

thermokon®

HOME OF SENSOR TECHNOLOGY

JOY

Manual



Revision

Revision	Date	Description	Author
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1. General information and safety instructions

A prerequisite for safe working is compliance with the specified safety instructions and handling instructions. The installation and assembly of electrical devices (modules) may only be carried out by an authorised electrician.

Please read the operating instructions carefully before using the appliance.

- The device may only be used for the purposes and applications described in this operating manual.
- The device should only be cleaned with a damp cloth. Do not use aggressive or solvent-based cleaning liquids. Failure to observe the safety instructions may result in damage to the device and harm to the user. Detailed information can be found in the document *Care_instructions_for_room_operating_units_en.pdf* (https://www.thermokon.de/direct/files/Care_instructions_for_room_operating_units_en.pdf)
- A faulty connection can lead to destruction of the device or even the whole building system.
- Additionally the instructions in the applicable data sheet are to be observed.

1.1. Intended use

- The device is intended for the use in a KNX-network and can be commissioned with the ETS 5 or newer.
- The room control unit is intended for use in offices, meeting or conference rooms, hotel, reception/lobby areas, nursing homes and hospitals, and generally in commercial and residential buildings. The room control unit is used for local room control for lighting, blinds and HVAC applications.
- The device may only be used and operated in a proper environment and according the corresponding specifications.

1.2. Non-intended use

- The room operating units must not be used if a malfunction of the device could endanger the life and limb of the user or third parties or cause damage to the product or other property.
- The device must not be used in potentially explosive atmospheres.
- The device must not be used in an atmosphere in which a chemically active substance is present.
- Any use other than that described in these instructions or any use other than that described here is considered improper and is prohibited.

1.3. Limitation of liability

All information and notes in this manual have been compiled in accordance with the applicable standards and regulations, the state of the art and our extensive knowledge and experience. The manufacturer's warranty conditions apply.

The manufacturer accepts no liability for damage due to:

- Non-compliance with these instructions or applicable documents
- Unintended / improper use
- Installations conducted by non-professional persons
- Unauthorised technical modifications

The actual scope of delivery may deviate from the explanations and illustrations described here in the case of special designs, additional product options or latest technical changes.

1.4. Support

Our support team is available for technical information .

Information about the responsible contact person can be obtained at any time by telephone or e-mail. You may also visit our website for contact details: See <https://www.thermokon.de/en-gb/contact/contact-persons>

We appreciate your contributions, feedback and user experiences in order to constantly improve our products!

2. Functional description

Das JOY ist ein Raumthermostat (RT) im hochwertigen Design zur individuellen Temperaturregelung in Wohn-, Gewerbe- und Geschäftsräumen. Die Fan Coil-Variante dient, je nach Ausführung, der Ansteuerung eines 3-stufigen Lüfters bzw. eines EC-Fan Coils (0-10V). Die Variante ist für Gebläse Konvektoren mit 2- und 4-Rohrsystemen ausgelegt. Die HC-Variante ist ein reines Thermostat. Die Joy KNX Geräte sind mit einem Temperatur- und Feuchte-, sowie optional mit einem CO₂-Sensor ausgerüstet. Die Sensorwerte werden gemessen, können über BUS ausgegeben und auf dem Display angezeigt werden.

Die Ansteuerung der Ventile erfolgt bei den 230V-Typen mit Relais (Zweipunktregler bzw. PWM eines PI-Reglers) und bei den 24V-Typen durch ein stetiges 0-10V Signal. Alternativ kann bei der HC-Variante ein 6-Wege-Ventil (Sauter oder Belimo) am dritten 0...10 V Ausgang angesteuert werden.

Die Bedienung erfolgt über Touch-sensitive Tasten. Mit dem modernen Design kombiniert das Gerät ein 2,5" LCD Display mit einer Touch-Oberfläche.

Das Raumbediengerät bietet folgende Hauptfunktionen:

- Integration bis zu drei verschiedener Sensoren (Temperatur, relative Feuchte und CO₂)
- Intuitive und komfortable Steuerung des Raumklimas
- Aufrufen eines ECO-Modus zur energiebewussten Klimasteuerung
- Steuerung von Lüftungsgeräten
- Steuerung von Beleuchtung mit Dimmfunktionen sowie Beschattung
- Anzeigen von Statusmeldungen, weiteren Betriebszuständen, wie „Fenster offen“, Raum belegt/unbelegt etc.
- Übersichtliche Darstellung der Messwerte
- Digitale Eingänge für externe Geräte (z.B. Fensterkontakte, Taupunktwärter etc.)
- Temperatursensoreingang (NTC10k) zur Temperaturmessung (z.B.: Außentemperatur)

2.1. Device versions

The Joy room control unit is available in the in the variants HC, FC and on request as Custom.



Illustrations exemplary, other colors and designs available.

2.1.1. Overview of variants:

Variant	Measuring variables	Control	Power supply
Joy KNX Fancoil 5 DO (FC5DO)	Temperature + Humidity (optional CO ₂)	3 Fan stages	230V
Joy KNX Fancoil EC AO2DO (FCAO2DO)	Temperature + Humidity (optional CO ₂)	EC-Fan 0-10V	230V
Joy KNX Fancoil EC 3AO (FC3AO)	Temperature + Humidity (optional CO ₂)	EC-Fan 0-10V	24V
Joy KNX HC AO2DO	Temperature + Humidity (optional CO ₂)	6 way valve	230V
Joy KNX HC 3AO	Temperature + Humidity (optional CO ₂)	6 way valve	24V

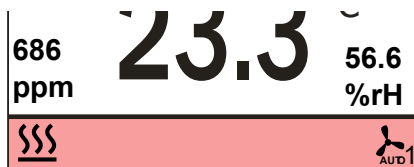
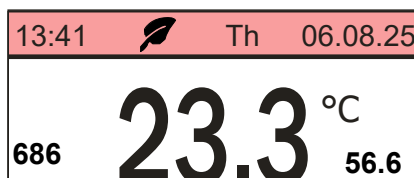
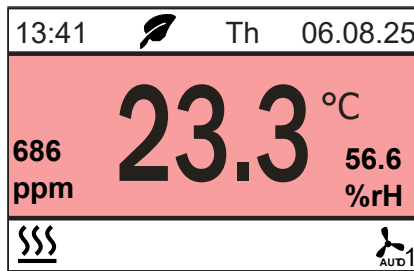
2.1.2. Device specific information (Start screen)

After switching on the device, a start screen is displayed for approx. 5s, which shows device-specific information such as device type and firmware version.



2.2. Screen

The Screen is divided into three areas: Header, Value Screen and Footer.



Value Screen

Internal sensor values

External sensor values (configurable)

Controller mode

(Additional CO2 sensor values depending on device (configurable))

Header

(Display of values/ symbols)

Time, Weekday, date,

ECO symbol (depending on mode)

Alert symbol (overwrites ECO symbol) protection symbol

Footer

(Display of symbols)

Symbols for states

Heating, Cooling, Window, Dewpoint, Occupancy, Fan stage



ECO-Function

GO 55 (Input), 54 (Output)
ECO inactive = 0 | ECO active = 1



Alert

GO 16 (Input), 15 (Output)



Building Protection

Frost protection GO 17 (Output)
Heating protection GO 18 (Output)



Cooling mode

GO 101 (Input)
ON = 0



Heating mode

GO 101 (Input)
ON = 1



Window open

GO 61 (Input), GO 60 (Output)
ON = 1 | OFF = 0



Dewpoint

GO 59 (Input), GO 58 (Output)
ON = 1 | OFF = 0



Occupancy

GO 53 (Input), GO 52 (Output)
Standby = 0 | Presence = 1



Fan stage

GO 83 (Input), GO 82 (Output)
Integer value of the active fan stage

2.2.1. Value Screen

The display on the main screen can be configured (General > Display > Homescreen). Available for selection:

- Sensor values (Temperature, external temperature sensor, humidity or optional CO2)
- Absolute (=Base) setpoint
- Setpoint offset

The sensor values of the internal temperature sensor are displayed in the middle by default. If an external temperature sensor is connected and the input is configured accordingly, its value is shown in the display. In addition, the relative humidity and the CO2 value can be displayed next to the central value. (Sensors > Humidity sensor / CO2 sensor > Show ...)

The display of the controller mode (Auto / Heating / Cooling) is activated / deactivated via „Show controller mode“ (HVAC > controller general > show controller mode). Additional information about the controller: („Regelung“ S.17)

When any button is pressed, the display on the value screen changes and shows a symbol for the respective function.

Symbol	Designation	Description	Symbol	Designation	Description
	Temperature / Setpoint	Displayed at Temperature value or setpoint change		Fan stage	Display of the fan stage (only FC variant)
	Light	Display of the lighting functions ON/OFF DIM/LIGHTER		Roller shutter / Shading	Display of the roller shutter / shading functions UP / DOWN

2.2.2. Header

The header is used to display the date and time. An info symbol is also displayed here if required or depending on certain states/modes.

Date & Time (General > Date & Time)

The date and time display can be switched on and the display format selected in drop-down menus. Synchronization of the currently valid values (date & time) can be activated or deactivated.

ECO symbol









The ECO symbol is displayed when the ECO function is activated. Further information on the ECO function here: („Room operating mode ECO“ S.18)

Alert symbol

An alarm symbol can be displayed via group objects or a configured input (display overwrites ECO symbol). The backlighting also flashes.

2.2.3. Footer

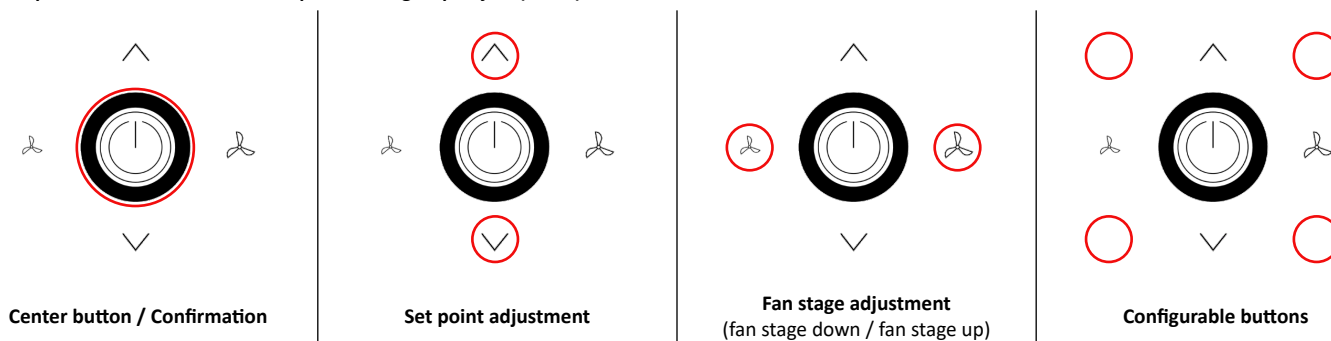
In the footer of the main screen, symbols for the states heating, cooling, room occupancy, window contact, dew point and fan levels can be shown or hidden via a group object (GO). The symbols are divided into symbol groups. Only one symbol per group can be displayed at a time. The symbols can be switched on or off as required.

Symbol groups					
Presence (Standby/Comfort)			Heating / Cooling		
Window/Dewpoint			Fan stage		

2.3. Buttons

There are buttons on the touch surface for operating the configured functions. Pressing the button once triggers an action. A long press of the button causes a value to change cyclically at 0.5s intervals. **Each time the buttons are pressed, the ring on the power button lights up as button feedback.**

Button operation can be blocked as required via a group object (GO13).



If no button is pressed for 3 seconds, the display returns to the main screen!

2.3.1. Customizable buttons

The buttons are divided into 2 button types and 4 button areas:

- 1 center button in the center of the keypad.
- 8 Adjustment / activation buttons in 3 rows (square top / center / bottom positioned around the central button).

The adjustment / activation buttons are divided into setpoint changes and 6 other buttons that can be configured via the ETS, 2 of which are preconfigured with the fan speed adjustment as standard.

2.3.2. Center button

Various functions can be assigned to the central button (ON/OFF), e.g. to change the presence status, activate ECO mode or the button can be locked. The configured function is triggered by a short press of the button. A long press of the button still triggers the ON/OFF function („Room operating mode Comfort (occupied)“ S.18). When using a keycard switch, the ON/standby (off) button function (long button press) is not possible.

Linking the button to the presence status does not exclude the use of a digital input as a presence detector! The last change (KO or button press) is used.

2.3.3. Menu Navigation

The menus are navigated using the UP, DOWN, CENTER LEFT, CENTER RIGHT and ENTER buttons. The menus are structured hierarchically. Starting from the main window as the highest level, you can jump to the submenus and from there to further submenus.

To jump back one level, select the header and then press the center LEFT button.

The UP / DOWN buttons are used to select a menu line. The currently selected menu line is displayed inverted. A value can only be modified in the selected menu line.

Icons are used in the menus to provide better orientation when navigating through the menus:

Change of value

V-/+W Center LEFT (-) / Center RIGHT (+) buttons to change the value. No selection via the ENTER button is necessary.

Accessing the next menu

u Center RIGHT button to call up the next menu

Display value selected

✓ The symbol is displayed when the corresponding value is selected.
Parameters for which no value change symbol is displayed can be selected using the ENTER button.

Exiting menus

Menus can be exited by selecting the header in the main window and then pressing the LEFT button.

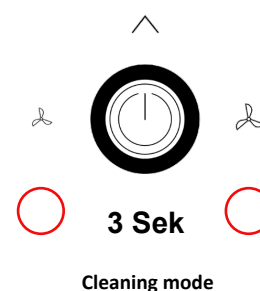
An automatic return to the main menu takes place after 10 minutes without user action.

Unconfirmed values are not accepted in this case.

2.4. (Surface) Cleaning mode

A cleaning mode can be activated to avoid having to press a button while the appliance is being cleaned.

Cleaning mode is activated using the key combination shown on the right:



3. Installation, Commissioning & Configuration

Correct commissioning ensures trouble-free and safe use of the devices. It is therefore essential to follow the instructions in the data sheet.

3.1. Connection

3.1.1. KNX TP1 Installation

In general, the country-specific installation regulations (e.g. VDE 0100, etc.) and regulations of the KNX standard must be observed.

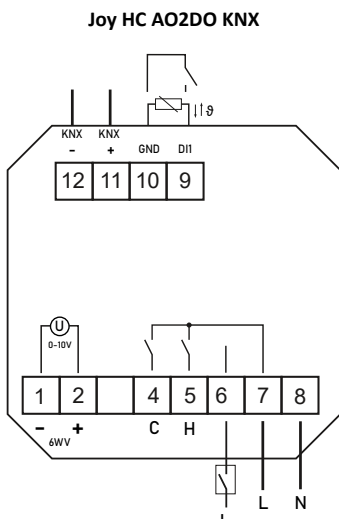
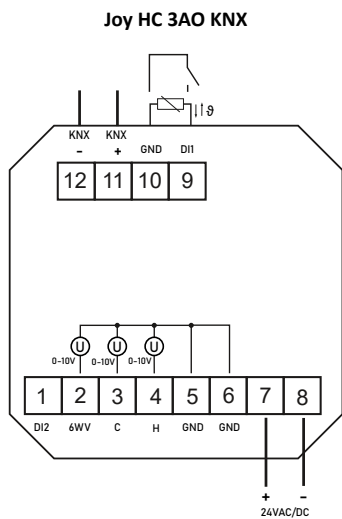
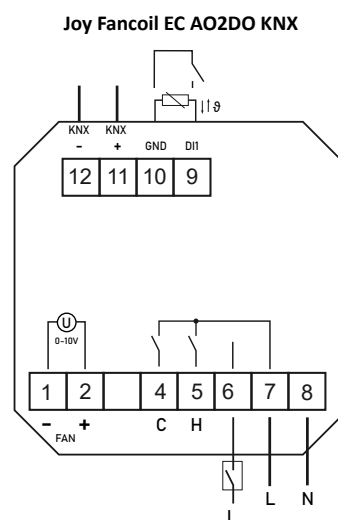
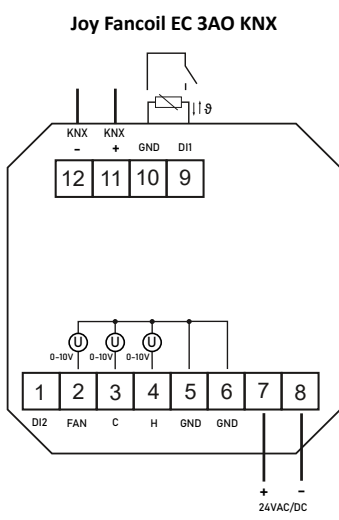
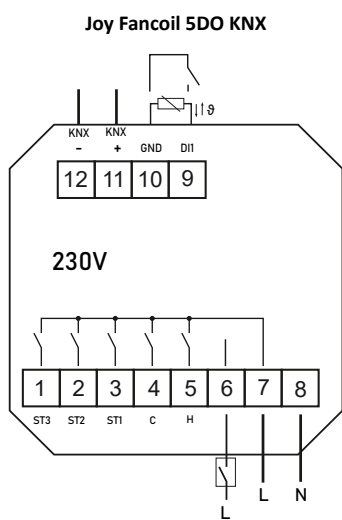
The room operating units load the bus with a load of 3mA (in accordance with the KNX standard).

Please note that KNX does not support a ring connection!

3.1.2. Electrical connection

The power supply and the KNX cables must be connected in accordance with the following connection diagrams depending on the device variant. The power supply must come from sources that meet the requirements for 230V devices of the Low Voltage Directive or the requirements for safety extra-low voltage (SELV), as well as the regulations of the KNX standard. The device starts after the power supply is switched on.

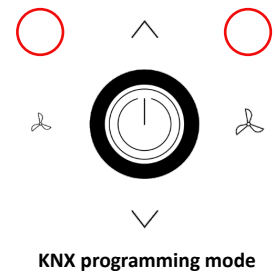
Further information is documented in the applicable data sheet.



3.2. Commissioning

Once the device has been connected, it can be put into operation.
The following procedure should be followed:

- Connect the programming interface to the bus (e.g.: USB Interface KNX)
- Switch on the bus and auxiliary power supply
- Specifying the physical address and configuring the application program using the ETS (5 or higher)
- Press the "KNX programming mode" key combination.
- Programming mode " appears on the display
- Programming the physical address and the application program using the ETS
- Check the parameterized functions (e.g. using the ETS)



3.3. Configuration / Device software

The following options are available for configuring the device:

- Parameterization via desktop PC/laptop with the ETS software, via USB interface KNX (art. no: 806190)
- Updating the device software, via micro SD card (art. no: 500098)

3.3.1. Device software (via SD-card)

Notes on updating the device: MicroSD card specification: FAT file system (**NTFS and exFAT file systems are not supported.**)

Updating the device software is only possible within the version main numbers.
The software version is displayed in the diagnostics menu: („Diagnostics menu“ S.14)

Follow the steps below to update the device software:

1. Remove the top part
2. Insert MicroSD card with valid device software file
3. Place upper part on lower part.
4. Valid device software file is recognized and the installation process is started (ring lighting flashes at 300ms intervals)
5. New device software is started after installation (approx. 20-30 seconds).
6. Remove the upper part to remove the MicroSD card from the device!

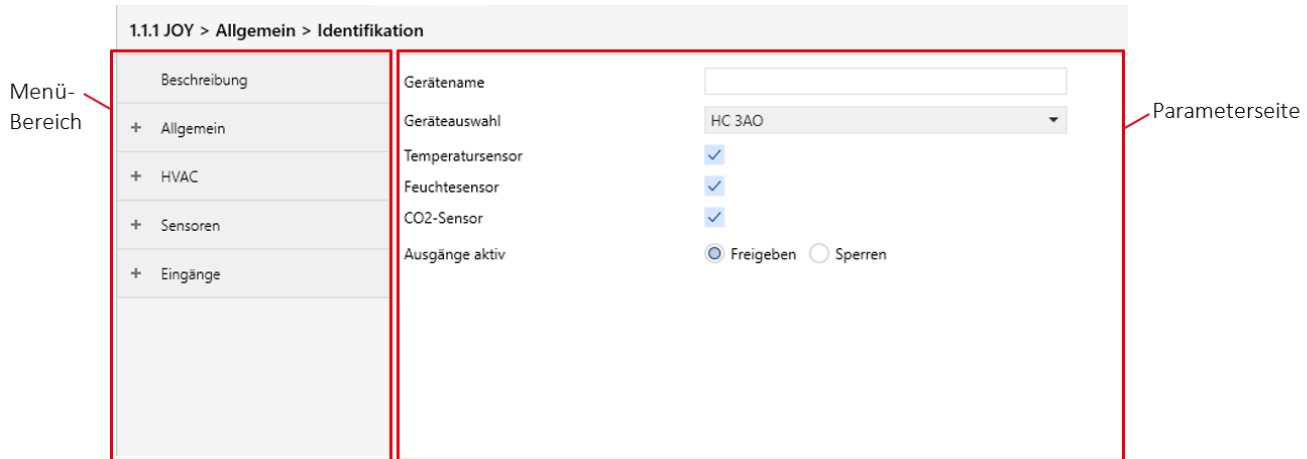
Additional informationen via www.thermokon.de

3.3.2. ETS Application program

The configuration or parameterization is carried out - as is typical for KNX- via ETS. (ETS5.0 or higher)

When parameterizing/configuring the devices, you should always proceed “from top to bottom” in the menu.

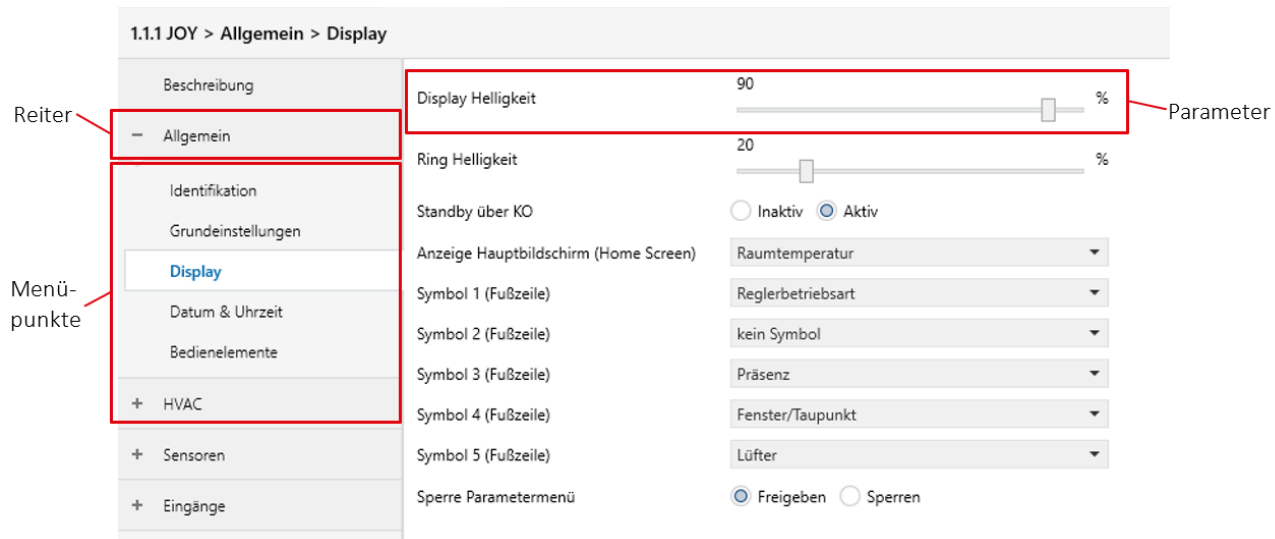
An application program is available for this purpose, which summarizes the device-specific settings in an intuitive user interface. The user interface of the application program is divided into the menu area and the respective parameter pages.



Within the menu area, the individual tabs are divided into corresponding menu items, which open the respective parameter pages by clicking on them. On the parameter pages, the device functions can be set to suit the application and requirements via corresponding parameters (e.g.: General > Display > Display brightness: 100%).

The reference of the respective parameter to the parameter page/menu item and to the tab is shown in this document as follows:

- Tab > Parameter page/menu item > Parameter: Selection (e.g.: General > Date & time > Transfer time via ETS: Active)



Dynamic structure

The application program menu has a dynamic structure. This means that if certain functions are activated, functions, parameters or communication objects dependent on this function are also activated.

Example:

If parameter “General > Display > Font color” is set to “User-defined”, parameter “General > Display > Font color selection” appears in order to be able to transfer the desired font color during programming.

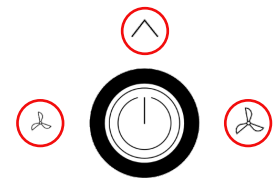
3.4. Parameter menu

The parameter menu contains the basic settings of the device. Configuration is carried out directly on the device.

3.4.1. Access parameter menu

The parameter menu is accessed via the following button combination: center left, up, center right

Manual access to the parameter menu can be blocked via the ETS.

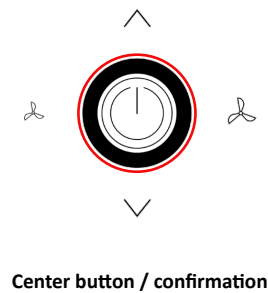
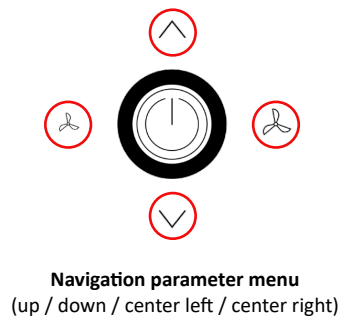


> 3 Sek

Access parameter menu
(Center left, up, center right)

3.4.2. Navigation parameter menu

The parameter menu is navigated using the following buttons:



3.4.3. Description parameter menu

Menu → Time/Date The time and date can be configured in the Time/date menu.

Menü	Zeiteinstellung/Uhrzeit	Zeiteinstellung/Datum
Uhrzeit/Datum ▶	Stunde ◀-/▶ 15	Tag ◀-/▶ 15
Sensor Einstellungen ▶	Minute ◀-/▶ 15	Monat ◀-/▶ 05
Allg. Einstellungen ▶		Jahr ◀-/▶ 25
KNX-Adresse: 1.1.1	Datum ▶	

Menu → Sensor settings In the Sensor settings menu, offset corrections can be made to the connected internal/external sensors, values of the internal/external sensors can be displayed and the CO2 sensor can be calibrated.

Menü	Sensor Einstellungen	Sensor Einstellungen
Uhrzeit/Datum ▶	Offset int. ◀-/▶ 0.6 K	Offset rH ◀-/▶ +0.0%
Sensor Einstellungen ▶	Wert int. 22.1°C	Wert rH +46.8%
Allg. Einstellungen ▶	Offset ext. ◀-/▶ 0.2 K	Kalib. CO2 ◀-/▶ +560ppm
KNX-Adresse: 1.1.1	Wert ext. 22.1°C	ASC CO2 OFF
	CO2/Feuchte ▶	Wert CO2 +643ppm

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.

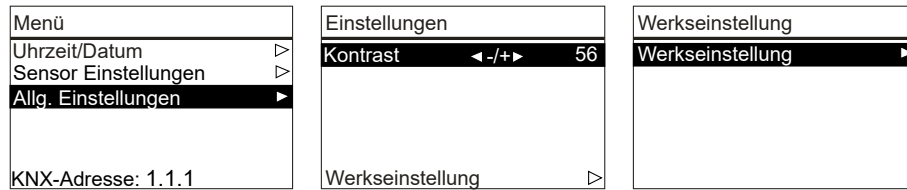
Offset rH A humidity offset can be configured to compensate for constant measured value deviations.

The parameter menu must be exited to accept the configured offset values.
(„Exit parameter menu / Apply configuration“ S.14)

Calib. CO2 A measured value can be entered here which is determined with a reference measuring device close to the appliance.
(siehe „Kalibration CO2 Sensor (Forced)“ S.14)

ASC CO2 Switches the ASC (Automatic Self Calibration) function ON / OFF (factory setting ON)
(siehe „ASC Automatic Self Calibration“ S.14)

Menu → Allg. Einstellungen Configuration of the contrast values, as well as the factory setting option



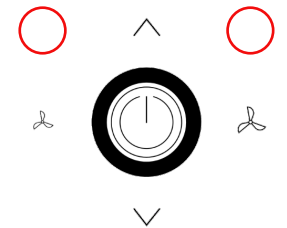
Factory Reset When the factory setting is selected, the room thermostat performs a restart and is reset to the delivery status. (Selection and confirmation)

3.4.4. Forced calibration CO2 Sensor

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 CO2 sensor settings menu.

Attention: CO2 sources (e.g. breathing air) influence the measured value recording!

The ASC function is deactivated during a forced calibration.



CO2 Sensor Calibration
(up left + up right)

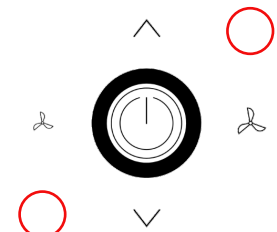
3.4.5. ASC Automatic Self Calibration

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.

3.4.6. CO2 sensor factory reset

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



Sensor factory reset
(up right + down left)

3.4.7. Diagnostics menu

The diagnostics menu displays various information, such as device type, software version, status of the inputs and outputs, controller status (current actuating value) and serial numbers. To access the diagnostics menu, navigate to the header in the start window of the parameter menu and press the central button.

3.4.8. Exit parameter menu / Apply configuration

Mark the header with the “up / down” buttons and press the “center left” button to exit the parameter menu.

The configured values are only applied when you exit the parameter menu.

4. functional description (controller)

4.1. Device functions

4.1.1. Sensors

Sensor measured values can be read out via KNX or shown on the display. A variant-specific configuration corresponding to the hardware version is required via the ETS.

Temperature

By default, the value of the internal temperature sensor is used as the actual value for the internal controller. The universal input can be parameterized as a sensor input for an external sensor (**NTC10K**) and used as an actual value transmitter for the controller. The sensor value of the external sensor is shown in the display as a temperature display.

The measuring range of the sensors is 0...50°C, (resolution: 0.1°). Both sensors can be offset to adjust the measured value.

Humidity

The measuring range of the sensor is 0...100% (resolution 0.1%). The sensor can be offset to adjust the measured value. The value is not processed internally!

CO2

The measuring range of the sensor is 0...2000 ppm, (resolution 10 ppm). It is possible to adjust the measured value for the sensor (for calibration with an external measuring device. The value is not processed internally!

4.1.2. Inputs

The KNX version of the device has 2 inputs. The internal input states are OR-linked with the corresponding Group Objects when configured as window, dew point and presence contact. With change-over configuration, the corresponding group object overrides the internal status!

Room occupancy, change-over and keycard can only be assigned to one input; the other functions can be used on several inputs simultaneously.

Universal Input 1 (low voltage)

Connection of an NTC10K or a potential-free contact

Input 2 (AO2DO=230V, 3AO=low voltage)

Connection of a potential-free contact. ATTENTION 230V! Observe wiring diagram!

Configurable functions:

- **External temperature sensor**
NTC10K connection option for recording and using temperature values away from the devicev
- **Change over sensor / DI**
In a 2-pipe system, the heating or cooling mode is specified for the controller via a change-over contact. The change-over function is activated via the configuration of a digital input or specified via a group object.
An input activated as a change-over contact deactivates the specification via KNX.
If the input is configured as a normally open contact, heating mode is enabled when the input is open and cooling mode is enabled when the input is closed. If a change-over sensor is selected, cooling mode <22° is enabled and heating mode is enabled from a temperature of >25°C.
Attention: When using the change-over function, the heating (terminal 5) and cooling (terminal 4) outputs are controlled in parallel.
- **Window**
If the window contact is active (window open = energy block active), the setpoints for heating and cooling are automatically set to frost protection or heat protection. The fan switches to automatic mode and returns to the previous state after leaving the energy block. The window contact/energy lock function is activated via the configuration of the digital input or via Group object. The last changed value determines the status. When the function is activated, the window symbol is automatically displayed in the "Window open" state if the symbol has been assigned a position in the footer and the heating and cooling controllers regulate to the frost protection or heat protection setpoint value.
- **Presence**
When using the presence function, a distinction is made between the comfort and standby room operating modes. In standby, the setpoint is lowered (heating) or raised (cooling) by the setpoint shift standby parameter. Comfort corresponds to normal operation of the controller.
- **Dewpoint**
An active dew point contact blocks the cooling controller. When the dew point is active, the dew point symbol is automatically displayed if the symbol has been assigned a position in the footer.
- **Keycard Switch**
Without a card in the keycard switch, operation of the buttons is disabled, the display is switched off and the controller regulates to the setpoints of the "Standby" state (decrease setpoint heating by parameter setpoint shift standby and increase setpoint cooling by configured value). If the keycard is not inserted, the device can be switched on and comfort mode activated using the "Central button".
- **Alert message**
An alarm symbol can be displayed in the header. (see „Header“ S.8)

4.1.3. Outputs

The outputs are assigned fixed functions. Depending on the device type, these can be manually overridden in different ways. For example, the digital outputs can only be manually overridden in conjunction with the controller mode or the fan speed. The analog outputs can be used freely.

Configuration of the outputs (Relay: 5DO-, EC/HC AO2DO variant | Analogue Output: EC 3AO-, HC 3AO variant)

For the two relay / analog outputs (heating / cooling), the direction of action can be changed for adaptation to the existing actuator (normally closed or normally open).

6 Way valve application (HC AO2DO-, HC 3AO-, EC 3AO variant)

In addition to various 6-way valve types, you can select whether the control value of the heating or cooling controller is also output on the 6-way valve output as a continuous 0-10V signal in parallel with the heating or cooling output. If 0: 0-10V continuous heating and cooling signal is selected, the 6-way valve output runs as a 0-10V signal in both cases!

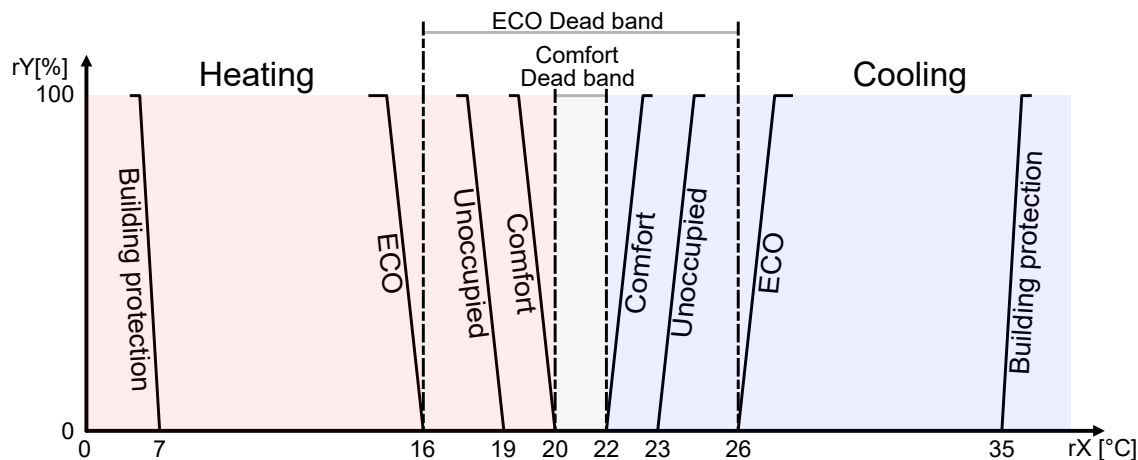
If a 6-way valve type is selected for the EC-3AO variant, both the heating and cooling outputs simultaneously output the signal converted to the configured 6-way valve type!

Controller override

The control functions can be decoupled from the internal controller and overridden and specified externally via communication objects.

4.2. Regelung

The JOY has a PI or two-point controller for heating and cooling. The control variable is output via the relays/outputs. The controller starts after a cold start (voltage on) of the device with a 30-second delay.



4.2.1. PI-controller

The time response of the PI controller is determined by the parameters X_p and T_n . Due to the proportional component, the control value reacts immediately to any control difference, while the integral component only takes effect over time. The resulting control value is output as a pulse-width modulated signal, as a continuous signal (3AO) or as an analog signal adapted to the corresponding 6-way valve type.

Proportional band X_p heating/cooling

The proportional range specifies the deviation at which the controller outputs the maximum control value (100%). A small X_p leads to a stronger control intervention of the proportional component with small deviations, but increases the oscillation tendency of the control loop.

Adjustment time T_n heating/cooling

The time that elapses until the I component generates the same control amplitude as is generated immediately as a result of the P component. To increase the integral component of the controller, the reset time must be reduced.

Cycle time

The cycle time when using the PI controller with digital valve switching outputs. The switch-on/switch-off time of the outputs is calculated as a function of the control value.

Example: PWM time=30min, control value $y=50\%$ → $T_{on}=15\text{min}$, $T_{off}=15\text{min}$

4.2.2. Two-point controller

If the heating setpoint minus half the hysteresis is undershot, the controller switches the heating output on and if the heating setpoint plus hysteresis threshold is exceeded, it switches it off. It behaves accordingly in cooling mode.

Hysteresis

Determines the switch-on/switch-off behavior of the two-point controller. The heating controller switches on when the actual value falls below the heating setpoint minus half the hysteresis and heats until the actual value has exceeded the heating setpoint plus half the hysteresis. The hysteresis prevents the actuator from “flickering” when the actual value is within the setpoint range.

4.2.3. Valve protection function

A valve protection function is implemented to ensure that the valves remain functional even if they are not used for a longer period of time. Valve protection is only started if the corresponding valve (heating or cooling) has not been activated for more than 96 hours.

The time is set to Friday 5:00h (heating valve) or 5:30h (cooling valve). The respective valve is then switched on for 5 minutes. The valve protection function can be deactivated.

4.3. Operating modes

The operating modes are switched via communication objects (KO), operating procedures, inputs or internal functions and are divided into two groups:

Room operating modes: Comfort (occupied) | Standby (unoccupied) | ECO | Building Protection (frost protection/heat protection)

Device operating modes: Sleep mode | Keycard mode

4.3.1. Room operating mode Comfort (occupied)

In comfort or normal mode, the controller works with the heating and cooling setpoint calculated from the basic setpoint GO71 and the (manual) setpoint set by the user on the device. The device is fully operational, the display and buttons can be used depending on the configuration

The comfort room operating mode can be specified via **GO51** (*room operating mode default HVAC mode*) or **GO53** (*room operating mode default switchover presence/standby*).

4.3.2. Room operating mode Standby (unoccupied)

In standby room operating mode, the controller works with the heating and cooling setpoint calculated from the basic setpoint GO71 and the setpoint configured for the setpoint increase/decrease. The respective setpoints for the "Standby" room operating mode can be configured via the ETS in the configuration parameter Controller setting "Heating" > Setpoint reduction "Standby" (heating) or Controller setting cooling > Setpoint increase "Standby" (cooling). The device is ready for operation, the display is switched on and the device switches to the "Comfort" room operating mode when the buttons are pressed.

The room operating mode standby can be specified via **GO51** (*room operating mode default HVAC mode*) or **GO53** (*room operating mode default switchover presence/standby*).

4.3.3. Room operating mode ECO

In ECO room operating mode, the controller works with the heating and cooling setpoint calculated from the basic setpoint **GO71** and the setpoint configured for the setpoint increase/decrease. The respective setpoints for the "ECO" room operating mode can be configured via the ETS in the configuration parameter Controller setting "Heating" > Setpoint reduction "ECO" (heating) or Controller setting cooling > Setpoint increase "ECO" (cooling). The device is ready for operation, the display is switched on and the device switches to "Comfort" operating mode when the buttons are pressed.

If ECO mode is active, the ECO symbol is shown in the header of the main screen. („Screen“ S.7)

The ECO mode can be preset via **GO51** (*room operating mode default HVAC mode*) or **GO55** (*room operating mode default ECO mode*). Alternatively, ECO mode can be activated/deactivated using the configured middle button! The last changed default setting determines the status.

Special feature GO55

If ECO mode is active via **GO55**, the value of the setpoint offset is not taken into account if the presence function is not used at the same time. If the presence function is used in parallel, it is possible to configure whether the OCCUPIED state overrides an active ECO mode (overtime function). If presence mode is used, the behavior of the setpoint set depends on the communication object.

4.3.4. Room operating mode Building Protection (frost/heating protection)

When the Building Protection room operating mode is active, the controller works with internal values to perform a frost protection / heat protection function. If the temperature falls below (frost protection) or exceeds (heat protection) the previously configured temperature limit values (HVAC > Controller general), the configured outputs are activated to prevent a further reduction (frost protection) or increase (heat protection) of the temperature.

If the Building Protection room operating mode is active, the display is switched on and the corresponding symbol is shown in the header of the main screen. („Screen“ S.7).

The Building Protection room operating mode can be specified via **GO51** (*default HVAC mode room operating mode*) or **GO57** (*default frost/heat protection room operating mode*).

4.3.5. Device operating mode Sleep mode

When the device operating mode Sleep mode is active, the controller works with internal values to perform a frost protection / heat protection function. The control function corresponds to the Building Protection room operating mode.

If the device operating mode Sleep mode is active, the display is switched off and the buttons, with the exception of the ENTER button, are locked.

The device operating mode Sleep mode can be specified via **GO12** (*Display default status device ON/OFF*). Alternatively, the sleep mode can be activated/deactivated by a long press on the middle button! The last changed setting determines the status.

The device can only be switched off manually if no keycard function is used.

4.3.6. Device operating mode Keycard mode

When keycard mode is activated, the appliance operates in comfort (occupied) or standby (unoccupied) mode. In contrast to the room operating mode Standby, the display is switched off in the device operating mode Keycard mode.

The device operating mode Keycard mode can be activated via a configured input („Inputs“ S.15). If the keycard is not inserted, the device can be switched on with the "Central button" and the Comfort room operating mode can be activated.

5. ETS- Configuration parameter

The following parameters are shown/hidden depending on the version and configuration.

5.1. Configuration parameter „General“

PARAMETERPAGE	PARAMETER	DESCRIPTION
Identification	Device name	Maximum 24 ASCII characters.
	Device type	Device type selection: <ul style="list-style-type: none"> - FC 5DO - FC EC AO2DO - FC EC 3AO - HC AO2DO - HC 3AO
	Temperature sensor	
	Humidity sensor	
	CO2 Sensor	Selection of activated sensor parameter pages under the “Sensors” tab, as well as function-specific parameters.
	Outputs active	Lock / unlock active outputs
Basic settings	Display language	Sets the display language.
	Send „in operation“	Activates Group object 1. The operating status is output via the object in the parameterized cycle.
	Reset via GO	Activates Group object 10.
	Device state after reset	Sets the device state after reset (idle state / last state / on)
	Values after reset	Sets which values are to be used after a reset. (keep last values / reset values)
	Send warnings, notices, alerts	Sets the interval for sent warnings/messages/states
Display	Display brightness	Sets the display brightness
	Ring brightness	Sets the ring brightness
	Standby via GO	Sets whether the standby mode can be activated via group object
	Home Screen	Sets the display on the main screen: <ul style="list-style-type: none"> - Room temperature - Setpoint absolute - Setpoint offset - Fan stage - Setpoint offset integer - Setpoint offset without unit - Setpoint offset Kelvin
	Symbol 1 (footer)	Sets the symbols for the footer: <ul style="list-style-type: none"> - no symbol - Controller operating mode - Presence - Window / dewpoint - Fan
	Symbol 2-5 (footer)	See symbol 1
	Lock parameter menu	Lock / unlock parameter menu
Date & time	Show time	Activates the display of the clock and sets the display format.
	Show date	Activates the display of the date and sets the display format.
	Synchronize date & time	Activates Group objects 12 & 13.
Keys	Function center key (ON/OFF)	Sets the function of the middle button (ON/OFF): <ul style="list-style-type: none"> - No special function - Toggle presence - Occupied - Unoccupied - Toggle ECO Mode - Key locked
	Function upper left key	Sets the button function: <ul style="list-style-type: none"> - Light 1 toggle - Light 2 toggle - Light 3 toggle - Light 1 On - Light 1 Off - Light 2 On - Light 2 Off - Light 3 On - Light 3 Off - Light 1 Dimm Up - Light 1 Dimm Down - Light 2 Dimm Up - Light 2 Dimm Down - Light 3 Dimm Up - Light 3 Dimm Down - Light 1 On/Dimm Up - Light 1 Off/Dimm Down - Light 2 On/Dimm Up - Light 2 Off/Dimm Down - Light 3 On/Dimm Up - Light 3 Off/Dimm Down - Blind 1 Up - Blind 1 Down - Blind 2 Up - Blind 2 Down - Blind 3 Up - Blind 3 Down - Controller mode toggle - Controller mode Heating/Cooling/Auto - Controller mode Heating/Cooling/Auto/Off - Controller mode Heating - Controller mode Cooling
	Function upper right key	See function upper left key
	Function lower left key	See function upper left key
	Function lower right key	See function upper left key

5.2. Configuration parameter „HVAC“

PARAMETERPAGE	PARAMETER	DESCRIPTION
HVAC general	Output HVAC Mode	Sets the room operation mode output.
	HVAC mode after reset	Sets the room operating mode after a reset until the first communication with the building control system (<i>last value / ECO / Comfort / Standby</i>)
	Override ECO mode	Keep ECO / overwrite ECO
Setpoint	Setpoint format	Sets the setpoint format. (<i>setpoint offset / setpoint absolute / setpoint offset integer / setpoint offset unitless / setpoint offset Kelvin</i>)
	Setpoint increment	Sets the increment of the set value. (<i>0,1 K / 0,5 K / 1 K</i>)
	Base setpoint	Sets the base setpoint.
	Setpoint range	Sets the setpoint range.
	Offset behaviour at change of presence	Sets the offset behaviour regarding the setpoint offset during occupation change - Keep value - Reset value - Reset value (unoccupied) / keep setpoint (occupied)
	Send setpoint	Sets the setpoint transmission behavior. (<i>Change of Value / cyclic / Change of Value & cyclic</i>)
	Heartbeat Setpoint	Sets the setpoint heartbeat
	Change of Value greater	Sets the required size for a change of value.
	Controller mode	Sets the controller mode (<i>Heating mode / Cooling mode / heating/cooling mode (2 pipe) / Auto (4 pipe)</i>)
Controller general	Deadband Base setpoint	Sets the deadband around the base setpoint
	Show controller mode	Activates / Deactivates the display of the controller mode
	Valve protection	Activates / Deactivates the valve protection function
	Frost protection	Sets the temperature limit for the frost protection function.
	Overheat protection	Sets the temperature limit for the heat protection function. See illustration:
	Minimum controller value behavior	Active / Inactive
	Send controller mode	Sets the controller mode transmission behavior. (<i>Change of Value / cyclic / Change of Value & cyclic</i>)
	Heartbeat controller mode	Sets the transmission cycle for the operating mode.
	6-way valve	Sets the 6-way valve - Inactive - 2-10V (e.g. Belimo) - 2-10V inverted (e.g. Belimo) - 0-10V DN15 (e.g. Sauter) - 0-10V DN15 inverted (e.g. Sauter) - 0-10V DN20 (e.g. Sauter) - 0-10V DN20 inverted (e.g. Sauter) - 0-10V constant signal heating - 0-10V constant signal cooling - 10-0V constant signal heating - 10-0V constant signal cooling - User defined 6 way valve
	Heating 100% (generic 6 way valve)	
	Heating 0% (generic 6 way valve)	
	Cooling 100% (generic 6 way valve)	
	Cooling 0% (generic 6 way valve)	
	Send controller value	
	Change of value greater	Sets the required size for a value change.
Heartbeat controller value		
Controller settings „heating“	Setpoint lowering „Standby“ (Heating)	Sets the value for lowering the setpoint in “Standby”.
	Setpoint lowering „ECO“ (Heating)	Sets the value for lowering the setpoint in “ECO”.
	Controller characteristic	Sets the controller characteristic of the device. (<i>PI / 2 point</i>)
	Hysteresis (Heating)	
	Cycle time	Sets the cycle time
	Analog output direction “Heating“	Normally open / normally closed
PI controller parameter (Xp/Tn)	<ul style="list-style-type: none"> - Radiator (5K/120min) - Floor heating (4K/100min) - Electric heater(4K/100min) - Fan coil(4K/90min) - Split unit(4K/90min) - User defined 	

	Xp (user defined)	
	Tn (user defined)	
	Digital output direction "Heating"	
	Analogue output direction "Heating"	
	Minimum controller value „Heating“	
	Maximum controller value „Heating“	
	Send controller value	Sets the actuating variable transmission behavior. (Change of Value / cyclic / Change of Value & cyclic)
	Change of value greater	
	Heartbeat controller value	
Controller settings „cooling“	Setpoint increase „Standby“ (Cooling)	Sets the value for increasing the setpoint in “Standby”
	Setpoint increase „ECO“ (Cooling)	Sets the value for increasing the setpoint in “ECO”.
	Controller characteristic	Defines the control characteristic of the device. (PI / 2 point)
	Cycle time	Sets the cycle time
	PI controller parameter (Xp/Tn)	<ul style="list-style-type: none"> - Chilled ceiling (5K/240min) - Fan coil (4K/90min) - Split unit (4K/90min) - User defined
	Xp (user defined)	
	Tn (user defined)	
	Digital output direction „Cooling“	Normally open / normally closed
	Minimum controller value „Cooling“	
	Maximum controller value „Cooling“	
	Send controller value	Sets the control variable transmission behavior (Change of Value / cyclic / Change of Value & cyclic)
	Change of value greater	
Heartbeat controller value		
Fan	Fan stages	FC-Variant: Value 1-3 HC-Variant: Value 1-5
	Fan assignment	Heating / Cooling / Heating & Cooling
	Threshold Fan stage 1	
	Threshold Fan stage 2	
	Threshold Fan stage 3	
	Threshold maximum fan stage (100%)	
	Fan stage "AUTO"	<ul style="list-style-type: none"> - without AUTO - with AUTO - with AUTO, without manual OFF - without AUTO, without manual OFF
	Fan minimum	
	Fan stage minimal	
	Fan maximum	
	Fan start at controller value	
	Start up time fan	
	Follow up time fan	
	Fan stage limit "AUTO"	
	Output active fan stage	<ul style="list-style-type: none"> - 1 bit GO - 1 byte percent GO - 1 byte integer GO
	Send controller value	Sets the controller transmission behavior. - (Change of value/ cyclical / change of value & cyclical)
	Change of value greater	
Heartbeat controller value		

5.3. Configuration parameter „Sensors“

PARAMETERPAGE	PARAMETER	DESCRIPTION
Internal temperature sensor	Description	Is displayed in the respective channel. Maximum 12 ASCII characters.
	Offset	Sets the specific offset (sensor correction value).
	Send value	Determines whether the measured value is to be displayed with a specific value change, cyclically, or both.
	Change of Value greater	Sets the required value change until the measured value is transferred.
	Heartbeat value	
External temperature sensor	See temperature	
Humidity sensor	Description	Is displayed in the respective channel. Maximum 12 ASCII characters.
	Offset	Sets the specific offset (sensor correction value).
	Show humidity	Activates / deactivates the display of measured humidity values on the main screen
	Send value	Defines when the measured value is to be transferred. (<i>Change of Value / cyclic / Change of Value & cyclic</i>)
	Change of Value greater	Sets the required value change until the measured value is transferred.
CO2 Sensor	Description	Is displayed in the respective channel. Maximum 12 ASCII characters.
	Threshold CO2-alarm	Sets the threshold value for a CO2-alarm.
	Elevation above sea level	Sets the height above sea level of the device location
	Show CO2	Activates / deactivates the display of measured CO2 values on the main screen
	Send value	Defines when the measured value is to be transferred. (<i>Change of Value / cyclic / Change of Value & cyclic</i>)
	Change of Value greater	Sets the required value change until the measured value is transferred.
	Heartbeat value	

5.4. Configuration parameter „Inputs“

PARAMETERPAGE	PARAMETER	DESCRIPTION
Universal input 1	Type of input	Defines the type of input. <ul style="list-style-type: none"> - Inactive - External temperature sensor - Change over sensor - Change-over DI - Window - Presence - Dew point - Keycard Switch - Alert
	Input direction	Set the direction of the input (<i>normally open / normally closed</i>)
	Send state of input (DI)	Defines when the state of the input is to be transferred. (<i>Change of Value / cyclic / Change of Value & cyclic</i>)
	Heartbeat state of input	
Input 2 (230V)	Type of input	Defines the type of input. <ul style="list-style-type: none"> - Inactive - Change-Over-DI - Window - Presence - Dew point - Keycard Switch - Alarm message
	Input direction	Sets the direction of the input. (<i>normally open / normally closed</i>)
	Send state of input (DI)	Defines when the state of the input is to be transferred. (<i>Change of Value / cvcllc / Chanae of Value & cvcllc</i>)

6. Group objects

The group object structure of all Joy KNX devices is uniform. Depending on the version and configuration, certain group objects are hidden or not available. In the following the group objects are structured according to their function and described accordingly.

6.1. Flags

The communication behavior of the individual objects is determined by the so-called flags.

FLAG	DESCRIPTION
C-flag	Activate / deactivate communication of objects.
R-flag	Object reacts to a GroupValueRead telegram from the bus and sends a GroupValueResponse telegram to the bus. (set flag)
W-flag	Object reacts to a GroupValueWrite telegram coming from the bus and overwrites the previous object value. (set flag)
T-flag	Object outputs each updated value: it sends a GroupValueWrite telegram to the bus. (set flag)
U-flag	The device will respond to a GroupValueResponse telegram coming from the bus for this object, so it overwrites the object value. For a switching actuator, for example, this means that a relay representing this object is opened or closed. (set flag)
I-Flag	Object sends a Group Value Read telegram after resetting the device to request the object value via a GroupValueResponse. The reason for resetting the device could be a power failure, a reset of the bus or an explicit request for resetting the device via a telegram. (set flag)

6.2. Group object description

The description contains the identification (ID), the name and the object function, the data point type, the effective direction (IN = receive / OUT = send), the validity for the respective device type (FC 5DO, FC EC AO2DO, HC AO2DO, FC EC 3AO), a description of the function, as well as the so-called parameter-specific dependencies.

6.2.1. Group Objects „Operation state“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
1	Operation state	Send in Operation	1.001	OUT	Object value = 1 cyclical, if the device is functioning correctly.	General > Basic settings > send „in operation“ (interval chosen)

6.2.2. Group Objects „Display“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
10	Display	Enforced Software Reset	1.003	IN	Object value = 1: Software reset in Device (Display). GO is reset after execution.	General > Basic settings > Reset via GO: Active
11	Display	Device state	1.001	OUT	ON / OFF = Idle state	
12	Display	Input device state	1.001	IN	Object value = 1: Device ON, Object value = 0: Device OFF (Standby) (Building protection active)	General > Display > Standby via GO: Active
13	Display	HMI lock	1.003	IN	Object value = 1: HMI locked, no interaction possible	
14	Display	HMI lock fan control	1.001	IN	Object value = 1: Fan stage adjustment locked	

6.2.3. Group Objects „Alert & Messages“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
15	Alert & Messages	Alert	1.001	OUT	Object value = 1: Warning symbol active. background lighting flashing	
16	Alert & Messages	Input alert	1.002	IN	Object value = 1: Warning symbol and background lighting flashing is activated.	
17	Alert & Messages	Frost alert	1.002	OUT	Active when temperature falls below set temperature	
18	Alert & Messages	Overheat alert	1.002	OUT	Active when temperature exceeds set temperature	
19	Alert & Messages	CO2 value passed	1.002	OUT	Active when set CO2 Value exceeds set value	

6.2.4. Group Objects „Date & Time“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
20	Time	Time synchronization	10.001	IN	Time synchronized via GO.	General > Date & time > Synchronise date and time: Active
21	Date	Date synchronization	11.001	IN	Date synchronized via GO.	

6.2.5. Group Objects „Light“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
30	Light 1	Switch	1.001	OUT	Object value = Status of the operating element (button) set on the device	
31	Light 1	State Switch	1.001	IN	Object value = Status change of the operating element (push-button)	
32	Light 1	Dimming relative	3.007	OUT	Object value = Dimming value of the control element set on the device	
33	Light 2	Switch	1.001	OUT	See light 1 Switch	
34	Light 2	State Switch	1.001	IN	See light 1 State Switch	
35	Light 2	Dimming relative	3.007	OUT	See light 1 Dimming relative	
36	Light 3	Switch	1.001	OUT	See light 1 Switch	
37	Light 3	State Switch	1.001	IN	See light 1 State Switch	
38	Light 3	Dimming relative	3.007	OUT	See light 1 Dimming relative	

6.2.6. Group Objects „Blind“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
39	Blind 1	Up / down (long press)	1.008	OUT	Object value = Status according to actuation of the operating elements (buttons)	
40	Blind 1	Lamella / stop (short press)	1.009	OUT		
41	Blind 1	Up / Down (relative)	3.008	OUT		
42	Blind 2	Up / down (long press)	1.008	OUT		
43	Blind 2	Lamella / stop (short press)	1.009	OUT		
44	Blind 2	Up / Down (relative)	3.008	OUT		
45	Blind 3	Up / down (long press)	1.008	OUT		
46	Blind 3	Lamella / stop (short press)	1.009	OUT		
47	Blind 3	Up / Down (relative)	3.008	OUT		

6.2.7. Group Objects „HVAC“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
50	Room operation mode	HVAC-Mode	20.102	OUT	Object value = Active room operating mode. 1: Comfort 2: Standby 3: ECO 4: Building Protection	<i>HVAC > HVAC general > Output HVAC-mode:</i> 1 Byte-GO / both
51	Room operation mode	Input HVAC-Mode	20.102	IN	Object value = sets room operating mode 1: Comfort 2: Standby 3: ECO 4: Building Protection	
52	Room operation mode	Presence/Standby	1.011	OUT	Object value = 1: Symbol is shown on the display, Function is active	<i>HVAC > HVAC general > Output HVAC-mode:</i> 1 Bit-GO / both
53	Room operation mode	Input Presence/Standby	1.011	IN	Object value = 1: Symbol is activated on the display, Room operating mode is set	
54	Room operation mode	Output ECO-Mode	1.011	OUT	Object value = 1: Symbol is shown on the display, Function is active	
55	Room operation mode	Input ECO-Mode	1.011	IN	Object value = 1: Symbol is activated on the display, Room operating mode is set	
56	Room operation mode	Building protection	1.011	OUT	Object value = 1: Symbol is shown on the display, Function is active	
57	Room operation mode	Input Building protection	1.011	IN	Object value = 1: Symbol is activated on the display, Room operating mode is set	
58	Energylock	Condensation	1.011	OUT	Object value = 1: Symbol is shown on the display, controller operating: Additional cooling controller locked	
59	Energylock	Input Condensation	1.011	IN	Object value = 1: Symbol is activated on the display, Controller operating: cooling controller lock is set	
60	Energylock	Output Window switch	1.019	OUT	Object value = 1: Symbol is shown on the display, Controller operating: Additional Energy lock active	
61	Energylock	Input Window switch	1.019	IN	Object value = 1: Symbol is activated on the display, Controller operating: Energy lock is set	
70	Setpoint	Output setpoint (absolute)	9.001	OUT	Object value = (absolute) Setpoint of the device (e.g.: 23°C)	
71	Setpoint	Output setpoint (relative)	9.002	OUT	Object value = (relative) Setpoint of the device (Setpoint shift to the base setpoint e.g.: +2K)	
72	Setpoint	Input setpoint (absolute)	9.001	IN	Object value = absolute setpoint (e.g.: 23°C)	
73	Setpoint	Input setpoint (relative)	9.002	IN	Object value = Setpoint relative (Setpoint shift to base setpoint e.g.: +2K)	
74	Setpoint	Input base setpoint	9.001	IN	Object value = base setpoint	

6.2.8. Group Objects „Fan control“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
80	Fan control	Fan stage [%]	5.001	OUT	Object value = Fan stage Percentage value scaled to the parameterized number of fan stages (2 fan stages: LS0 = 0%, LS1 = 50%, LS2 = 100%)	<i>General > Identification > Device type: FC 5DO / FC EC AO2DO / FC 3AO HVAC > Fan > Output active fan stage: 1 Byte percent GO</i>
81	Fan control	Input fan stage [%]	5.001	IN	Object value = sets the fan stage percentage value scaled to the parameterized number of fan stages (2 fan stages: LS0 = 0%, LS1 = 50%, LS2 = 100%)	
82	Fan control	Fan stage integer	5.100	OUT	Object value = integer value of the active fan stage (2 LS: LS0 = 0, LS1 = 1, LS2 = 2)	<i>HVAC > Fan > Output active fan stage: 1 Byte integer GO</i>
83	Fan control	Input fan stage integer	5.100	IN	Object value = sets the value of the active fan stage (2 LS: LS0 = 0, LS1 = 1, LS2 = 2)	
84	Fan control	Fan stage 1 active	1.001	OUT	3 stage type only	<i>HVAC > Fan > Output active fan stage: 1 Bit GO</i>
85	Fan control	Fan stage 2 active	1.001	OUT	3 stage type only	
86	Fan control	Fan stage 3 active	1.001	OUT	3 stage type only	
87	Fan control	Fan stage 4 active	1.001	OUT	5 stage type only	
88	Fan control	Fan stage 5 active	1.001	OUT	5 stage type only	
89	Fan control	Fan stage auto active	1.001	OUT	5 stage type only	
90	Fan control	Input fan stage auto active	1.001	OUT	5 stage type only	
91	Fan control	Input fan stage integer	1.001	OUT	5 stage type only	
92	Fan control	Fan stage 1 active	1.001	OUT	Object value = 1, if fan stage active, 0, if fan stage not active	
93	Fan control	Fan stage 2 active	1.001	IN	Object value = 1, to set fan stage active, 0, to set fan stage not active	

6.2.9. Group Objects „Controller output“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
100	Controller mode	Heating/cooling	1.100	OUT	Object value = 1: heating mode active	
101	Controller mode	Change over input	1.100	IN	Object value = 1: heating mode is activated	
102	Output 6 way valve	Output value PI	5.001	OUT		<i>HVAC > Regler general > Output 6 way valve: 6 way valve</i>
110	Controller output heating	Controller value heating	5.001	OUT	Object value shows the controller heating variable	
111	Controller output heating	Output value 2 point/PWM	1.001	OUT	Object value shows the controller heating variable	<i>General > Identification > Device selection: FC 5DO / FC EC AO2DO / HC AO2DO</i>
112	Controller output heating	Input value	5.001	OUT		<i>General > Identification > Device selection: FC 3AO / 3AO</i>
113	Controller output heating	Input value continuous	1.015	IN	Object value sets the controller automatic mode	
114	Controller output heating	Output active	5.001	IN	Object value sets the controller variable	
115	Controller output heating	Output value cooling	1.001	OUT		
120	Controller output cooling	Output value 2 point/PWM	5.001	OUT		

121	Controller output cooling	Input value	1.001	OUT		
122	Controller output cooling	Input value continuous	5.001	OUT		
123	Controller output cooling	Output active	1.015	IN		
124	Controller output cooling	Heating/cooling	5.001	IN		
125	Controller output cooling	Change over input	1.001	OUT		

6.2.10. Group Objects „Sensors“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
130	Sensors	Temperature	9.001	OUT	Object value = Sensor value	General > Identification > Temperature sensor: Active
140	External Temperature sensor	Temperature	9.001	OUT	Object value = Sensor value	General > Identification > Temperature sensor: Active
141	Temperature	Overwrite internal temperature value	9.001	IN	Object value = Sensor value	General > Identification > Temperature sensor: Active
150	Humidity	Relative humidity	9.007	OUT	Object value = Sensor value	General > Identification > humidity sensor: Active
160	CO2	CO2	9.008	OUT	Object value = Sensor value	General > Identification > CO2 sensor: Active

6.2.11. Group Objects „Inputs“

NR.	NAME	OBJECT FUNCTION	DPT	IN / OUT	DESCRIPTION	DEPENDENCIES
170	Digital input	State digital input 1	1.011	OUT	Object value = Input state	Inputs > Universal input 1 > type of input: External temperature sensor / Change over DI / Window / Presence / Dewpoint / Key card / Alert
180	Digital input	State digital input 2	1.011	OUT	Object value = Input state	Input > Input 2 (230V) > type of input: Change over DI / Window / Presence / Dewpoint / Key card / Alert

7. KNX Specification

The Joy KNX devcies have been developed in accordance with the current KNX specification v2.1.

Further information can be found at:

<https://my.knx.org/>

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