Manuals+

Contents [hide]

thermokon®

thermokon JOY 5DO Room Controller

Product Information

Specifications:

- Model: JOY 5DO | EC AO2DO | EC 3AO RS485 Modbus
- Product Type: Fancoil Regulator (from Version 4.x)
- Measuring Values: Temperature, Humidity (optional), CO_2* (optional)
- Network Technology: RS485 Modbus RTU, Fail-safe Biasing required

APPLICATION

JOY Fancoil 5DO (85..260 V ~)

Modern design, flush mounting fan coil room thermostat. Used for individual control of temperature in commercial and residential buildings. It is tailored for two-pipe and four-pipe fan coil units with two-wire electric valves. The device combines a modern design with a 2,5" LCD and a touch-sensitive surface, 3 time program options each with 4 time periods options.

JOY Fancoil EC AO2DO (85..260 V ~)

Modern fan coil room thermostat to control fan coil units with EC fans. It is suitable for 2- and 4-pipe systems. It has 2 relays and 1 analogue output 0-10V (heating valve, cooling valve and EC fan). The device combines a modern design with a 2,5" LCD and a touch-sensitive surface, 3 time program options each with 4 time periods options.

JOY Fancoil EC 3AO (24 V ~/=)

Modern design, flush mounting fan coil room thermostat. Used for individual control of temperature in commercial, industrial and residential buildings. It is tailored for two-pipe and four-pipe fan coil units with two-wire electric valves or controlling a 6-way valve. The device combines a modern design with a 2,5" LCD and a touch-sensitive surface, 3 time program options each with 4 time periods options.

SECURITY ADVICE – CAUTION

The installation and assembly of electrical equipment should only be performed by authorized personnel.

The product should only be used for the intended application. Unauthorised modifications are prohibited! The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or assets. Ensure all power is disconnected before installing. Do not connect to live/operating equipment.

CAUTION! Risk of electric shock due to live components within the enclosure, especially devices with mains voltage supply (usually between 90..265 V).

Please comply with

- Local laws, health & safety regulations, technical standards and regulations
- Condition of the device at the time of installation, to ensure safe installation
- This data sheet and installation manual

PRODUCT TESTING AND CERTIFICATION

Declaration of conformity

The declaration of conformity of the products are available on our website

https://www.thermokon.de/direct/en-gb/categories/joy-fancoil

NOTES ON DISPOSAL

The crossed-out wheelie bin symbol indicates that the product or removable batteries must not be disposed of with household or commercial waste. Within the EU, you are legally obliged to dispose of the product separately and appropriately in accordance with the national laws of your country. Alternatively, please contact your supplier or Thermokon Sensortechnik GmbH. Further information can be found at: www.thermokon.com

MOUNTING ADVISE ROOM SENSORS

The Accuracy of the room sensors are influenced by the technical specifications as well as the positioning and the installation type.

During Assembly:

- Seal mounting box (if present).
- Installation type, air draught, heat source, radiation heat or direct sunlight can affect the measurement.
- Bulding material specific properties of the installation place (brick-, concrete-, partition wall, cavity wall, …) can affect the measurement.

Assembly not recommendet in…

- Air draught (e.g.: close to windows / doors / fans …)
- Near heating sources,
- Direct sunlight
- Niches / between furniture / …

MOUNTING ADVICES

Plasterboard boxes shall be covered by wall paper or paint to avoid that the plasterboard box's front rim will be partially visible underneath JOY.

Maybe consider using white plasterboard boxes (i.e. Kaiser 9063-77).

APPLICATION NOTICE

- Software Software-description on https://www.thermokon.de/
- MicroSD-Card Data storage device for Update, Upgrade or configuration
  - FAT-filesystem required
  - NTFS and exFAT filesystems are not supported!
- Bootloader A MicroSD-card Bootloader for loading applications (Update, Upgrade) or configurations is integrated in the device. active boot lader = ring illumination blinks (1 sec. cycle), display is not triggered!
- Firmware Update – Remove upper part, insert a microSD-card with valid Update file, mount upper part.
  - Valid update file is recognized and the update process is started (ring illumination blinks in a 300ms cycle)
  - New application is started automatically after Update (approx. 20-30 sec.).
  - Remove upper part, to remove MicroSD-card from the device!
- Device Configuration
  - Remove upper part, insert a microSD-card with device configuration file, mount upper part.
  - Configuration file is recognized and the device is configured.
  - Device ready for operation.
  - Remove upper part, to remove MicroSD-card from the device!
- The parameters for the display, set point and the controller can only be changed via the configuration software.

NOTES ON THE UPDATE FUNCTION

An update of the device software is only possible within the version main numbers.

| 3.0.2 ▶ 3.0.11 ✓ | 2.6.6 ▶ 2.3.0 ✓ | 2.x ▶ 3.x ✖ | 2.x ▶ 4.x ✖ |

CONFIGURATION VIA UCONFIG | MICROSD-CARD OR MODBUS

Configuration software:

uConfig | Windows 10 is required to use the uConfig configuration software The JOY room thermostat can be parameterised using the uConfig configuration software. An SD card is used to transfer the created configuration file to the device. For BUS devices, a live configuration can also be performed via the BUS interface. The installer for the

configuration software can be found in the Download-Section on our website. The installer retrieves all necessary files and plug-ins from our web server. In this version an update function is integrated in the software. Download-Section

https://www.thermokon.de/en-gb/download

TECHNICAL DATA

JOY Fancoil 5DO | JOY Fancoil EC AO2DO | JOY Fancoil EC 3AO

Measuring values	temperature, humidity *(optional)*, CO2* *(optional)*
Network technology	RS485 Modbus RTU, **Fail-safe Biasing required**
Measuring range temp.	0..+50 °C
Accuracy temperature	±1 K (typ. bei 21 °C)
Measuring range humidity *(optional)*	0..100% rH non-condensing
Accuracy humidity *(optional)*	±2% between 10..90% rH (typ. at 21 °C)
Measuring range CO2 *(optional)*	0..2.000 ppm
Accuracy CO2 *(optional)*	(5% of measuring value) + 50 ppm
Control function	setpoint adjustment +0..+50 °C, fan stages
Display	LCD 2,5", 240×160 px, white backlighting
Functions	integrated PI- and 2-point-/ 3-point-controllers, 2nd control loop: 2-point controller

Enclosure	PC and glass, optional black or white	
Protection	IP30 according to EN 60529	
Connection electrical	**Terminal 1..8** terminal block max. 1,5 mm²	**Terminal 9..12** terminal block max. 1.0 mm²
Ambient condition	0..+50 °C, max. 85% rH non-condensing	
Weight	195 g	
Mounting	flush mounted with standard EU box (Ø=60 mm)	

*Humidity and CO2 measured values are not processed internally. The values are displayed and can be read out by higher-level systems for evaluation and further use.

JOY Fancoil 5DO

Output switch contact	3x normally open contacts (fan speed), 240 V, load max. 3 A	2x normally open contacts (heating/cooling), 240 V, load max. 500 mA
Power supply	85..260 V ~	
Power consumption	max. 2,5 VA (260 V ~)	
Inputs	**DI1** input for NTC 10 K or floating contact	**DI2** digital input for non-floating contact (230 V ~)

JOY Fancoil EC AO2DO

Output voltage	1x 0..10 V, max. load 5 mA, EC FAN control

Output switch contact	2x normally open contacts (heating/cooling), 240 V max. load 500 mA
Power supply	85..260 V ~
Power consumption	max. 3 VA (260 V ~)
Inputs	**DI1** input for NTC 10 K or floating contact **DI2** digital input for non-floating contact (230 V ~)

JOY Fancoil 3AO

Output Voltage	3x 0..10 V, max. load 5 mA, EC FAN control, heating/cooling or control 6-way-valve (configurable via software)
Power supply	24 V = (±10%) or 24 V ~ (±10%) SELV
Power consumption	max. 2,5 W (24 V =)
Inputs	**DI 1** 1 input for NTC10k or potential-free contact **Di 2** digital input, for potential-free contact

*Power supply

When several BUS devices are supplied by one 24 V AC voltage supply, it is to be ensured that all "positive" operating voltage input terminals (+) of the field devices are connected with each other and all "negative" operating voltage input terminals (-) (=reference potential) are connected together (in-phase connection of field devices). In case of reversed polarity at one field device, a supply voltage short-circuit would be caused by that device. The consequential short-circuit current flowing through this field my cause damage to it. Therefore, pay attention to correct wiring.

FUNCTION DESCRIPTION – CONTROLLER/FAN STAGES

JOY Fancoil 5DO (85..260 V ~)	JOY Fancoil EC AO2DO (85..260 V ~)	JOY Fancoil EC 3AO (24 V ~/=)
PI controller (PWM) & 2-point/3-point controller (configurable)	PI controller (PWM) & 2-point/3-point controller (configurable)	PI controller (0..10 V)

Fan stages (all types)

In automatic mode the fan speed is linked to the controller. The assignment of the fan stage to the control (heating / cooling, only heating, only cooling) is freely selectable. To ensure that the fan motor starts reliably, a period of time can be configured in which the fan starts with maximal value. Using one or more time channels, the fan control have to be set per timechannel and per period. Via the touch surface the user has the option to override the settings of the device every time. When the next time channel starts, the fan speed is set to the configured value. The fan is set to automatic mode when the user changes the occupancy state (occupied↔unoccupied).

Heating/ cooling with PI-controller (PWM) (only 5DO and EC AO2DO)

The time response of the PI control loop depends on the control parameters xp for the proportional area and tn for the reset time of the integral range. In case of an error, the P portion immediately changes the position value proportionally to the error variable, while the integral portion takes effect after a certain time.

The resulting actuating variable is output as a pulse-width-modulated signal directly to the outputs.

Heating/ cooling with 2-point-/ 3-point-controller (only 5DO and EC AO2DO)

In the case of temperature control, the 2-point controller only knows the switching states heating ON and heating OFF. The 3-point controller also knows the switching state of cooling. Two – and three-point controller work with a hysteresis.

Heating/ cooling with PI-controller (0..10 V) (only EC 3AO)

The time response of the PI control loop depends on the control parameters xp for the proportional area and tn for the reset time of the integral range. In case of an error

variable, the P portion immediately changes the position value proportionally to the error variable, while the integral portion takes effect after a certain time.

The resulting manipulated variable is output as an analogue 0..10 V signal directly to the outputs.

EC Fan automatic mode with PI-controller (only EC 3AO and EC AO2DO)

(for EC AO2DO with two-point/three-point controller, the temperature range for controlling the 0..10 V EC fan is parameterised separately)

The 0..10 V (0..100%) control of the fan is proportional to the calculated manipulated variable of the PI controller.

example: Calculated actuating variable 65% = Fan control with 6,5 V

Calculated actuating variable 22% = Fan control with 2,2 V

EC Fan manual with PI-controller (only EC 3AO and EC AO2DO)

Up to 5 steps (steps) can be set using the configuration software. The set number of steps is divided linearly to the manipulated variable of 0..100%.

- example: max. steps (stages) = 5

  Stage 1 = 20% Stage 2 = 40% Stage 3 = 60% Stage 4 = 80% Stage 5 = 100%
- max. steps (stages) = 3

  Stage 1 = 33% Stage 2 = 66% Stage 3 = 100%

CO2 + Humidity measuring value

The measuring range of the CO_2 sensor is 0…2000 ppm, (resolution 1 ppm). The sensor offers the option of adjusting the measured value (for calibration with an external measuring device) or automatic self-calibration.

The measuring range of the humidity sensor is 0..100 % (resolution 0.1%). It is possible to adjust the measured value for the sensor (for calibration with an external measuring device).
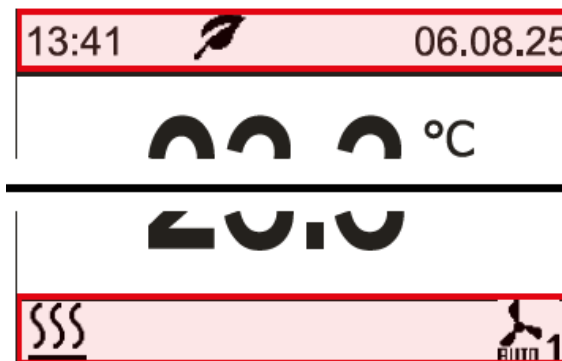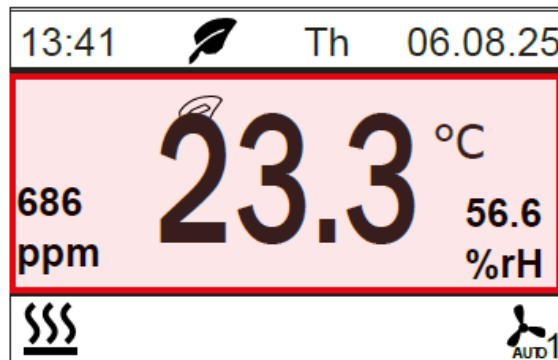
The humidity and CO_2 values can be read out via the bus or shown on the display. The values are not processed internally!

DISPLAY
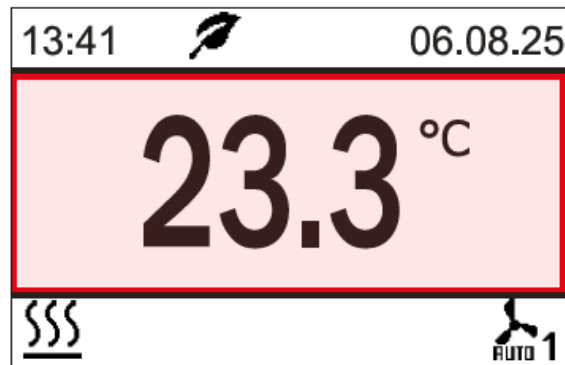
Value Screen

- internal sensor values
- external sensor values (configurable)
- (additional humidity/ CO2 -value optionally configurable)

Header (value/ symbol display)

Time, weekday, date, ECO symbol (mode dependent)

Alarm symbol (higher priority than ECO-Symbol)

Footer (symbol display)

Symbols for heating/cooling mode, occupancy, window contact, etc.

The symbol „Timechannel active" is only shown when a time channel is active.
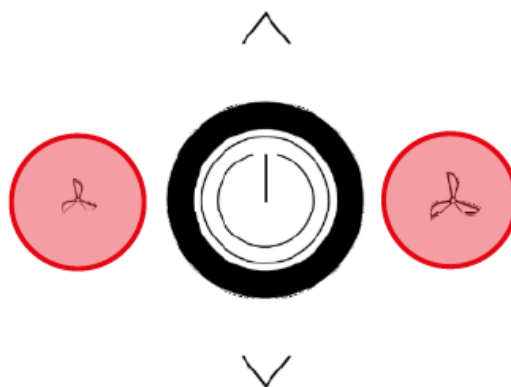
	Occu-pancy			Window contact/ dew point	
	Heating/ Cooling			Fan stage	
	Time-channel active				

## FUNCTION DESCRIPTION – BUTTONS

On the touch surface, there are adjustment options for setpoint and fan speed regulation.

While pressing these buttons, the white ring-LED of the Power-button lights up for visual feedback.

- Fan speed adjustment: „fan speed up" / „fan speed down"

- Setpoint change (setpoint range ± 3 °C, default, configurable).
- Power button for Standbymode, or Presence key*
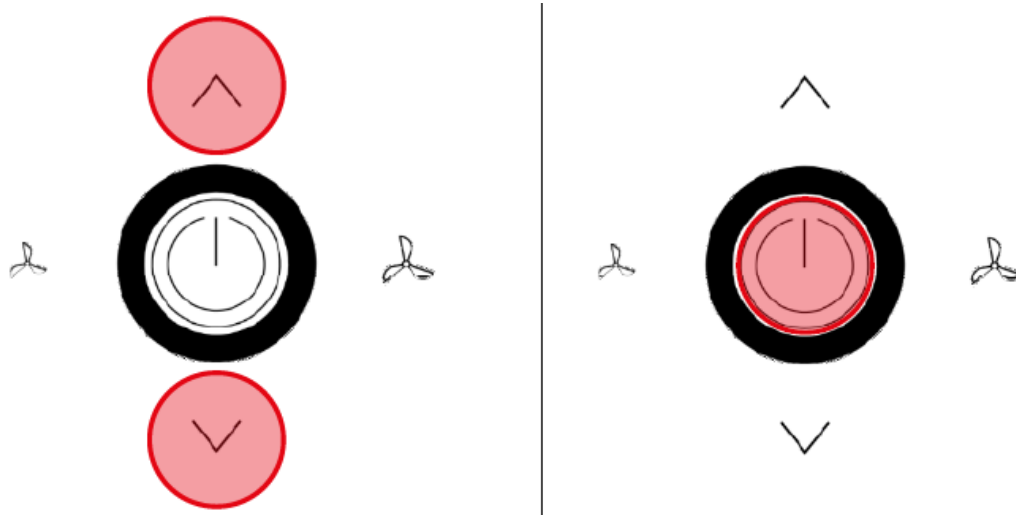
*If the key is used as a presence key at the same time, the key must be pressed for at least 3s, in all other cases a short press is sufficient.

3 seconds without any interaction, the display returns back to main screen.
Standby mode (not compatible with Keycard-switch function)
In standby mode the display and all outputs are switched off (controller deactivated). The frost and heat protection monitoring remains active. The Modbus registers can still be read out (e.g. room temperature).

- Navigation Parameter menu (up, down, left, right)
- Open submenu (right) In header left to leave the submenu
- Confirmation
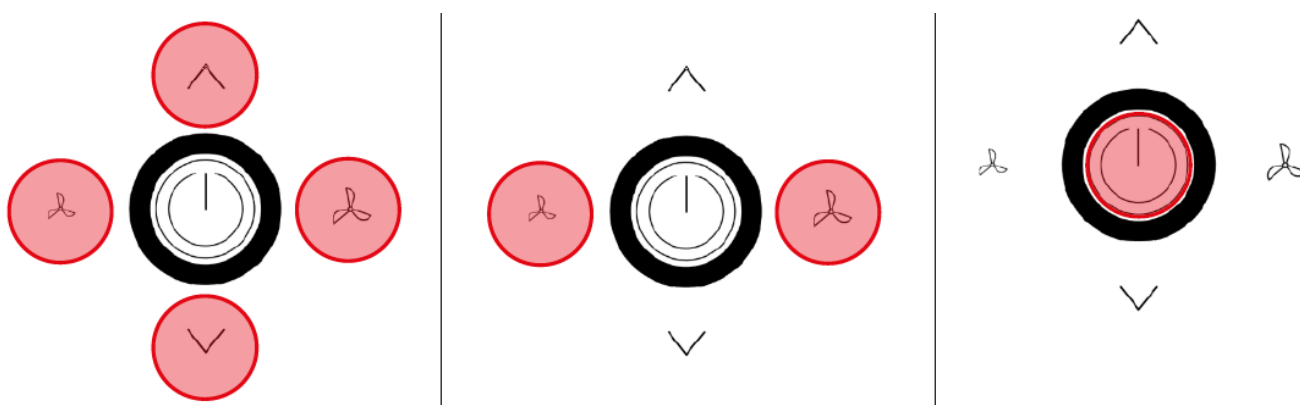
DIAGNOSTICS MENU
To access the diagnostics menu, select the header in the startscreen of the parameter menu, and press the ENTER key. Here you will find various information, such as device type, software version, state of the inputs and outputs and controller state (current manipulated variable).

PARAMETER MENU – MODBUS INTERFACE

The configuration menu is activated by simultaneously pressing the buttons "up" (A) and "down" (C) for at least 5 seconds.

The menu is enabled during the first 60 minutes after switching on the supply voltage as long as the device is not actively involved in Modbus communication. As soon as the device receives a valid request addressed to the device from a DDC, access to the menu is blocked. Without valid communication, access is blocked after 60 minutes!
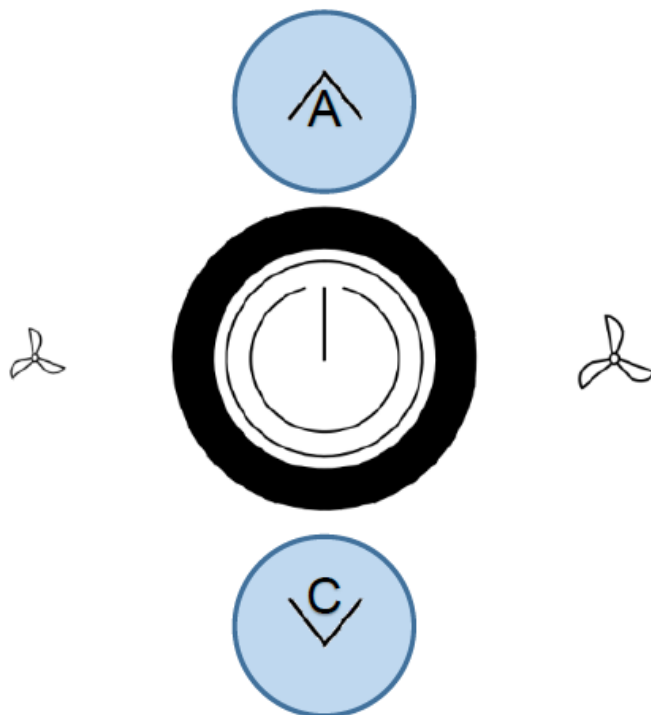
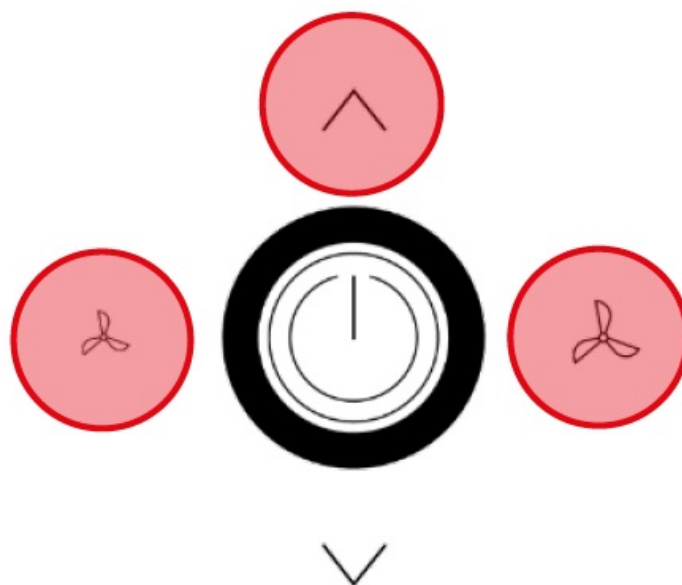| Modbus settings		
Address	◄ -/+ ►	32
Baudrate	◁ -/+ ▷	19200
Parity	◁ -/+ ▷	Even

- Address (default: 32)

  Adjustable address (1-247)
- Baud rate (default: 19200)

  9600Bd | 19200Bd | 38400Bd | 57600Bd
- Parity (default: even)

Non | odd | even

CONFIGURATION

Parameter menu

Access to Parameter menu:

Press buttons for 3 seconds simultaneously

```
Menu
─────────────────────────────
Timechannels              ▷
Time/Date                 ▷
Sensor settings           ▷
Common settings           ▷


```

If no entry is made for 8 minutes, the parameter menu is left automatically.

MENU → TIME CHANNELS

```
┌─────────────────────────────┐
│ Menu                        │
│ ┌─────────────────────────┐ │
│ │ Timechannels         ▷  │ │
│ └─────────────────────────┘ │
│ Time/Date            ▷      │
│ Sensor settings      ▷      │
│ Common settings      ▷      │
│                             │
│                             │
└─────────────────────────────┘
```

Up to 3 time channels with 4 time periods each can be parameterized. The time channels are prioritized, channel 3 has the highest priority.

```
┌──────────────────────────────┐   ┌────────────────────────────────┐
│ Timechannels                 │   │ Timechannels/Timer1            │
│ ┌──────────────────────────┐ │   │ from day   ◁-/+▷         Mo    │
│ │ Timechannel 1  Mo - Fr ► │ │   │ to day     ◁-/+▷         Fr    │
│ └──────────────────────────┘ │   │ 1: 06:00h - A -  22.0°    ✓►  │
│ Timechannel 2           ▷    │   │ 2: 08:30h - 1 -  20.0°    ✓▷  │
│ Timechannel 3           ▷    │   │ 3: 16:00h - A -  22.0°    ✓▷  │
│                              │   │ 4: 22:30h - 0 -  22.0°ECO ✓▷  │
└──────────────────────────────┘   └────────────────────────────────┘
```

```
┌─────────────────────────────┐
│ Periods/Period1             │
│ Start   ◁-/+▷     06:00h    │
│ Fan     ◁-/+▷     AUTO      │
│ Temp    ◁-/+▷     22.0°     │
│ ┌─────────────────────────┐ │
│ │ ECO-Mode            ✓   │ │
│ └─────────────────────────┘ │
│                             │
└─────────────────────────────┘
```

Time Channel

Time period within one week configuration ◄ - / + ► via button left / right

4 periods

Periods

- Start – configuration start setpoint (24h format)
- Fan – selection fanstage (depends on type)

- Temperatur – setpoint (in °C or °F depends on configuration)
- ECO mode – In ECO mode, the dead zone between heating and cooling is automatically set to the ECO dead zone configured in the "General Settings" menu (default: 10 K).

MENU → TIME/DATE

In the Time/ Date menu the time, date and the display format can be configured.

Default settings:

24h display format

Daylight savings settings (CET) Date presentation Day. Month. Year

The room thermostat is equipped with a real-time clock (needs to be set during commissioning.

MENU → SENSOR SETTINGS

```
Menu

Timechannels              ▷
Time/Date                 ▷
Sensor settings           ▷
Common settings           ▷
```

Value display of internal and external temperature sensors

```
Sensor Settings            │ Sensor Settings
Offset int.  ◄-/+►  0.6 K  │ Offset rH    ◄-/+►    +0.0%
Value int.         22.1°C  │ Value rH             +46.8%
Offset ext.  ◁-/+▷  0.2 K  │ Calib. CO2 ◄-/+►   +560ppm
Value ext.         22.1°C  │ ASC CO2                 OFF
                           │ Value CO2           +643ppm
CO2/rH                  ►  │
```

- Offset int. An offset can be configured to compensate for the self-heating of the internal temperature sensor.
- Offset ext. An offset can be configured for temperature compensation of a connected external NTC10K.
- Offset rH A humidity offset can be configured to compensate for constant measured value deviations.
- Calib. CO_2 A measured value can be entered here that is determined with a reference measuring device near the appliance. (Calibration CO_2 Sensor (Forced))
- ASC CO_2 Switches the ASC (Automatic Self Calibration) function ON / OFF (factory setting ON)

CALIBRATION CO2 SENSOR (FORCED)

The key combination (top left + top right) is used to calibrate the currently detected air mixture in the device with the value configured in the display. This key combination only works in the CO_2 sensor settings menu.

Attention: CO_2 sources (e.g. breathing air) influence the measured value recording! The ASC function is deactivated during a forced calibration.
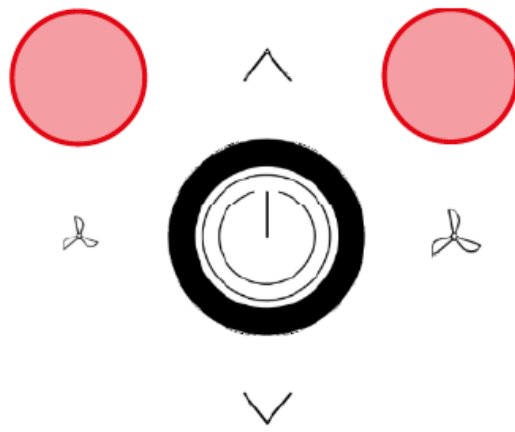
ASC (AUTOMATIC SELFCALIBRATION)

The ASC function sets the lowest recorded CO2 value (7-day period) as the reference value for the measured value recording. A sufficient supply of fresh air within the 7-day period is necessary to ensure a correct measurement result.

CO2 FACTORY SETTING

To reset the sensor to factory settings, use the key combination. This key combination only works in the CO2 sensor settings menu.
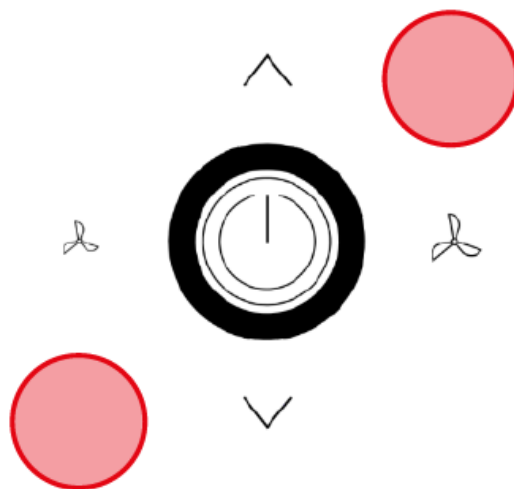
MENU → COMMON SETTINGS

```
Menu

Timechannels            ▷
Time/Date               ▷
Sensor settings         ▷
Common settings         ▷
```

```
Settings/Common                 Settings/Common                 Settings/Language

Brightness LCD ◀-/+▶  100%      Valve protect   ◀-/+▶  ON        Deutsch              ✓
Brightness LED ◁-/+▷  100%      ECO deadband ◁-/+▷  10.0K        English
Contrast       ◁-/+▷  56        Fanstages     ◁-/+▷  3


Common                   ▷      Language               ▷        Factory setting        ▷
```

Common device settings:

- Brightness

- Contrast

- Valve protection

- ECO deadband

- Fan stages (type-depending)

- Language

- Factory setting (reset)

Brightness

- Configuration of the LCD brightness/ LED ring brightness during button operation/ usage.

Contrast

- Configuration of the display contrast values

Valve protection

A valve protection function actuates the heating and cooling valves regularly to prevent locking during non-usage times.

The function is executed fridays at 5.00 (heating valve) and 5.20 (cooling valve). The corresponding valve is triggered for 5 minutes, if not activated during the last 96 hours.

ECO deadband

The dead band can be adjusted (default 10.0 K)

* further information in the software specification file

Fanstages

Configuration of the device fan stages

Factory setting

By selecting "Factory setting", the room thermostat will be reset and restore the device to factory default settings.

INPUTS

Up to 2 inputs are configurable for functions such as windows contact, dew point, occupancy, change-over or external sensor option.
The overview of possible combinations can be found in the software specification of the JOY.

- Sensor (NTC10K) The value of an external sensor will be shown if connected and configured accordingly. In this case, the room thermostat controls according to the external sensor. Alternatively, an external temperature sensor can be used at the universal input to protect floor heating. If a configured temperature is exceeded, the heating sequence is suspended.
- Change-Over DI The digital input is used to switch between heating and cooling mode. Depending on the state of the contact, only the heating controller or only the cooling controller is active in the room thermostat (default setting, contact open: Heating controller active, contact closed: Cooling controller active, input signal configurable via 'Polarity' parameter). Terminals 4 and 5 are used in parallel as an output for heating or cooling.
- Change-Over Sensor
  The change-over sensor is used to automatically switch between heating and cooling mode. The limit temperatures for heating and cooling can be configured. If the digital

input is configured as a changeover, the room thermostat is automatically in 2-pipe operating mode and both outputs (terminals 4 and 5 [3AO: terminals 3 and 4]) are used in parallel as an output for heating or cooling.

If the universal input is configured as a changeover sensor, the measurement of the medium temperature can be controlled via various parameters. Up to two measurements can be carried out per day, for which the opening time of the valves and the start and subsequent duration of the medium temperature measurement can be configured.

During the active opening time and after a faulty medium measurement (invalid temperature), the controller mode display alternates between the heating and cooling symbols if activated. Further information in the software description.

- Window contact/Energy hold off
  If a window contact is enabled via the digital input, the reference will switch to a setback set point (Heat SP/Cool SP).
- Dewpoint An active dewpoint contact locks the cooling controller.
- Occupancy If occupancy-function is active, the symbol will be displayed automatically. In state of "unoccupied" the heating set point is reduced by 2K (default setting) rsp. the cooling set point raised by 2K.
- Keycard-Switch When the card is not inserted, the device is switched in sleep mode. Operation of the keys is locked, the display is switched off and the controller adjusts to the nominal values of the "unoccupied"-State.
- Alarm contact An alarm symbol can be shown in the header of the display. The backlight flashes when the alarm is active. This symbol is in the same position as the ECO symbol. The alarm symbol has a higher priority and overwrites the ECO symbol!

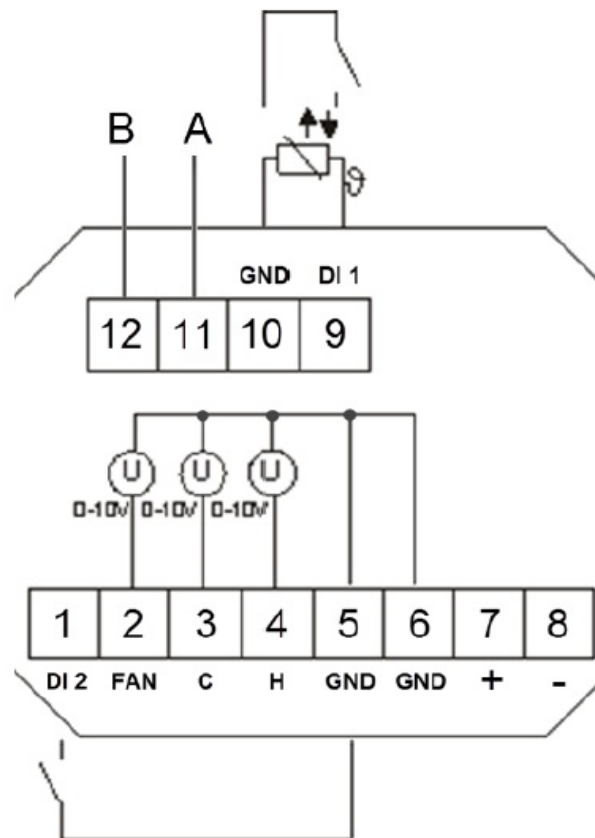## CONNECTION PLAN

JOY Fancoil 5DO (85..260 V ~)
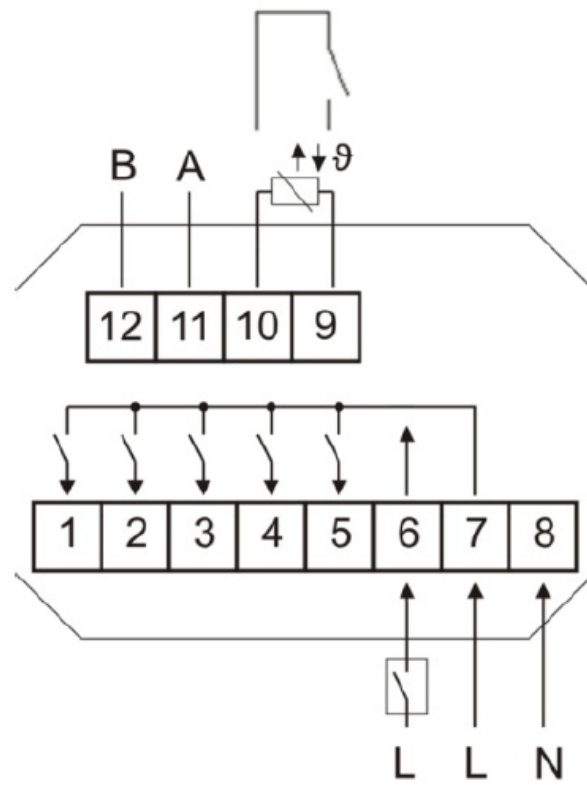
- 1 Fan Speed 3
- 2 Fan Speed 2
- 3 Fan Speed 1
- 4 Cooling
- 5 Heating
- 6 Digitaler Input 2 (230 V)
- 7 L
- 12 Modbus B
- 11 Modbus A
- 10 GND DI 1
- 9 Digital Input 1 (or NTCIOK)
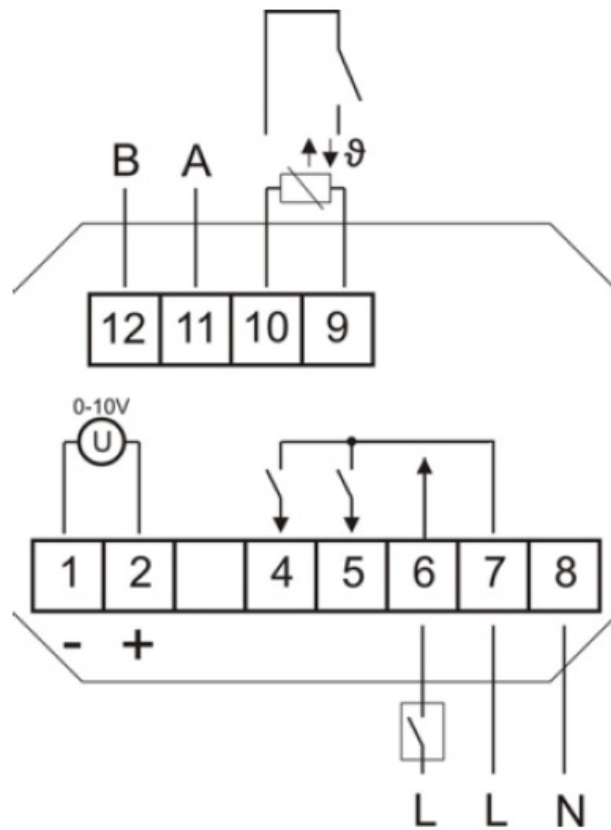
- 1 EC Fan GND
- 2 EC Fan (0..10 V)
- 4 Cooling
- 5 Heating
- 6 Digital Input 2 (230V)
- 7 L
- 8 N
- 12 Modbus B
- 11 Modbus A
- 10 GND DI 1
- 9 Digital Input 1 (or NTCIOK)

- 1 Digital Input 2
- 2 EC Fan (0..10 V)
- 3 Cooling (0..10 V) or 6-way valve
- 4 Heating (0..10 V) or 6-way valve
- 5 GND DI 2
- 6 GND
- 7 24 V = (±10%) or 24 V ~ (±10%)
- 8 GND
- 12 Modbus B
- 11 Modbus A
- 10 GND DI 1
- 9 Digital Input 1 (or NTCIOK)

Note:

The inputs for floating contacts must not be connected in parallel. If the operating mode (Change-Over DI) of several devices is to be switched by one contact, the input for the floating contacts must be used. It must be ensured that the same phase is used for jointly switched devices.

DIMENSIONS (MM)
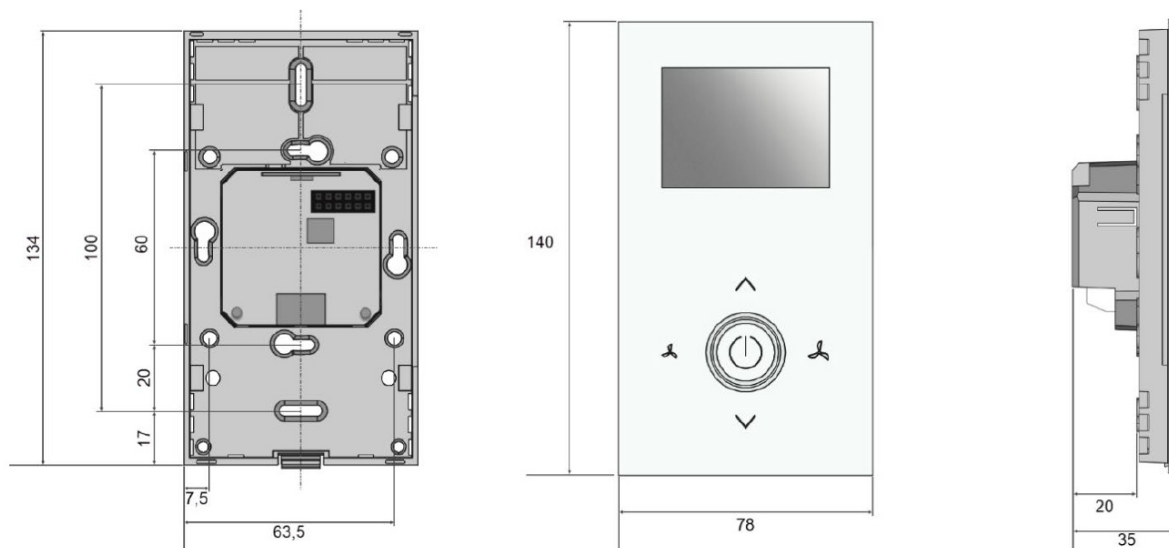
ACCESSORIES (OPTIONAL)

- Frame for surface mounting JOY pure white Item No. 760201
- Frame for surface mounting JOY black Item No. 760951
- Decorative frame pure white for JOY Item No. 681452
- Decorative frame black for JOY Item No. 740951
- MicroSD card 2GB Item No. 500098
- RS485 Biasing Adapter Item No. 811378
- USB RS485 Modbus RTU Logger Item No. 809917
- Converter RS485 Modbus – USB Item No. 668293

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JOY_Fancoil_Modbus_Datasheet_en.docx © 2025

FAQ

- **Q: How can I update the device software?**

  A: Device software updates are possible within specified version main numbers. Refer to the user manual for detailed instructions on updating the software.
- **Q: Where can I find the configuration software?**

  A: The configuration software uConfig can be downloaded from the Download Section on Thermokon's website. Ensure you have Windows 10 to use this software.

Documents / Resources
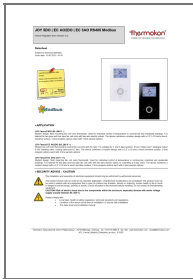
thermokon JOY 5DO Room Controller [pdf] Instructions

5DO, EC AO2DO, EC 3AO, JOY 5DO Room Controller, JOY 5DO, Room Controller, Controller

References

- User Manual

🏷 5DO, controller, EC 3AO, EC AO2DO, JOY 5DO, JOY 5DO Room Controller, Room Controller,

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