a mixed circuit for TABS, then this mixed circuit automatically uses the resulting heating curve for flow temperature control.

If no design values are available, it is also possible to enter manually the slope for heating curve flow (Slope flow) and the 3 slopes for heating curve return (Slope Ret Level 1 ... 3):

TABs Settings

sCCT

Use design values

Weight Roomtemp.

Weight Coretemp.

Heat Curve Starting point Normal mode

Core temp. heating absence

Core temp. cooling

Core Temperature safety distance to dew point (in K)

Core temp. minimum

Core temp. maximum

Slope Flow

Slope Ret Level 1

Slope Ret Level 2

Slope Ret Level 3

06.04.04 System Bus Scan

System Bus Scan shows Base, R-Module and the 2 U-Modules.

Sysbus scan

Master **EM ROOM**

U-Module n 0

U-Module n 2

Scan finished

06.04.05 Definition of U-Modules

U-Module Configuration

U-Module	Address	Function
U-Module1	00	Mixed circuit # 1
U-Module2	02	Dehumidification n 1 Option Fancoil

06.04.06 U-Module for mixed circuit (sCCT)

U-Module n 0 Mixed circuit # 1

Input/ output	Function	Actual values	Acti- vation
AI 1	Mixed supply temp.	22.0	<input checked="" type="checkbox"/>
AI 2	Return temperature	23.0	<input checked="" type="checkbox"/>
AI 3	External temperature	19.6	<input checked="" type="checkbox"/>
AI 4			
DI 1	Dew point	1	<input checked="" type="checkbox"/>
DI 2	Mixed Circuit demand	0	
REL 1	Pump	0	

Pump high efficiency

Invert control signal

Mixed supply temp. offset

Return temperature offset

06.04.07 Type of Mixed circuit, manifolds

Mixed circuit # 1

Floor Heat Cool

sCCT

Confirm

Quit

Manifolds

Manifold #

1 Mixed circuit # 1

2 None

Confirm

Quit



Note:
Manifold #2 is supplied by an external source

06.04.08 Dehumidifier, Fan Coil

U-Module Dehumidifier 1 Option Fancoil

U-Module Dehumidifier 1.1 Option Fancoil

REL 1 Fan coil Fan coil 1

REL 2 Dehum compressor Dehum compressor 1

Manifold 1

U-Module Dehumidifier 1.2 Option Fancoil

REL 3 Fan coil None

REL 4 Dehum compressor Dehum compressor --

Manifold --

Confirm & test

Confirm

Quit

Combined usage:
Fan coil uses relay 1
Dehumidifier (only compressor) relay 2
Dehumidifier is supplied by manifold 1

06.04.09 Assignment to Control Area (CA)

Device configuration

Device, functions Status

Master Configure ?

R-Module
Pump
Boiler
Chiller

REHAU BALANCE actuators

Confirm

When "Configure" is selected, the new page for CA opens (if there are CAs defined):

Master
Assignment to CA

RZ	Room unit	CA
1	Disp TH Bus	no
2	Disp TH Bus	no
3	Disp TH RC	no
10	Probe T Bus	no

Confirm

Quit

On the page „system components“ it has been configured that there is only 1 CA.

Master
Assignment to CA

RZ	Room unit	CA
1	Disp TH Bus	CA-1
2	Disp TH Bus	CA-1
3	Disp TH RC	no
10	Probe T Bus	no

Confirm

Quit

The 1st room unit is paired to room zone **1** and 11, its main room zone is **1**.

The 2nd room unit is paired to room zone **2** and 12, its main room zone is **2**.

The 3rd room unit Disp TH RC is paired to room zones **3**, 4 and 9, its main room zone is **3**.

The 4th room unit (probe T BUS) is paired to room zone **10**.

The room units paired to main room zone 1 and 2 are combined in CA-1.

06.04.10 Definition of Room Zones

Master
Device configuration

RZ	Room unit	Main RZ/CA	Type	Mani- fold	H	C
1	Disp TH Bus	1-CA 1	sCCT	1	H	C
2	Disp TH Bus	2-CA 1	sCCT	1	H	C
3	Disp TH RC	3	sCCT	1	H	C
4	Disp TH RC	3	sCCT	1	H	C
5		--				
6		--				
7		--				
8		--				
9	Disp TH RC	3	Floor	2	H	C
10	Probe T Bus	10	Floor	2	H	C
11	Disp TH Bus	1-CA 1	Floor	2	H	C
12	Disp TH Bus	2-CA 1	Floor	2	H	C

Buttons: Confirm & test, Confirm, Configure outputs and inputs, Quit

The sCCT system is supplied by manifold 1 and used for heating and cooling.
The floor system is supplied by manifold 2 and is used for heating only.

The 3rd column shows the assignment of Main room zones to CA.

06.04.11 Digital Inputs / Outputs

Master
Output configuration

REL 1	Pump local
REL 2	Boiler
REL 3	Chiller
REL 4	None
REL 5	None
REL 6	None

Pump high efficiency

Buttons: Confirm, Quit

Master
Input configuration

DI 1	Cooling (CO)
DI 2	None
DI 3	None
DI 4	None
DI 5	None

Buttons: Confirm, Quit

The input „Cooling“ is used to switch the system to cooling mode.

06.04.12 Finalization of Wizard

Device configuration

Device, functions	Status
Master	OK
R-Module	
Pump	
Boiler	
Chiller	

Enable automatic mode heat/cool

REHAU BALANCE actuators

Heat/Cool remote switching

Button: Confirm

The 2 checkboxes “Enable automatic mode heat/cool” and “Heat/Cool remote switching” allow, that the system is switched from heating to cooling by the input “Cooling (CO)”.



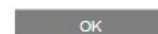
Please note:

The system must be set to Automatic mode.

System configuration completed



You may now enter specific data for this installation



07 Configurations and Settings in Installer level (Web Pages)

07.01 Configuration of Room Units

After completing of wizard the installer menu appears.

Installer main menu

- System set up procedure
 - Room Units
 - Timer programs
 - Settings
 - System
 - Diagnosis/Calibration
- Exit installer menu

From installer menu the configuration of room units can begin:

Room Units	
Master - 1	22.1
Master - 2	22.6
Master - 3	21.3
Master - 10	21.5

The room units still have the name of the base unit (in this case Master) combined with the main room zone.

Master - 1 is the 1st room unit of CA-1.

The dehumidifier and fan coil for cooling will be assigned to it.



Note:

This is done only for the 1st room unit of CA-1.

The 2nd room unit shows automatically the same assignment.

Rooms

Master - 1
22.1

21,0

19,0

24,0

26,0

15,0

Humidity : 36 %

Weekly program

1
▼

Dehumidifier

U-Module Dehumidifier 1.1 Option Fancoil
▼

Fan coil

Fan coil 1
▼

Fan coil Supply

None
▼

Fan coil System

Cool
▼

Fan coil Tolerance

Comfort
▼

Fan coil Active in Reduced

Fan coil Lock

Enable auto start

Pilot room

Display lock

Cooling (CO)

Function of additional input

P10
▼

Exclude Room Temp

Remote temperature : 21.7

Version : 1.6

Confirm

The external probe is configured as P10 (return temperature probe). The measured value of 21.7 °C is only displayed when this page is re-entered. The room unit is configured for heating and cooling.

Master - 2 is the 2nd room unit of CA-1.
The dehumidifier and fan coil for cooling are shown as they were defined for Master - 1.

Rooms

Master - 2 22.6

	21,0	19,0
	24,0	26,0
		15,0

Humidity : 35 %

Weekly program

1

i

Dehumidifier

U-Module Dehumidifier 1.1 Option Fancoil

Fan coil

Fan coil 1

Fan coil Supply

None

Fan coil System

Cool

Fan coil Tolerance

Comfort

Fan coil Active in Reduced

Fan coil Lock

Enable auto start

Pilot room

Display lock

Heating

Cooling (CO)

Function of additional input

P9

Exclude Room Temp

Remote temperature : 21.7

Version : 1.6

Confirm

The external probe is configured as P9 (core temperature probe), the measured value of 21.7 °C is only displayed when this page is re-entered.

Master - 3 is the only room unit in the room „BISTRO“.

Rooms

Master - 3 21.3

	21,0	19,0
	24,0	26,0
		15,0

Humidity : 39 %

Weekly program

1

i

Dehumidifier

No dehumidifier

Fan coil

None

Enable auto start

Pilot room

Display lock

Heating

Cooling (CO)

Function of additional input

P10

Version : 1.6

Confirm

The external probe is defined as return temperature probe (P10).
The room is configured for heating and cooling.

The room unit Master – 10 is for a room with under-floor heating only.

Rooms

Master - 10 21.6

21,0 19,0 15,0

Weekly program
1

Dehumidifier
No dehumidifier

Fan coil
None

Enable auto start

Pilot room

Display lock

Heating

Cooling (CO)

Function of additional input
P0

Version : 1.27

Confirm

There is no external probe connected (P0).

07.02 Settings in installer menu

Installer main menu

- System set up procedure
- Room Units
- Timer programs
- Settings
- System
- Diagnosis/Calibration

Exit installer menu

From installer main menu the menu point „Settings“ can be chosen:

Settings

- Heating/Cooling settings
- Mixed circuits
- Devices
- Functions
- Control settings
- Fancoil Settings
- Dehumidifier settings
- Assignment return temp. level
- TABS Settings

Reset parameters to default

When configuring CCT systems, the menu item „CCT Charge Controll“ appears.

07.02.01 Tabs Settings

This is exactly the same page, which is in the wizard for initial setting.

If TABS causes during operation an oversupply or undersupply with effect on the room temperature, the TABS parameters can manually be adjusted in TABS settings.

The most reliable and recommended method is, to modify the design values in small steps:

- Heat Curve Starting Point Normal Mode
- Flow temperature at design temperature
- Return temperature at design temperature

Furthermore, the balancing of room and core part is also possible:

- Weight Room temperature
- Weight Core temperature

◀ **TABS Settings**

Design temperature

sCCT

Use design values

Weight Roomtemp.

Weight Coretemp.

Heat Curve Starting point Normal mode

Core temp. heating absence

Core temp. cooling

Core Temperature safety distance to dew point (in K)

Core temp. minimum

Core temp. maximum

Flow temp. at design temp.

Slope Flow 0.27

Return temp. level at design temperature

Level 1

Slope Ret 0.17

Level 2

Slope Ret 0.12

Level 3

Slope Ret 0.07

07.02.02 Mixed circuit

When the system uses one (or up to 3) mixed circuits, the "Settings" menu contains the menu point "Mixed circuits".

A mixed circuit for TABS takes the following parameter settings from the TABS settings menu:

1. Heat curve starting point in normal mode
2. Heat curve slope (flow) in normal mode

◀ **Mixed circuits**

Mixed circuit # 1

TABS Settings -> Use design values

Heat curve starting point normal mode (C)

Heat curve starting point absence mode (C)

Heat curve slope in normal mode

Heat curve slope in absence mode

Mixed supply temp. reduction in reduced mode (in K)

Minimum value of supply temperature in heating mode (normal) (C)

Min. value of supply temperature in heating mode (absence) (C)

Maximum value of supply temperature in heating mode (normal) (C)

Maximum value of supply temperature in heating mode (absence) (C)

Filter time for outside temperature (in h)

Min. value supply temp. cooling mode (normal) (C)

Mixed supply temp. : safety distance to dew point (in K)

Return temperature limit in cooling mode (C)

Proportional band-width heating circuits (in K)

Proportional band-width cooling circuits (in K)

Integral time mixed circuits (in sec)

Delay time for enabling PI-Controller (in sec)

The parameters

- Heat curve starting point in absence mode
- Heat curve slope in absence mode

are calculated out of parameters 1) and 2).



Note:

These values cannot be modified.

07.02.03 Control settings

Control settings are the settings for room temperature control. Only settings for systems, which have been configured in WIZARD, are shown.

The type of parameters is the same as for other radiant systems, but the values (min. / max. / default) are adapted to TABS.

sCCT

Proportional bandwidth heating mode (in K)

Proportional bandwidth cooling mode (in K)

Pulse period time of room temp. control (in min)

Minimum pulse length room temp. control (in min)

Integral time room temperature control (in min)

Integral part limitation (in %)

Optimization factor for room temp. control

Pulse length threshold for continuous mode (%)

Shift of proportional band (%)

Because of the higher thermal mass of sCCT the marked parameters are adapted to higher values.

07.02.04 Assignment of rooms to areas

When TABS is planned in an installation, different design values can be provided for different areas. Up to 3 different return temperature levels can be entered.

In this menu the rooms or Control Areas are assigned to the different return temperature levels.

◀ **Assignment return temp. level**

		Level		
		1	2	3
CA-1	sCCT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Master - 3	sCCT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

07.02.05 CCT Charge control

In chapter 03.06 the strategy of charging the core of a CCT system is described.

The menu shown below controls this method:

For each part of the installation, which is supplied with CCT, one of the weekly programs is selected to use this strategy for heating or cooling or both modes.

CCT Charge Control

		Weekly program	Block	Reduction (in %)	
CA1		1	<input checked="" type="checkbox"/>	<input type="text" value="0"/>	H C
RU1-8		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	H C

In the active time span (red) of the daily program the charging of the CCT takes place.

In the not active time span of the daily program (white) the following options are possible:

- complete blocking of CCT
- reduction of heating or cooling power by the chosen percentage value

Example

In Control Area 1 (CA1, in our example the office) the CCT is to be charged for heating and cooling outside of office usage times; during office usage times the CCT is out of operation („block“). Weekly program 1 is used as the time program, which uses daily program 10 every day:

◀ Daily program 10

0h 6h 12h 18h

Delete all

Add time span

Start time

End time:

Add time span

Confirm program

The charging of the CCT therefore starts at 6 p.m. and runs until the next morning at 5 a.m. In the remaining period of time, i.e. from 5 a.m. to 6 p.m., the CCT is completely switched off. During this period, the under-floor heating / cooling takes over.

08 Operating by User

08.01 User Level of Web Pages

The user level of web pages is not different to installations with other radiant systems.

The control area 1 appears as one room, named now Master – 1 (which is the name of the 1st room unit of CA 1).

Rooms	
Master - 1	22.1
Master - 3	21.3
Master - 10	21.5

In our example, the user may change the room names:

Rooms	
Office	22.2
Bistro	21.3
Bathrooms	21.6

08.02 Room units

Any change of settings which is done at one of the room units, which belongs to a control area, is mirrored to the other room units of this control area.

08.03 Operating by Mobile App

The operating of the system is not different to installations without TABS.

09 Parameters relevant for TABS

09.01 TABS settings

The parameters shown here are for 4-CCT, 5-sCCT, 6-IFHC.



To find in App:

Home → More → Settings → Installer → Control Parameters → TABS Settings

Key	Text in parameter menu	Comment	Min	Max	Base value	Unit
BKT1 oBKT1 IFHC1	Design Values	Value is 1 when design values are used. In this case the flow and return temperature at the design temperature are entered and the system uses the calculated heat curves for flow and return or core temperature.	0	1	4: 1 5: 1 6: 1	-
BKT2 oBKT2 IFHC2	Weight of room temperature	Factor which defines the influence of room temperature for the control algorithm for TABS.	1	10	4: 1 5: 1 6: 1	-
BKT3 oBKT3 IFHC3	Weight of core temperature	Factor which defines the influence of core temperature for the control algorithm for TABS.	1	10	4: 1 5: 1 6: 1	°C
BKT4 oBKT4 IFHC4	Heat Curve Starting Point Normal Mode	The heat curve starts at this point; the value for the flow temperature is equal to the outside temperature here. Valid for normal mode (not absence mode).	1	30	4: 21 5: 21 6: 21	°C
BKT5 oBKT5 IFHC5	Core temperature cooling	Target value for core temperature in cooling mode.	15	25	4: 20 5: 20 6: 20	°C
BKT6 oBKT6 IFHC6	Core temperature Absence	Target value for core temperature in heating mode, when system is in absence mode.	10	25	4: 18 5: 18 6: 18	°C
BKT7 oBKT7 IFHC7	Core temperature Minimum	Minimum value of core temperature.	10	25	4: 16 5: 16 6: 16	°C
BKT8 oBKT8 IFHC8	Core temperature maximum	Maximum value of core temperature.	20	40	4: 30 5: 30 6: 30	°C
BKT9 oBKT9 IFHC9	Flow temperature at the design temperature	When design values are used, this value is entered for flow temperature at the design temperature.	10	40	4: 32 5: 32 6: 32	°C
BKT10 oBKT10 IFHC10	Slope of flow Temperature	When design values are used, this value is calculated. When design values are not used, this value has to be entered.	0	1	4: 0,36 5: 0,36 6: 0,36	-
BKT11 oBKT11 IFHC11	Return temperature level 1 the design temperature	When design values are used, this value is entered for return temperature at the design temperature.	10	40	4: 28 5: 28 6: 28	°C
BKT12 oBKT12 IFHC12	Slope return temperature level 1	When design values are used, this value is calculated. When design values are not used, this value has to be entered.	0	1	4: 0,26 5: 0,26 6: 0,26	-
BKT15 oBKT15 IFHC15	Safety distance of core to dew point temperature	Cooling of the radiant element is stopped when the core temperature drops below dew point plus safety distance.	0	10	4: 2 5: 2 6: 2	K

09.02 Mixed circuits**09.02.01 Heating circuits**

The parameters are used as default values if a mixed circuit is specified during the configuration of the system.

During the start-up, a parameter set is created for each heating circuit in line with the utilisation of the heating circuit (floor/wall, ceiling, CCT, sCCT, IFHC).

The parameters shown here are for 4-CCT, 5-sCCT, 6-IFHC.

The parameters in the gray table cells are only displayed and cannot be changed in this menu.



To find in App:

Home → More → Settings → Installer → Control Parameters → Heating → Heating Circuits

Key	Text in parameter menu	Comment	Min	Max	Base value	Unit
MIXH01	Heat curve starting point normal mode	The heat curve starts at this point; the value for the flow temperature is equal to the outside temperature here. Valid for normal mode (not absence mode).	10	40	4: 21 5: 21 6: 21	°C
MIXH02	Heat curve starting point absence mode	Like MIXH01, but for absence mode.	10	40	4: 16 5: 16 6: 16	°C
MIXH03	Heat curve slope in normal mode	Defines the slope of the heating curve. Valid for normal mode (not absence mode).	0	1	4: 0,28 5: 0,28 6: 0,28	-
MIXH04	Heat curve slope in absence mode	Like MIXH03, but for absence mode.	0	1	4: 0,16 5: 0,16 6: 0,16	-
MIXH05	Minimum value of supply temperature in heating mode (normal)	Minimum value for flow temperature at start of heating mode, independent from heat curve function. Valid for normal mode (not absence mode).	15	40	4: 22 5: 22 6: 22	°C
MIXH06	Minimum value of supply temperature in heating mode (absence)	Like MIXH05, but for absence mode.	15	40	4:20 5:20 6:20	°C
MIXH07	Maximum value of supply temperature in heating mode (normal)	Maximum limit for flow temperature at very low outside temperatures, independent from heating curve function. Valid for normal mode (not absence mode).	20	40	4: 35 5: 35 6: 35	°C
MIXH08	Maximum value of supply temperature in heating mode (absence)	Like MIXH07, but in absence mode.	20	40	4: 35 5: 35 6: 35	°C
MIXH09	Filter time for outside temperature	For start and end of heating mode and for the calculation of flow temperature not the actual value of outside temperature, but the timely filtered value is used.	0	99	4: 48 5: 48 6: 48	h
MIXH11	Flow temp. reduction in reduced mode	In reduced mode (economy mode) the flow temperature is reduced by this value.	0	10	4: 4 5: 4 6: 4	K
MIXH12	Compensation factor for room temperature	Influence of the deviation between set point and actual value of room temperatures on flow temperature.	0	5	4: 0 5: 0 6: 0	-

09.02.02 Cooling circuits

The parameters are used as default values if a mixed circuit is specified during the configuration of the system.

During the start-up, a parameter set is created for each cooling circuit in line with the utilisation of the heating circuit (floor/wall, ceiling, CCT, sCCT, IFHC)

The parameters shown here are for 4-CCT, 5-sCCT, 6-IFHC.



To find in App:

Home → More → Settings → Installer → Control Parameters → Cooling → Cooling Circuits

Key	Text in parameter menu	Comment	Min	Max	Base value	Unit
CAn	Minimum value supply temperature in cooling mode (normal)	Minimum value of flow temperature in normal mode (not reduced mode).	8	25	4: 16 5: 16 6: 16	°C
CBn	Flow temperature: safety distance to dew point	The flow temperature always has this safety distance to the worst (highest) value of the dew point temperature.	1	10	4: 2 5: 2 6: 2	°C
CCn	Element temperature limit in cooling mode	The temperature of cooled elements must not be below this value in cooling mode.	15	25	4: 20 5: 20 6: 20	°C
CDn	Return temperature limit in cooling mode	The return temperature must not be below this value in cooling mode.	15	25	4: 18 5: 18 6: 18	°C
CEn	Increase cooling flow temperature in reduced mode	In reduced mode (energy saving mode) the flow temperature is increased by this value.	0	10	4: 1 5: 1 6: 1	K

09.03 Control settings

The parameters define the behavior of the room temperature control for TABS.

The parameters shown here are for 4-CCT, 5-sCCT, 6-IFHC.



To find in App:

Home → More → Settings → Installer → Control Parameters → Cooling → Room Temperature Control

Key	Text in parameter menu	Comment	Min	Max	Base value	Unit
RO1	Proportional bandwidth heating mode	Proportional band of room temperature control in heating mode. The proportional band affects the immediate reaction to temperature change. The bigger the band, the weaker the reaction.	0	10	4: 4 5: 4 6: 4	K
RO2	Proportional bandwidth cooling mode	Like RO1, but for cooling mode	0	10	4: 4 5: 4 6: 4	K
RO3	Pulse period time room temperature control	Time period of the pulse width modulation signal used for room temperature control.	30	360	4: 80 5: 60 6: 80	min
RO4	Minimum pulse length room temperature control	Pulses below this value will be restrained.	20	60	4: 25 5: 20 6: 25	min
RO5	Integral time room temperature control	Integral time in minutes of controller in heating- and cooling mode. Affects the reaction to permanent deviation to the set point. The longer the time, the slower the reaction. 0 means OFF.	0	600	4: 180 5: 120 6: 180	min
RO6	Integral (part limitation)	Limitation of integral part in control signal in %.	0	100	4: 30 5: 30 6: 30	%
RO7	Optimization room temperature control	Level of room temperature control optimization.	0	10	4: 5 5: 5 6: 5	-
RO8	Pulse length threshold (for continuous mode)	Pulses with a length above this limit (percentage of pulse width period) result in a permanent activation of drives (continuous signal).	50	100	4: 80 5: 80 6: 80	%
RO9	Shift of proportional band	Defines the middle position of p-band. 0 % means symmetrical to set point. Can be reduced to -25 % or more in case of well-adjusted flow temperatures and well insulated buildings.	-50	50	4: 0 5: 0 6: 0	%

10 Hints for optimization

No.	Problem	Possible reason	Measure
1	Room temperature is oscillating	Core temperature is time wise too high (settings are not well adapted)	If the option "use design values" has not been chosen, adapt heat curve or return temperature curve in TABS settings (slope). If the option "use design values" has been chosen, check and reduce setting for flow and return temperature at $-15\text{ }^{\circ}\text{C}$.
2		Core temperature is time wise too high (return temperature measurement is not correctly measured)	Check placement and thermal contact of return temperature probe(s).
3	Room temperature is too high or too low	Core temperature is too high or too low (settings are not well adapted)	Check settings in TABS (see Nr. 1 and 2).
4		Core temperature is too high or too low (information about outside temperature is not correct)	Check outside probe or setting of position of installation (weather information might be incorrect).
5		The balance between TABS and an additional system as e.g. floor heating is not correct	Check TABS settings (see Nr. 1 and 2) and settings of other system.
6			
7			

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