# MR24 – Central radio controller 24V Biofloor Connect

COMAP offers the Biofloor Connect control system as part of its Biofloor underfloor heating and cooling solution. Composed of a central radio control module (MR24), wireless digital room thermostats (TRD24) and actuators (ACTUONOFF) to control the circuits, it allows a perfect room by room temperature control.
The Biofloor Connect system, in combination with the 9000TP manifold range is eu.bac certified with a value of CA = 0,5K.

eu.bac european building automation controls association


## Versions

| Item code | Description |
|---|---|
| **C422010001** | Central radio controller 24V 4chan. +LAN Biofloor Connect |
| **C422011001** | Central radio controller 24V 8chan. +LAN Biofloor Connect |
| **C422012001** | Central radio controller 24V 12Chan. +LAN Biofloor Connect |

## Application

As a bi-directional receiving station for the, The MR24 is Biofloor Connect's central controller, receiving signals from the TRD24 radio digital room units (bi-directional communication) and activating thermal actuators in underfloor heating control systems. The signals of the radio digital room units can be individually assigned to the corresponding channel outputs of the controller.

## Description

Intelligent bi-directional radio controller for underfloor heating/cooling systems

- Encoded data transmission over 868 MHz frequency
- RJ45 port for LAN connection
- LED indicators for the functions, communication status and operating modes
- One LED indicator per channel for visualization and confirmation of the channel assignment
- Emergency function in case of loss of radio signal reception
- Individual parameters for every channel accessible remotely (with the Biofloor Connect app)
- Integrated pump logic and potential-free output
- Heating/cooling mode selection input and potential-free and configurable output
- Input for monitoring the leaving water temperature
- Input for monitoring the relative humidity
- Max. 12, 16 ou 20 radio digital room units per controller
- Maximum 3 zones per controller.
- Maximum 3 controllers per system

Biofloor connect COMAP

Dowload Biofloor Connect application for free.
Available for iPhone and Android

## Technical description

Black housing (RAL9005) with transparent cover

- Versions with 4, 8 and 12 channels
- Including a transformer
- Monitoring of the inputs and state of the controller with LEDs
- 24 V version with triac outputs for thermal actuators
- Automatic connection terminal, depending on the channel, 1 or 2 actuators/channel
- Maximum number of thermal actuators with 12-channel version: 16
- SD card for software update accessible from the outside

| | |
|---|---|
| **Power supply** | 24 V~; ±15% |
| **Power consumption** [2] | |
| **24 V 4 channels** [1] | 14,6 W max. |
| **24 V 8 channels** [1] | 26,6 W max. |
| **24 V 12 channels** [1] | 38,6 W max. |
| **Power consumption in stand-by mode** | 2,6 W |
| **Max. power consumption, idle** | 250 mA at 24 V |
| **Number of actuators** [3] | 1 or 2 per channel |
| **Max. perm. Load** | 0,7 A/24 V/canal |
| **Pump connection** | 230 V~, max. 2,5 (1) A |
| **Heating/cooling output** | 230 V~, max. 2,5 (1) A |
| **Input for monitoring temperature limit** | 24…230 V (N + L) |
| **Heating/cooling input** | contacts detected |
| **ECO input** | contacts detected |
| **24 V Triac output** | 24 V, 1 A~ |
| **Perm. ambient temperature** | 0…55 °C |
| **Perm. ambient humidity** | 5…80% Hr (non condensing) |
| **Ingress protection** | IP 20 (EN 60529 |
| **Protection class** | 1 A/230 V/canal |
| **Fuse rating 24 V** | 2A T |
| **Radio frequency** | 868,3 MHz |

| | |
|---|---|
| **Transmission power** | > 13 mW |
| **Range** [4)] | env. 50 m |
| **24 V~** | II (EN 60730) |

[1)] 24 V version including separate transformer 230 V / 24 V, 42 VA. Power consumption including transformer output
[2)] Power consumption depends on the number of thermal actuators connected
[4)] In standard buildings or detached houses, depending on the ambient conditions

CE conformity as per:
- Radio EN 300220
- Immunity (R&TTE) EN 301489-3
- Emission (R&TTE) EN 300220-3

## Accessories

### External antenna A24

External active aerial including 5 m of cable with two RJ12 plugs.
Only this aerial connection cable may be used. If a different or longer connecting cable is used, operation may be impaired.
**Item code : C422014001**

### Repeater E24

Repeater for forwarding information either in the network of radio digital room units, between the radio digital room unit and the central radio controller or in the system network from central radio controller to central radio controller central radio controller.
Only one repeater may be used in each network. A micro-switch is used to select the network.
Supplied ex works with integrated switched-mode power supply.
**Item code : C422013001**

## Functional description

### Main functions

The MR24 central radio controller and the TRD24 radio digital room units are components of a bi-directional control system for controlling underfloor heating and cooling systems.

- The central radio controller and radio digital room unit communicate with each other reliably using radio signals.
- The radio digital room unit uses an internal nickel temperature sensor to measure the room temperature. Individual parameters – such as the set point, limit value and the time program – can be set and altered using the sensor buttons.
- The central radio controller has short-circuit-proof outputs, a standby mode and separate relays for the pumps and heating control. The actuators are controlled using either on/off control or pulse width modulation (PWM).
- The system is equipped with a self-diagnosis function and a fault indicator. To ensure correct operation, it is easy to carry out radio connection tests. To address the radio digital room unit and the central radio controller, various combination options are available. For example, several radio digital room units can be assigned to one central radio controller, and up to three central radio controllers can be grouped together on each wireless communication system.

## *Energy-saving mode (reduced mode)*

Using the time schedule to select an individual temperature profile for each day provides the ideal comfort level with the minimum energy consumption.

- There are three different time programs stored in the radio digital room unit. The time programs can be set according to requirements.
- Additionally, an external timer signal can be connected to the 'ECO' (N/R) input. The timer signal can be used to reduce the setpoint temperature of the radio digital room units by 3 K or more. It can be set from 0 to 10 K using parameter P-44.
- In order to activate this input, parameter P-61 must be configured using the room operating unit.
- With this parameter, the input can be used to set the controller to standby mode or to activate the frost-protection facility.

## *Cooling mode*

The cooling mode can be activated by an external signal, e.g. from a heat pump or via potential-free contacts. The 'C/O' input and the temperature limit input, parameterized with P-62 as the C/O input, are available for this function.

- Optionally, the C/O signal can be fed to a chiller via the integrated potential free output.
- Depending on the radio digital room unit's parameter setting, cooling mode can be activated using a radio digital room unit with master function or with any radio digital room unit. This function can be set using parameter P-51.

## *Pump control*

The integrated pump control output with anti-gripping allows a circulation pump to be activated as required.

## *Anti-jamming function for pump and valves*

To prevent the pump and the valves from gripping, the anti-jamming function is started once a week.
The function is started if one of the outputs has not been addressed for a week.

- The anti-blocking function switches on the pump for 3 minutes.
- The actuators are monitored on each channel and are switched on for 20 minutes.
- The pump and the actuators switch on automatically without advance warning.

## *Emergency mode*

Emergency mode is intended as a frost-protection facility; for this reason it is active only in heating mode.

- If no radio signal has been transmitted between the radio digital room unit and the central radio controller for 30 minutes, the corresponding channels on the central radio controller switch to emergency mode.
- When the emergency mode is active, the thermal actuators are switched on for 30% of the standard time and off for 70% of the standard time. The standard time is specified with the selected control algorithm. The channel's LED flashes. Emergency mode is indicated by a warning symbol on the display of the radio digital room unit.
- To ensure that emergency mode works properly, the central radio controller must be supplied with power and should not be damaged by external influences, such as a lightning strike.

## *Temperature control*

The radio digital room unit measures the room temperature with the internal or external NTC sensor, or in combination with a floor sensor.

- The setpoint temperature is set via the radio digital room unit.
- The measured room temperature and the setpoint temperature are transmitted automatically to the central radio controller every 10 minutes.
- If the setpoint is changed, the new setpoint and the measured temperature are transmitted to the central radio controller immediately.

To ensure efficient temperature control, there are three different control algorithms, plus optimized actuator control. There is a choice of control: either on/off control or one of two control systems with different periods.

- With on/off control, the heating is switched on or off if the temperature difference is greater than 0.2 K.
- If the setpoint is above the measured temperature, the valves are opened. The valves close when the setpoint is below the measured temperature.

Each channel forms its own control loop. If a radio digital room unit is assigned to multiple central radio controllers, these channels are grouped into one control loop. Up to three zones may be formed for functions such as 'master' room operating unit, 'common setpoint use of several room operating units' or 'operating mode adjustment of several room operating units'.

## *Temperature control via underfloor temperature sensor*

With a radio digital room unit to which an underfloor temperature sensor is connected, a comfortable floor temperature is maintained by measuring the floor temperature.

- Under normal conditions, the room temperature is regulated using the setpoint and the current room temperature.
- If the current room temperature is above the setpoint, the comfort control for the floor is activated.
- The comfort temperature of the floor can be adjusted using parameter P-02. Parameter P-43 can be used to control the maximum temperature.

**This function is used as a safety limiter of the floor temperature.**

- No liability can be demanded in the event of a temperature that is too high or in the event of defective components in the heating system.
- If a safety limiter is required, this must be realized using an external safety temperature limiter (item code VMP03A14).

## *Humidity control*

The radio digital room unit determines the humidity difference based on the measured humidity and the setpoint. The signal is sent to an optional single-channel I/O box via the central radio controller.
Either a humidifier or a dehumidifier is connected to this I/O box.

## *Initial controlled floor heating*

For a newly-installed underfloor heating system, we recommend heating up the floor slowly. This heating-up period is 36 hours and is divided into three steps.

- 1st step for 12 hours with a setpoint of 7 °C
- 2nd step with a setpoint of 12 °C
- 3rd step with a setpoint of 15 °C

If the room temperature is above the setpoint for the corresponding step, the valves are closed.

## *Cooling lock and/or bypass*

The cooling lock can be activated with parameter P-45. When it is active, this room operating unit (or the room) is not switched to cooling when the system is switched from heating to cooling. The cooling lock can be combined with the bypass function.

The bypass function is used to discharge heat safely. When all the channels are closed, this channel (or multiple channels selected for this function) is opened, or remains open.

- For applications with a heat pump, and if the heat pump is not protected against positive pressure, we recommend equipping a room – and, if applicable, two pipe runs – with the bypass function.
- For applications that can lead to high temperatures, such as with solar heating systems, we recommend that the 'bypass heating' function is not activated. The wireless channel is not closed by the temperature limiter in the event of an alarm.

## *Addressing*

When addressing is being carried out, a radio digital room unit is assigned to a radio channel.

- The addressing, and the deletion of the addressing, can be performed separately on each channel.
- There is an addressing button for each channel.
- Single or multiple channels can be addressed or deleted at the same time.

The following combinations are possible between the central radio controller and the radio digital room unit:

- Assign a radio digital room unit to one channel.
- Assign a radio digital room unit to multiple channels.
- Assign a radio digital room unit and up to four room operating units in sensor mode to one channel.
- Combine up to three central radio controllers into a system using a wireless protocol.
- Combine multiple channels into one zone; a maximum of three zones can be formed for each wire-less controller.
- Up to 8 wireless room units can be assigned to a central radio controller, 4-, 8- or 12-channel variant.

It is possible to assign one radio digital room unit and four additional radio digital room units in sensor mode to one central radio controller. Before they are assigned to the radio channel, the radio digital room units must be set as sensors.
It is possible to assign up to 12, 16 or 20 radio digital room units (room operating units, room operating units in sensor mode, window contacts etc.) to each central radio controller.
If you want to set up a system with more than 20 radio digital room units, you can spread the radio digital room units across several central radio controllers.

- For example, if you need 12 radio channels, you can accomplish this using a central radio controller with 4 channels and a central radio controller with 8 channels, and let them communicate by radio signals. With this configuration, you can connect up to 28 radio digital room units.

### *Zones and cases for forming zones*

You can form three zones for each central radio controller. The zone button and three LEDs are available for this purpose.
When the zone button is pressed, the first zone is activated, the green power LED flashes, and the blue LED for zone 1 lights up. For the LEDs of the channels, the LEDs that are not assigned to a zone start to flash. The red LED is available for zone 2, and the yellow LED is available for zone 3. Zones are divided into the following cases:

- Within one zone, the operating modes 'Off (frost-protection facility)', 'Eco', 'Normal operation' or time program are always the same. The change can be carried out on every radio digital room unit.

The master function is assigned to a radio digital room unit outside a zone.
The other room operating units are affiliated with one or more zones.
The following options are available with this radio digital room unit:

- Change the operating mode.
- Change the time programs for the associated central radio controller.
- Select heating or cooling for the entire system.

## *Radio communication between controllers*

Multiple central radio controllers can be combined into a system. A system can comprise a maximum of three central radio controllers.

- One of these central radio controllers must be defined as the master.
- The central radio controllers are set as slaves ex works. The communication between the master and slave controllers is performed every 3 minutes. For this function, there is a master button and a system button for addressing the controllers with one another.
- Before the central radio controller is assigned to a radio digital room unit, the central radio controller must be defined as the master. If the central radio controller is not defined as the master until afterwards, the settings may be lost.

The following signals are transferred:

- Pump signal: the parameter P-63 can be used to define whether the pump signal is local or central.
    - If 'central' is selected, the central pump is connected to the master controller and switched on if there is a demand at any controller. The pump is switched on after approx. 3 minutes.
    - With this configuration, the potential-free output for pump control is also active.
    - If 'local' is selected, the relevant pump output becomes active on the controller.
    - The master switches its pump only when there is a demand from itself, not when there is a demand at the slave.
- Heating/cooling signal: if the room operating unit is configured for heating/cooling change-over, this signal is also forwarded to the master. The master subsequently forwards it to the next slave.
- Alarm if temperature is too high
- The time

The following signals are not transferred:

- The Eco signal is local and is not forwarded to the slave controller.
- The humidity alarm is local.

## *Software update*

A software update can be performed via the integrated SD card. The power supply must be disconnected before the SD card is removed and updated. The boot loader with the new software starts automatically.

## *Model with LAN (Internet connection)*

The model with a LAN interface has an integrated web application. Various applications can be started via this interface and in combination with a LAN router.

- Controlling the installation locally via a WLAN system.
- Using the COMAP Biofloor Connect app, controlling the installation via an iPhone over the internet.

Details on this application can be found in the web application manual.

## *eu.Bac Certification*

COMAP Biofloor Connect may be referred to as an “eu.bac-certified wireless controller”. For this, the following requirements must be fulfilled:

• Only series 9000 plastic distributors may be used.

• Only the thermal actuators ACTUONOFF, M30 and 24V or TE24, M30 in 24V from COMAP are used for the control. Third-party products may not be used with regard to the certification.

Case 1: Use of a thermal actuator ACTUONOFF, M30 and 24V (Ref. C430015001)

| Parameter | Description |
|---|---|
| **Control algorithm** | PWM control with a fixed period of 12 minutes must be activated.<br>For this, parameter P-65 must be configured to setting “2”. |
| **Optimized actuator activation** | This activation enables energy savings and reduces the running times of the thermal actuators. This function is activated using parameter P-66:<br>Configure parameter P-66 to setting “2”. |
| **Proportional gain for the PID controller** | With regard to the eu.bac certification, the default value of the proportional gain is set to 3K, see parameter P-68. When the PWM control is activated, parameter P-68 is also activated. |
| **Integral gain for the PID controller** | The default value of the integral gain is 4h, see parameter P-69.<br>When the PWM control is activated, parameter P-69 is also activated. |

Case 2: Use of a thermal actuator TE24, M30 and 24V (Ref. C430041001)

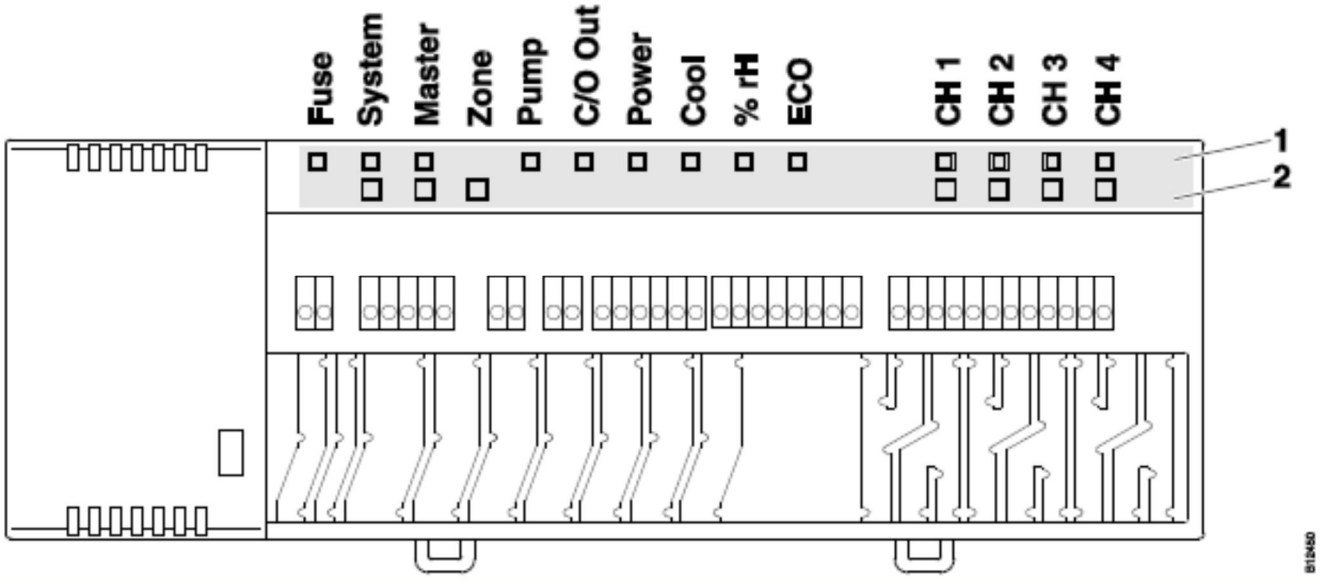
| Parameter | Description |
|---|---|
| **Control algorithm** | PWM control with a fixed period of 12 minutes must be activated.<br>For this, parameter P-65 must be configured to setting “2”. |
| **Optimized actuator activation** | This function must not be activated. |
| **Proportional gain for the PID controller** | With regard to the eu.bac certification, the default value of the proportional gain is set to 3K, see parameter P-68. When the PWM control is activated, parameter P-68 is also activated. |
| **Integral gain for the PID controller** | The default value of the integral gain is 4h, see parameter P-69.<br>When the PWM control is activated, parameter P-69 is also activated. |

## *Description of the operating modes*

The following operating modes can be set using the room operating unit:

| Symbol | Description |
|---|---|
| | Off (frost-protection facility) |
| | Reduced mode |
| | Normal mode |
| | Time programs Pro1, Pro2 and Pro3 |
| | Cooling mode, only when the radio digital room unit has priority; otherwise only as an indicator |
| | Heating mode, only when the radio digital room unit has priority; otherwise only as an indicator |
| AUTO | Auto cooling mode; shown only when cooling mode is switched on via the external C/O input |

## *Description of the operating buttons and LEDs*



| Operating buttons | Description |
|---|---|
| **System** | Combine up to three central radio controllers into one system. Additionally, I/O boxes and an outside-temperature sensor can be integrated into a system. |
| **Master** | Set a central radio controller as the master in a system with multiple central radio controllers.<br>One master must be defined for each system. |
| **Zone** | Combine multiple central radio controller channels into one zone or up to a maximum of 3 zones. |
| **Channel** | Address a radio digital room unit and a central radio controller.<br>Delete addressing.<br>Add channels to zones or delete them. |

| LEDs | Description |
|---|---|
| **Fuse : red LED** | Miniature fuse 2 A (slow) for power supply defective, 24 V version. |
| **System: yellow LED** | On: communication between two or three central radio controllers. |
| **Master:<br>green LED** | On: central radio controller has been configured as master.<br>Off: central radio controller has been configured as slave. |
| **Zone display, green power<br>LED flashes at the same time** | Blue (Cool): Zone 1<br>Red (% rh): Zone 2<br>Yellow (NO): Zone 3 |
| **Pump: green LED** | On: pump on<br>Off: pump off |
| **C/O Out: green LED** | The function of the 'C/O Out' LED depends on the setting of parameter P-51.<br>'Burner' function active. On: heating demand.<br>'C/O' function active. On: cooling demand. |
| **Power: green LED** | On: power supply on<br>Off: no power supply |
| **Cool: blue LED** | On: C/O contacts closed (cooling mode active)<br>On: Temp. limit C/O 24…230 V input active (configured as C/O input)<br>On: change-over via radio digital room unit for heating/cooling (C/O output active)<br>Off: central radio controller is in heating mode |

| LEDs | Description |
|---|---|
| **% rh: red LED** | On: dew point active only in cooling mode<br>Flashing: Temp. limit active in heating mode or cooling mode |
| **ECO: yellow LED** | On: ECO input is active<br>Off: ECO input is not active |
| **CH 1…CH 12: green LEDs** | On: addressing completed and output active<br>Flashing: ready for addressing<br>Flashing, followed by fast flashing: warning of deletion, or deleting<br>Fast flashing: channel in emergency mode |

### *Engineering and fitting notes installation*

The receiver should be installed above or near the underfloor heating system's distributor. The location should be clean, protected from splash water and ventilated.

## *Accessories*

### *External active antenna Biofloor Connect A24*

To improve reception – e.g. if the central radio controller is installed in a metal cabinet – an external antenna can be connected to the central radio controller.

- The active antenna does not require an external power supply. It is powered by the central radio controller via the supplied communication cable.
- A communication cable (5 m long) with an RJ12 plug at both ends is included.
    - If a different or longer connecting cable is used, operation may be impaired.
- The active antenna does not require addressing.
- When the antenna is connected to the central radio controller via the power cable, the internal antenna of the central radio controller is deactivated and the external active aerial takes over its function.
    - If the five-metre cable supplied is not long enough, a repeater E24 (available as an accessory) must be used.

### *Repeater Biofloor Connect E24*

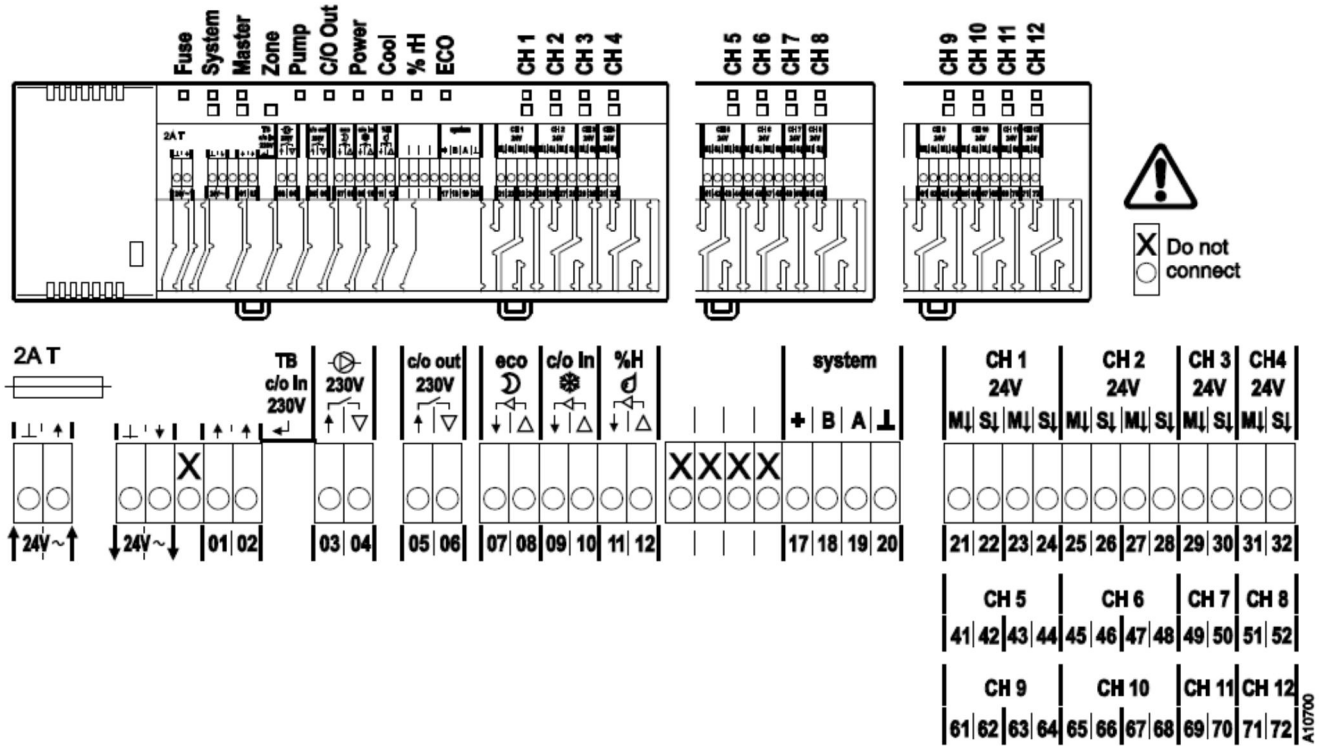
If a radio connection cannot be set up between the central radio controller and the room operating unit, or between central radio controllers (in a system of two or three central radio controllers), a repeater can be used.
This increases the range of transmission between the radio devices.

- The repeater automatically assigns the required information to the central radio controller via the bidirectional radio system. A power supply of 230 V/5 V is required for this purpose. A plug-in power supply unit is included.
- A maximum of one repeater can be incorporated into a wireless room operating network or system network (central radio controller). In a wireless room operating network, all the room operating units, room sensors and other accessories can transmit the signals to the central radio controller via a repeater.
- In a system network, only the two 'slave' central radio controllers can transmit the signals to the 'master' central radio controller via the repeater.
- The repeater must be addressed with the controller, either with the room operating wireless network or with the system network. See the technical manual.


1 Red LED: no radio connection with central radio controller
2 Yellow LED: radio connection
3 Green LED: power
4 Button for addressing and for deleting the addressing

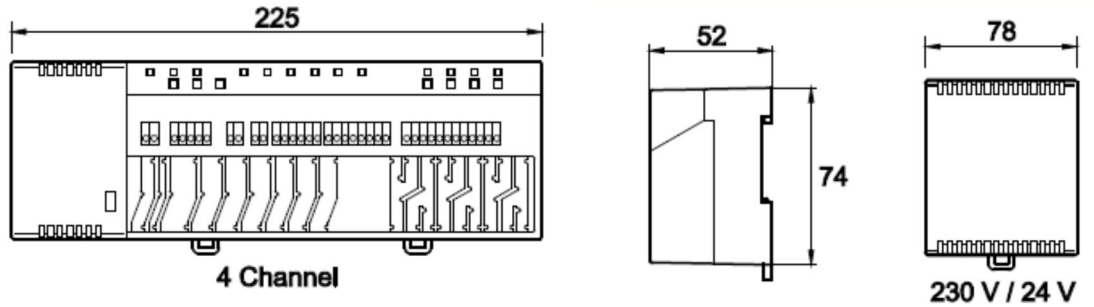
A second button is located under the cover. This button can be used to switch off the LEDs.

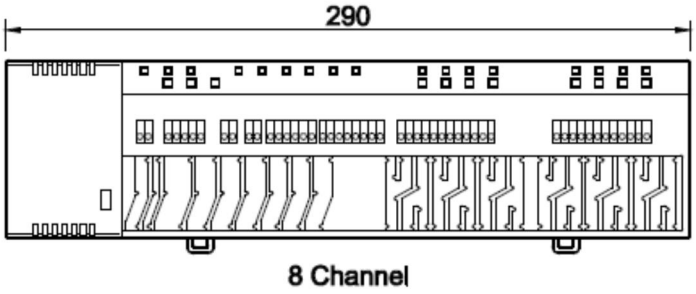
## *Wiring diagram*

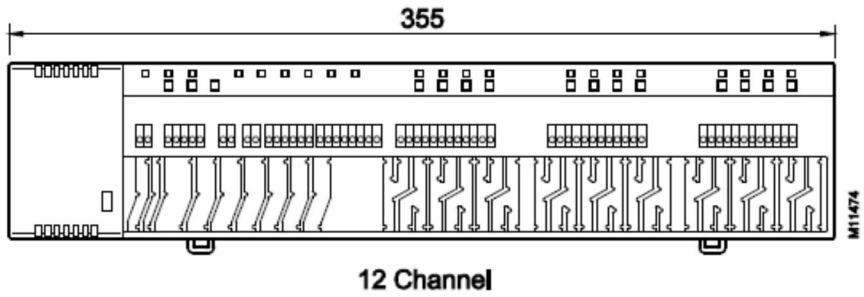


## Dimension drawing

### Central radio controller MR24




### Accessories

External active antenna A24 and repeater E24