ABB i-bus® KNX
Fan Coil Actuator FCA/S 1.1M
Product Manual
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1 General

Fans, also referred to as blower convectors or Fan Coil units, are used for distributed HEATING and COOLING applications. They are installed in a room and powered via a central heating and cooling system. The room temperature can be quickly adjusted to suit individual preferences using this system.

The Fan Coil Actuator FCA/S 1.1M has two outputs for control of motor power operated or thermal heating and cooling valves. Fan Coil Actuators switch multi-level fans with up to three fan speeds using floating contacts. Furthermore, two binary inputs, e.g. for monitoring of a window contact and the dew point are available. An additional contact is possible, for example, for control of an electric heater.

1.1 Using the product manual

This manual provides you with detailed technical information relating to the function, installation and programming of the ABB i-bus® KNX Fan Coil Actuator. The application of the device is explained using examples.

This manual is divided into the following sections:

Chapter 1 General
Chapter 2 Device technology
Chapter 3 Commissioning
Chapter 4 Planning and application
Chapter A Appendix
1.1.1 Note

Notes and safety instructions are represented as follows in this manual:

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<tr>
<th>Note</th>
<th>Tips for usage and operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples</td>
<td>Application examples, installation examples, programming examples</td>
</tr>
</tbody>
</table>

| Important                 | These safety instructions are used as soon as there is danger of a malfunction without risk of damage or injury. |

| Caution                   | These safety instructions are used as soon as there is danger of a malfunction without risk of damage or injury. |

| Danger                    | These safety instructions are used if there is a danger for life and limb with inappropriate use. |

| Danger                    | These safety instructions are used if there is a danger to life with inappropriate use. |
1.2 **Product and functional overview**

The Fan Coil Actuator FCA/S controls a single-phase fan with up to three fan speeds via a step or changeover control. This ensures that no two fan speeds can be switched on simultaneously. An additional programmable switch-over delay is provided for this purpose. Three-phase drives are not supported. The additional output can be used for control of an electrical load. Manual operation of the device is possible.

The FCA/S controls motor-power operated heating and cooling valves as well as multilevel fans via the ABB i-bus®.

Two binary inputs are available, for example, as signalling contacts for window contact and dew point monitoring. The scanning voltage for the binary inputs is provided by the device.

The actuator is a modular installation device with a module width of 4 space units in Pro M design for installation in the distribution board. The connection to the ABB i-bus® is established using the front side bus connection terminal. The Fan Coil Actuator does not require an auxiliary voltage supply. The assignment of the physical addresses as well as the parameterization is carried out with Engineering Tool Software ETS.

1.2.1 **Product overview**

<table>
<thead>
<tr>
<th>Inputs</th>
<th>FCA/S 1.1M</th>
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<tr>
<td>Binary via contact scanning</td>
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</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th>FCA/S 1.1M</th>
</tr>
</thead>
<tbody>
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<td>Switching contact 16 A (10 AX)</td>
<td>1</td>
</tr>
<tr>
<td>Switching contact 6 A</td>
<td>3</td>
</tr>
<tr>
<td>Electronic 0.5 A</td>
<td>4</td>
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</table>

1.2.2 **Functional overview**

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Window contact</td>
<td>1</td>
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<tr>
<td>Drip tray</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th>FCA/S 1.1M</th>
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</thead>
<tbody>
<tr>
<td>Outputs 16 A (10 AX) switch</td>
<td>1</td>
</tr>
<tr>
<td>Auxiliary electrical heater</td>
<td>1</td>
</tr>
<tr>
<td>Outputs 6 A switches</td>
<td>3</td>
</tr>
<tr>
<td>Three speed fan</td>
<td>3</td>
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</table>

<table>
<thead>
<tr>
<th>Outputs 0.5 A switches</th>
<th>FCA/S 1.1M</th>
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</thead>
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<tr>
<td>Valve COOLING</td>
<td>2</td>
</tr>
</tbody>
</table>
2 Device Technology

The Fan Coil Actuator FCA/S 1.1M is a modular installation device (MDRC) in Pro M Design. It is intended for installation in the distribution board on 35 mm mounting rails. The assignment of the physical addresses as well as the parameterization is carried out with ETS.

The device is powered via the ABB i-bus® and does not require an additional auxiliary voltage supply. The FCA/S 1.1M is operational after connection of the bus voltage.

2.1 Technical data

<table>
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<th>Supply</th>
<th>Bus voltage</th>
<th>21...32 V DC</th>
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<td></td>
<td>Current consumption, bus</td>
<td>&lt; 12 mA</td>
</tr>
<tr>
<td></td>
<td>Leakage loss, bus</td>
<td>Maximum 250 mW</td>
</tr>
<tr>
<td></td>
<td>Leakage loss, device</td>
<td>Maximum 2.85 W*</td>
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</table>

*The maximum power consumption of the device results from the following specifications:

<table>
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<tr>
<th>KNX bus connection</th>
<th>0.25 W</th>
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<tbody>
<tr>
<td>Relay 16 A</td>
<td>1.0 W</td>
</tr>
<tr>
<td>Relay 6 A</td>
<td>0.6 W</td>
</tr>
<tr>
<td>Electronic outputs 0.5 A</td>
<td>1.0 W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connections</th>
<th>KNX</th>
<th>Via bus connection terminals</th>
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</thead>
<tbody>
<tr>
<td>Inputs/Outputs</td>
<td>Via screw terminals</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Screw terminal</th>
<th>Screw terminal, slotted head</th>
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<td>0.2...2.5 mm² stranded</td>
<td>0.2...4 mm² solid core</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>Maximum 0.6 Nm</td>
<td></td>
</tr>
<tr>
<td>Grid</td>
<td>5.08</td>
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<th>Function</th>
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<td>For assignment of the physical address</td>
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<tr>
<td>For toggling between manual operation / operation via ABB i-bus® and displays</td>
<td></td>
</tr>
<tr>
<td>Programmable function</td>
<td></td>
</tr>
<tr>
<td>For switching through the individual fan speeds: 0 =&gt; 1 =&gt; 2 =&gt; 3 =&gt; 0 =&gt; 1 =&gt; 2 =&gt; 3 =&gt;...</td>
<td></td>
</tr>
<tr>
<td>For display of fan speed 1</td>
<td></td>
</tr>
<tr>
<td>For display of fan speed 2</td>
<td></td>
</tr>
<tr>
<td>For display of fan speed 3</td>
<td></td>
</tr>
<tr>
<td>For control and display of the valve HEATING</td>
<td></td>
</tr>
<tr>
<td>For control and display of the valve COOLING</td>
<td></td>
</tr>
<tr>
<td>For switching and display of the switch contact</td>
<td></td>
</tr>
<tr>
<td>For switching and display of the binary input</td>
<td></td>
</tr>
</tbody>
</table>

Enclosure

| IP 20 | To EN 60 529 |

Safety class

| II | To EN 61 140 |

Isolation category

| Overvoltage category | III to EN 60 664-1 |
| Pollution degree | 2 to EN 60 664-1 |

KNX safety extra low voltage

| SELV 24 V DC |

Temperature range

| Operation | -5 °C...+45 °C |
| Transport | -25 °C...+70 °C |
| Storage | -25 °C...+55 °C |

Storage at temperatures exceeding +45 °C reduces the service life!

Ambient conditions

| Maximum air humidity | 93 %, no condensation allowed |

Design

| Modular installation device (MDRC) | Pro M modular installation device |
| Dimensions | 90 x 72 x 64.5 mm (H x W x D) |
| Mounting width in space units | 4 modules at 18 mm |
| Mounting depth | 64.5 mm |

Installation

| On 35 mm mounting rail | To EN 60 715 |

Mounting position

| As required |

Weight

| 0.1 kg |

Housing/colour

| Plastic housing, grey |

Approvals

| KNX to EN 50 090-1, -2 Certification |

CE mark

| In accordance with the EMC guideline and low voltage guideline |
## Device Technology

### FCA/S 1.1M | 2CDC 508 062 D0203

<table>
<thead>
<tr>
<th>Device type</th>
<th>Application program</th>
<th>Maximum number of communication objects</th>
<th>Maximum number of group addresses</th>
<th>Maximum number of associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCA/S 1.1M</td>
<td>Fan Coil Actuator/<em>…</em></td>
<td>70</td>
<td>85</td>
<td>85</td>
</tr>
</tbody>
</table>

* … = current version number of the application program. Please observe the software information on our homepage for this purpose.

### Note

The ETS and the current version of the device application program are required for programming. The current version of the application program is available for download on the internet at [www.abb.com/knx](http://www.abb.com/knx). After import it is available in the ETS under ABB/Heating, Ventilation, Air conditioning/Fan coil actuator 1-fold. The device does not support the locking function of a KNX device in the ETS. If you inhibit access to all devices of the project with a BCU code, it has no effect on this device. It can still be read and programmed.

### 2.1.1 Electronic outputs

<table>
<thead>
<tr>
<th>Rated values</th>
<th>Number</th>
<th>4, non-isolated, short-circuit proofed</th>
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<tr>
<td>Uᵣ, rated voltage</td>
<td>24…230 V AC (50/60 Hz)</td>
<td></td>
</tr>
<tr>
<td>Iᵣ, rated current (per output pair)</td>
<td>0.5 A</td>
<td></td>
</tr>
<tr>
<td>Continuous current</td>
<td>0.5 A resistive load at Tₑₜ₉ * up to 20 °C</td>
<td></td>
</tr>
<tr>
<td>Inrush current</td>
<td>0.3 A resistive load at Tₑₜ₉ * up to 60 °C</td>
<td></td>
</tr>
</tbody>
</table>

* Tₑₜ₉ = ambient temperature

### 2.1.2 Binary inputs

<table>
<thead>
<tr>
<th>Rated values</th>
<th>Number</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ, scanning voltage</td>
<td>32 V, pulsed</td>
<td></td>
</tr>
<tr>
<td>Iᵢ, scanning current</td>
<td>0.1 mA</td>
<td></td>
</tr>
<tr>
<td>Scanning current Iᵢ, at switch on</td>
<td>Maximum 355 mA</td>
<td></td>
</tr>
<tr>
<td>Permissible cable length</td>
<td>≤ 100 m one-way, at cross-section 1.5 mm²</td>
<td></td>
</tr>
</tbody>
</table>
2.1.3 Fan rated current 6 A

<table>
<thead>
<tr>
<th>Rated values</th>
<th>Number</th>
<th>3 contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{\text{in}}$, rated voltage</td>
<td>250/440 V AC (50/60 Hz)</td>
<td></td>
</tr>
<tr>
<td>$I_{\text{in}}$, rated current (per output)</td>
<td>6 A</td>
<td></td>
</tr>
</tbody>
</table>

### Switching currents

- AC3* operation (cos $\varphi = 0.45$) EN 60 947-4-1: 6 A/230 V
- AC1* operation (cos $\varphi = 0.8$) EN 60 947-4-1: 6 A/230 V
- Fluorescent lighting load to EN 60 669-1: 6 A/250 V (35 $\mu$F)
- Minimum switching performance:
  - 20 mA / 5 V
  - 10 mA/12 V
  - 7 mA/24 V
- DC current switching capacity (resistive load): 6 A/24 V

### Service life

- Mechanical endurance
- Electronic endurance to DIN IEC 60 947-4-1
- AC1* (240 V/cos $\varphi = 0.8$): $> 10^7$
- AC3* (240 V/cos $\varphi = 0.45$): $> 1.5 \times 10^6$
- AC5a* (240 V/cos $\varphi = 0.45$): $> 1.5 \times 10^4$

### Switching times

- Maximum relay position change per output and minute if only one relay is switched: 2,683

1) The maximum inrush-current peak may not be exceeded.
2) The specifications apply only after the bus voltage has been applied to the device for at least 10 seconds. Typical delay of the relay is approx. 20 ms.

"What do the terms AC1, AC3 and AC5a mean?"

In intelligent installation systems, different switching capacity and performance specifications that are dependent on the special applications, have become established in domestic and industrial installations. These performance specifications are rooted in the respective national and international standards. The tests are defined so that typical applications, e.g. motor loads (industrial) or fluorescent lamps (residential), are simulated.

The specifications AC1 and AC3 are switching performance specifications, which have become established in the industrial field.

**Typical application:**

- **AC1** – Non-inductive or slightly inductive loads, resistive furnaces (relates to switching of ohmic/resistive loads)
- **AC3** – Squirrel-cage motors: Starting, switching off motors during running (relates to (inductive) motor load)
- **AC5a** – Switching of electric discharge lamps

These switching performances are defined in the standard EN 60947-4-1 *Contactors and motor-starters – Electromechanical contactors and motor-starters*. The standard describes starter and/or contactors which previously preferably used in industrial applications.
**2.1.4 Rated current output 16 A**

<table>
<thead>
<tr>
<th>Rated values</th>
<th>Number</th>
<th>( U_{\text{in}} ) rated voltage</th>
<th>( I_{\text{in}} ) rated current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>250/440 V AC (50/60 Hz)</td>
<td>16 A</td>
</tr>
</tbody>
</table>

**Switching currents**

- AC3\(^*\) operation (\( \cos \varphi = 0.45 \)) EN 60 947-4-1 8 A/230 V
- AC1\(^*\) operation (\( \cos \varphi = 0.8 \)) EN 60 947-4-1 16 A/230 V
- Fluorescent lighting load AX to EN 60 669-1 16 A/250 V (70 \( \mu \)F)\(^1\)
- Minimum switching performance 100 mA/12 V 100 mA/24 V
- DC current switching capacity (resistive load) 16 A/24 V

**Service life**

<table>
<thead>
<tr>
<th>Service life</th>
<th>Minimum switching performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 mA/12 V</td>
</tr>
<tr>
<td></td>
<td>100 mA/24 V</td>
</tr>
</tbody>
</table>

**Switching times\(^2\)**

<table>
<thead>
<tr>
<th>Switching times(^2)</th>
<th>Maximum relay position change per output and minute if only one relay is switched.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>313</td>
</tr>
</tbody>
</table>

\(^1\) The maximum inrush-current peak may not be exceeded.

\(^2\) The specifications apply only after the bus voltage has been applied to the device for at least 10 seconds. Typical delay of the relay is approx. 20 ms.

---

*What do the terms AC1, AC3 and AC5a mean?*

In intelligent installation systems, different switching capacity and performance specifications that are dependent on the special applications, have become established in domestic and industrial installations. These performance specifications are rooted in the respective national and international standards. The tests are defined so that typical applications, e.g. motor loads (industrial) or fluorescent lamps (residential), are simulated.

The specifications AC1 and AC3 are switching performance specifications, which have become established in the industrial field.

**Typical application:**

- **AC1** – Non-inductive or slightly inductive loads, resistive furnaces (relates to switching of ohmic/resistive loads)
- **AC3** – Squirrel-cage motors: Starting, switching off motors during running (relates to (inductive) motor load)
- **AC5a** – Switching of electric discharge lamps

These switching performances are defined in the standard EN 60947-4-1 *Contactors and motor-starters - Electromechanical contactors and motor-starters*. The standard describes starter and/or contactors which previously preferably used in industrial applications.
### 2.1.5 Output lamp load 16 A

<table>
<thead>
<tr>
<th>Lamps</th>
<th>Incandescent lamp load</th>
<th>2500 W</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fluorescent lamp T5/T8</strong></td>
<td>Uncorrected</td>
<td>2500 W</td>
</tr>
<tr>
<td></td>
<td>Parallel compensated</td>
<td>1500 W</td>
</tr>
<tr>
<td></td>
<td>DUO circuit</td>
<td>1500 W</td>
</tr>
<tr>
<td><strong>Low-voltage halogen lamps</strong></td>
<td>Inductive transformer</td>
<td>1200 W</td>
</tr>
<tr>
<td></td>
<td>Electronic transformer</td>
<td>1500 W</td>
</tr>
<tr>
<td></td>
<td>Halogen lamp 230 V</td>
<td>2500 W</td>
</tr>
<tr>
<td><strong>Dulux lamp</strong></td>
<td>Uncorrected</td>
<td>1100 W</td>
</tr>
<tr>
<td></td>
<td>Parallel compensated</td>
<td>1100 W</td>
</tr>
<tr>
<td><strong>Mercury-vapour lamp</strong></td>
<td>Uncorrected</td>
<td>2000 W</td>
</tr>
<tr>
<td></td>
<td>Parallel compensated</td>
<td>2000 W</td>
</tr>
<tr>
<td><strong>Switching performance (switching contact)</strong></td>
<td>Maximum peak inrush-current $I_p$ (150 $\mu$s)</td>
<td>400 A</td>
</tr>
<tr>
<td></td>
<td>Maximum peak inrush-current $I_p$ (250 $\mu$s)</td>
<td>320 A</td>
</tr>
<tr>
<td></td>
<td>Maximum peak inrush-current $I_p$ (600 $\mu$s)</td>
<td>200 A</td>
</tr>
<tr>
<td><strong>Number of electronic ballasts (T5/T8, single element)</strong></td>
<td>18 W (ABB EVG 1 x 18 SF)</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>24 W (ABB EVG-T5 1 x 24 CY)</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>36 W (ABB EVG 1 x 36 CF)</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>58 W (ABB EVG 1 x 58 CF)</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>80 W (Helvar EL 1 x 80 SC)</td>
<td>10</td>
</tr>
</tbody>
</table>

1) For multiple element lamps or other types the number of electronic ballasts must be determined using the peak inrush current of the electronic ballasts.
2.2 Connection schematics

**FCA/S 1.1M with electromotor valve drives**

1. Label carrier
2. Button **Programming**
3. LED **Programming** (red)
4. Bus connection terminal
5. Button ✖
6. LED ✖ (yellow)
7. Inputs (A, B)
8. Button **Fan speed**
9. LED **Fan speed 1…3** (yellow)
10. Button **Switch contact**
11. LED **Switch contact** (yellow)
12. Button ON/OFF
13. LED ON/OFF (green)

**FCA/S 1.1M with electro-thermal valve drives**

14. Output switching contact
15. Fan
16. Valve HEATING
17. Valve COOLING
18. LED Valve HEATING (yellow)
19. Button Valve HEATING
20. LED Valve COOLING (yellow)
21. Button Valve COOLING
22. LED **Input A** (yellow)
23. Button **Input A**
24. LED **Input B** (yellow)
25. Button **Input B**
2.3 Dimension drawing
2.4 Assembly and installation

The device is a modular installation device for quick installation in the distribution board on 35 mm mounting rails to EN 60 715.

The mounting position can be selected as required.

The connection to the bus is implemented using the supplied bus connection terminal. The terminal assignment is located on the housing.

The device is ready for operation after connection to the bus voltage.

Accessibility to the device for the purpose of operation, testing, visual inspection, maintenance and repair must be provided compliant to VDE 0100-520.

Commissioning requirements

In order to commission the device, a PC with ETS and a KNX interface, e.g. USB or IP, are required. The device is ready for operation after connection to the bus voltage.

The installation and commissioning may only be carried out by qualified electrical specialists. The appropriate norms, guidelines, regulations and specifications for your country should be observed when planning and setting up electrical installations and security systems for intrusion and fire detection.

Protect the device from damp, dirt and damage during transport, storage and operation.

Only operate the device within the specified technical data limits!

The device should only be operated in an enclosed housing (distribution board)!

The voltage supply to the device must be switched off, before mounting work is performed.

Danger

In order to avoid dangerous touch voltages, which originate through feedback from differing phase conductors, all-pole disconnection must be observed when extending or modifying the electrical connections.

Foil keypad

The device incorporates manual operating features. Special device functions can be undertaken using the operating keys on the foil keypad.

The foil keypad may not be operated with pointed or sharp-edged objects, e.g. screwdrivers or pens. This may damage the keypad.
Supplied state
The device is supplied with the physical address 15.15.255. The application program is preloaded. It is therefore only necessary to load group addresses and parameters during commissioning. However, the complete application program can be reloaded if required. A longer downtime may result if the application program is changed or after a discharge.

Assignment of the physical address
The assignment and programming of the physical address is carried out in the ETS.

The device features a button Programming for assignment of the physical device address. The red LED Programming lights up after the button has been pushed. It switches off as soon as the ETS has assigned the physical address or the button is pressed again.

Download behaviour
Depending on the PC, which is used, the progress bar for the download may take up to one and a half minutes before it appears due to the complexity of the device.

Cleaning
If devices become dirty, they can be cleaned using a dry cloth or a cloth dampened with a soapy solution. Corrosive agents or solutions should never be used.

Maintenance
The device is maintenance-free. No repairs should be carried out by unauthorised personnel if damage occurs, e.g. during transport and/or storage.
2.5 Manual operation

Function of manual operation
Manual operation facilitates on-location operation of the device. As standard, the button Manual operation is enabled and can be switched on and off using it.

Switch on of manual operation:
Press button until the yellow LED lights continuously.

Switch off of manual operation:
Press button briefly.

The yellow LED continues to flash for 2 seconds.

After connection to the KNX, after an ETS download or ETS reset, the device is in KNX operation. The LED is off. All LEDs indicate the current state.

Note
If the Manual operation is generally disabled or disabled via communication object Enable/ block manual operation, the LED flashes during the button push. A switchover from KNX operation to the Manual operation mode does not occur.

Note
If manual operation is activated, the current fan speed remains set and can only be operated manually. Here any limitations, forced operations and programmed dwell times are not considered. If manual operation is deactivated, the fan sets to a speed to which it would also be set without manual operation, e.g. via the value of the communication objects. The setting occurs with the parameterized dwell times!
Display elements

Indicator LEDs are located on the front of the device.

All LEDs Output X indicate the actual state. In KNX operation the LED is off.

The response of the display elements is described in the following table:

<table>
<thead>
<tr>
<th>LED</th>
<th>KNX operation</th>
<th>Manual operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>Manual operation</td>
<td>Off: The device is in KNX mode&lt;br&gt;Flashes (for about 3 seconds): Changeover to manual mode.&lt;br&gt;Flashes continuously: Manual operation is software-inhibited via KNX. The LED flashes as long as button is pressed. The LED switches off when released.</td>
</tr>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>Input A…B</td>
<td>On: Input closed.&lt;br&gt;Off: Input opened.</td>
</tr>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>Output switch contact</td>
<td>Off: Contact open.</td>
</tr>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>Valve HEATING</td>
<td>On: Contact closed.&lt;br&gt;Off: Contact open.</td>
</tr>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>Valve COOLING</td>
<td>Off: Valve position ≠ 0&lt;br&gt;The display indicates the same value as the 1 bit status of the valve control.&lt;br&gt;With a state change the new state is immediately indicated.</td>
</tr>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>Fan speed 1…3</td>
<td>Off: Fan is off.</td>
</tr>
<tr>
<td><img src="images/led.png" alt="LED" /></td>
<td>ON/OFF</td>
<td>Off: Fan automatic not activated</td>
</tr>
</tbody>
</table>
### 2.5.2 Operating controls

Buttons for manual operation are located on the front of the device.

The behaviour of the operating controls is dependent on the operating states *KNX operation* and *Manual operation* as described in the following table:

<table>
<thead>
<tr>
<th>Button</th>
<th>KNX operation</th>
<th>Manual operation</th>
</tr>
</thead>
</table>
| **Manual operation** | Long button operation (about 3 sec.): Switch to Manual operation, provided that Manual operation is not blocked by a parameter setting.  
Short button push: LED flashes and switches off again. The device is once again in KNX operation. | Long button operation (about 3 sec.): Changeover to the KNX operation. The inputs are scanned again. In this way, the input states are updated.  
Reset of the Manual operation to KNX operation can also be completed within a parameterized time depending on the parameterization. |
| **Input A…B**   | No reaction                                                                  | By pressing the button the input is simulated. The parameterized features are carried out.  
The button can be disabled by the parameter settings. |
| **Switch contact** | No reaction                                                                 | The relay is toggled by pressing the button.  
The button can be disabled by the parameter settings. |
| **Valve HEATING** | A fault, e.g. due to an overload, is indicated on the device by flashing (frequency 5 Hz) of the corresponding LED.  
The fault is acknowledged by pressing the respective button for longer than 4 s. | By pressing the button the connected valve is controlled.  
A fault cannot be acknowledged.  
A characteristic curve adjustment is not undertaken.  
The button can be disabled by the parameter settings. |
| **Valve COOLING** | No reaction                                                                 | By pressing the button, the individual fan speeds can be switched through. This is according to the following sequence:  
0 ⇒ 1 ⇒ 2 ⇒ 3 ⇒ 0 ⇒ 1 ⇒ 2 ⇒ 3 ⇒…  
The button can be disabled by the parameter settings. |
| **Fan speed**    | No reaction                                                                   | An ON telegram is sent on the bus by pressing this button. |
| **ON/OFF**       | No reaction                                                                   |                                                                                   |
3 Commissioning

3.1 Overview

The application program Fan Coil Actuator/1.0 is available for the Fan Coil Actuator. Programming requires the ETS.

The following functions are available:

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional output</td>
<td>For control of auxiliary electrical heating, e.g. in the Winter → Summer transition phase.</td>
</tr>
<tr>
<td>Fan</td>
<td>A three speed fan is controlled alternately with a two-way connection or with speed switching.</td>
</tr>
<tr>
<td>Valve HEATING/COOLING</td>
<td>One valve for HEATING and one valve for COOLING are controlled. The control of the valves can be implemented as PWM (constant) control or as 3-point control (opening and closing). The valve outputs are short circuit protected.</td>
</tr>
<tr>
<td>Binary inputs</td>
<td>Two binary inputs are available. These are used for example, to monitor the window contact and condensation (dew point).</td>
</tr>
</tbody>
</table>

The 6 A outputs are available for Fan Coil applications.

**Caution**

Improper switching will cause destruction of the fan motors. The technical data of the fan must be observed, e.g. speed or switching function. 

For further information see: Parameter window Multi-level fan, page 38

The Fan Coil Actuator features relays in each output which are mechanically independent of the other outputs. Switching noises cannot be avoided due to the mechanical nature of the design.

The installation location of the Fan Coil Actuator can either be centrally in an electrical distribution board, or distributed in a Fan Coil unit. Usually, the Fan Coil Actuator is used in conjunction with a room temperature controller for an individual room temperature control system. The room temperature controller sends a control variable which is used to control the fan stages via the Fan Coil Actuator.

**Fan Coil controls**

- Fan with three fan speeds
- With changeover or speed control
- 2 pipe system HEATING and COOLING
- 2 pipe system HEATING or COOLING
- 3 pipe system
- 4 pipe system

For further information see: Planning and Application, page 119
Configuration design types
A Fan Coil unit can be configured as a compact device or a modular installation device:

- **Compact devices**: These are supplied with enclosures and are available as self-contained units for wall or ceiling mounting.
- **Modular installation devices**: These have no enclosures and are mounted in the wall, in the ceiling or in the floor. The air is blown into the room through a grill.

Air supply
Fan Coil units are available as recirculation or as mixed air devices.

- **Recirculation devices**: The room air is directed past heat exchangers by the fans.
- **Mixed air devices**: The room air is mixed with fresh air. The mixing ratio between re-circulated and fresh air can usually be adjusted.

### 3.1.1 Functions of the inputs
The following table provides an overview of the functions possible with the inputs of the Fan Coil Actuator and the application program:

<table>
<thead>
<tr>
<th>Functions of the inputs</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simplified switch sensor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3.1.2 Functions of the output
The following table provides an overview of the functions possible with the outputs of the Fan Coil Actuator and the application program:

<table>
<thead>
<tr>
<th>Functions of the output</th>
<th>Output (16 A/10 AX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch function</td>
<td></td>
</tr>
<tr>
<td>Normally closed contact</td>
<td></td>
</tr>
<tr>
<td>Normally open</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>Staircase light</td>
<td></td>
</tr>
</tbody>
</table>
3.2 Parameters

The parameterization of the Fan Coil-Actuator is implemented using the Engineering Tool Software ETS. The user program can be found in the ETS at ABB/Heating, Cooling, Blower/Fan Coil Actuator 1-fold.

The following chapter describes the parameters of the device using the parameter window. The parameter window features a dynamic structure so that further parameters may be enabled depending on the parameterization and the function of the outputs.

The default values of the parameters are underlined, e.g.:

Options:  no
             yes
3.2.1 Parameter window General

Higher level parameters are set in the parameter window General.

Sending and switching delay after bus voltage recovery in s [2…255]
Options: 2…255

Telegrams are only received during the sending and switching delay. The telegrams are not processed, however, and the outputs remain unchanged. No telegrams are sent on the bus.

After the sending and switching delay, telegrams are sent and the state of the outputs are set to correspond to the parameterization or the communication object values.

If communication objects are read during the sending and switching delay, e.g. by a visualisation system, these read requests are stored and a response is sent, after the sending and switching delay has been completed.

An initialization time of about two seconds is included in the delay time. The initialisation time is the time that the processor requires to be functional.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The set switching delay does not act on the electronic outputs (valve HEATING/COOLING)!</td>
</tr>
</tbody>
</table>

How does the device behave with bus voltage recovery?

After bus voltage recovery, the device always waits for the sending delay time to elapse before sending telegrams on the bus.
Rate of telegrams
Options: not limited
1 telegram/second
2 telegrams/second
3 telegrams/second
5 telegrams/second
10 telegrams/second
20 telegrams/second
0.05 seconds/telegram
0.1 seconds/telegram
0.2 seconds/telegram
0.3 seconds/telegram
0.5 seconds/telegram

A telegram limitation is implemented to control the bus load created by the device.

Send object "in operation"
Options: no
yes

The In operation communication object indicates the presence of the device. This cyclic telegram can be monitored by an external device. If a telegram is not received, the device may be defective or the bus cable to the transmitting device may be interrupted.

Note
After bus voltage recovery the communication object is sent after the set sending and switching delay.

- yes: The communication object In operation is not enabled. The following parameters appear:

Telegram repeated
s [1...65,535]
Options: 1…60…65,535

This parameter determines the time interval, at which the communication object In operation cyclically sends a telegram.

Send value cyclically
Options: 1
0

This parameter defines the value that the communication object sends on the bus.
Enable input A
(binary input, contact scanning)
Enable input B
(binary input, contact scanning)
Options: no yes
- yes: The input is activated. The corresponding parameter window is enabled.

Note
The inputs are equipped as binary inputs with contact scanning. The scanning voltage is provided by the device.

Enable output
(switch contact 16 A/10 AX)
Options: no yes
- yes: The output is activated. The corresponding parameter window is enabled.

Enable communication object
“Request status values” 1 bit
Options: no yes
Via this communication object, all status messages can be requested, provided that they have been parameterized with the option after a change or request.
- yes: A 1 bit communication object Request status values is enabled. The following parameter appears.
  recall with object value
  Options: 0
  1
  0 or 1
  - 0: The status messages are requested with the value 0.
  - 1: The status messages are requested with the value 1.
  - 0 or 1: The status messages are requested with the values 0 or 1.
3.2.2 Parameter window Manual

In the parameter window Manual, all the settings for manual operation can be made.

<table>
<thead>
<tr>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control input</td>
</tr>
<tr>
<td>Fan</td>
</tr>
<tr>
<td>- Status messages</td>
</tr>
<tr>
<td>- Automatic operation</td>
</tr>
<tr>
<td>Valve Heating</td>
</tr>
<tr>
<td>- Function</td>
</tr>
<tr>
<td>Valve Cooling</td>
</tr>
<tr>
<td>- Function</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manual operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>enabled</td>
</tr>
<tr>
<td>no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enable communication object</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Status man. operation&quot; 1 bit</td>
</tr>
<tr>
<td>no</td>
</tr>
</tbody>
</table>

Function of the buttons:

- OnOff
- Speed
- Valve Heating
- Valve Cooling
- Input A
- Input B
- Output

**Manual operation**

Options: enable/disable via communication object

- enabled
- disabled

This parameter defines if the switch over between the operating states Manual operation and KNX operation is enabled or disabled via the button on the device or via a communication object.

- *enable via communication object* The communication object Enable manual operation – manual operation (No. X) appears.
- *enabled* The operating states Manual operation and KNX operation can be toggled via button .
- *disabled* Manual operation is generally disabled.

Telegram value:

- 0 = block button
- 1 = enable button

**Note**

The manual operation overwrites the input states.
The following parameter appears:

**Reset manual operation to EIB/KNX operation**

Options:  
- **no**
- **after 1/3/10/30 minute(s)**

This parameter determines how long the device remains in the *Manual operation* mode after pressing the @ button.

- **no**: The device remains in *Manual operation* until the button @ is pressed again.
- **after 1/3/10/30 minute(s)**: The device remains in *Manual operation* after the last button push until either button @ is pushed again or the programmed time has timed out.

**Enable communication object "Status man. operation" 1 bit**

Options:  
- **no**
- **yes**

- **yes**: The 1 bit communication object *Status of manual operation* (no. 5) is enabled. The following parameter appears:

  **Send object value**

  Options:  
  - **no, update only**
  - **after a change**
  - **after request**
  - **after a change or request**

- **no, update only**: The status is updated but not sent.
- **after a change**: The status is sent after a change.
- **after request**: The status is sent after a request.
- **after a change or request**: The status is sent after a change or a request.

For further information see: *Manual operation*, page 17
Function of the buttons:

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The respective LEDs indicate the current input states. The foil keypad can be operated when manual operation has been activated. If group addresses have been assigned, telegrams will be sent on the bus! Any signal changes from the installed system will not be considered. With switchover to the operating state <strong>KNX operation</strong> the respective LEDs again indicate their current input states. The communication objects are updated and telegrams are sent.</td>
</tr>
</tbody>
</table>

**On/Off**

Options:  
- **Indication “Status automatic”**
- **LED/button with objects**

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The button ON/OFF has no further functions with both options.</td>
</tr>
</tbody>
</table>

- **Indication “Status automatic”:** The LED indicates the current operating state of the Fan Coil Actuator:  
  - LED ON = fan automatic activated  
  - LED OFF = fan automatic not activated
- **LED/button with objects:** The communication objects LED ON/OFF (no.: 3) and button ON/OFF (no.: 2) appear. With these communication objects, it is possible to freely select the function.

**Speed**

Options:  
- **enabled**  
- **disabled**

With this parameter the button can also be enabled or disabled.
- **enabled:** The button is enabled.
- **disabled:** The button is disabled.
Valve Heating
Options: enabled
   disabled
With this parameter the button 🔄 can be enabled or disabled.
• enabled: The buttons are enabled.
• disabled: The buttons are disabled.

Valve Cooling
The operation of the COOLING valve does not differ from the operation of the HEATING valve.
For further information see: Parameter description Valve HEATING, page 66

Input A
This parameter is visible if in Parameter window Input A, page 79, with parameter Input A the option Switch sensor/fault monitoring input has been selected.
Options: Block
   Switch
   Buttons
With this parameter the button can be disabled, or programmed as a switch or push button.
• block: The button is disabled.
• Switch: With every actuation the states of the input and the LED are changed.
• Push buttons:
   Press button => input closed, LED on
   Release button => input opened, LED off

Input B
The operation of input A does not differ from the operation of input B.

Output
Options: enabled
   disabled
With this parameter, the button can be enabled or disabled.
• Enabled: The button is enabled.
• Disabled: The button is disabled.
### 3.2.3 Parameter window Control input

In this parameter window, all settings for the Control input are undertaken.

<table>
<thead>
<tr>
<th>General</th>
<th>HVAC-System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>Valve cooling independently usable</td>
</tr>
<tr>
<td>Control input</td>
<td>Operation heat/cool after</td>
</tr>
<tr>
<td></td>
<td>bus voltage recovery</td>
</tr>
<tr>
<td>Fan</td>
<td>Monitoring control values</td>
</tr>
<tr>
<td></td>
<td>e.g. thermostat</td>
</tr>
<tr>
<td>- Status messages</td>
<td></td>
</tr>
<tr>
<td>- Automatic operation</td>
<td></td>
</tr>
<tr>
<td>Valve Heating</td>
<td>Operation heat/cool after</td>
</tr>
<tr>
<td>- Function</td>
<td>bus voltage recovery</td>
</tr>
<tr>
<td>Valve Cooling</td>
<td>Monitoring control values</td>
</tr>
<tr>
<td>- Function</td>
<td>e.g. thermostat</td>
</tr>
</tbody>
</table>

**HVAC-System**

Options:
- 1 Control value/2-pipe
- 1 Control value/4-pipe, with switching object
- 2 Control values/2-pipe
- 2 Control values/2-pipe, with switching object
- 2 Control values/4-pipe

This parameter defines the pipe system, which is used with the Fan Coil Actuator. The individual functions are described in the following chapters.

---

**Important**

If a valve is deactivated due to a conversion of the HVAC system, the valve will be fully closed. A correction curve which may be set will be ignored!

---

**Monitoring control values**

**e.g. thermostat**

Options:  
- no  
- yes

- yes: The communication object *Fault control value* is enabled. Hereby for example, a thermostat can be cyclically monitored.

---

**Note**

During a fault (emergency operation) when the control signal from the thermostat is no longer received, the Fan Coil Actuator autonomously performs a *Pulse width modulation – calculation*, page 141. For this purpose, the Fan Coil Actuator uses the programmable PWM cycle time.
With option yes, the following parameters appear:

**Monitoring time in s**
\[30…65,535\]  
Options: 30…120…65,535

With this parameter, the time is set with which all telegrams on the input/setting values of the FCA/S are monitored: Communication objects Control value HEATING, Control value COOLING or Control value HEATING/COOLING.

If a setting variable is not received within the parameterized time, a communication malfunction has occurred and emergency operation is activated.

<table>
<thead>
<tr>
<th>Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>It must be assured that the monitoring time is set to at least factor 3 larger than the set sending time of the thermostat.</td>
</tr>
</tbody>
</table>

The reaction of the FCA/S to a setting value not received can be defined in the following parameters.

**Send object value**
(Object "Control value fault" 1 bit)

Options: no, update only  
after a change  
after request  
after a change or request

- *no, update only*: The status is updated but not sent.
- *after a change*: The status is sent after a change.
- *after request*: The status is sent after a request.
- *after a change or request*: The status is sent after a change or a request.

**Control value after control fault**

in % \[0…100\]

Options: 0…30…100

This control value in percent can be set with a control value fault should the control fail (emergency operation).
3.2.3.1 HVAC system – 1 Control value/2-pipe

If option 1 Control value/2-pipe is selected, then further parameters appear:

**Valve cooling independently usable**

This parameter serves as a note or remark.

**Valve COOLING**

The cooling valve can be used additionally and independently via the communication object Control value COOLING(extra!). The valve COOLING is not monitored in the process.

**Valve HEATING**

Via communication object Control value HEATING/COOLING, the valve HEATING and the fan are controlled.

For further information see: [Configuration of a HVAC system with Fan Coil units](#), page 121
3.2.3.2 HVAC-System – 1 Control value/4-pipe, with switching object

If option 1 Control value/4-pipe with switching object is selected, further parameters appear:

**Toggle Heating/Cooling via separate object**

This parameter serves as a note or remark.

- **Valve HEATING/COOLING**
  - Using communication object Control value HEATING/COOLING, the valves HEATING/COOLING and the fans are controlled.
  - Toggle between HEATING and COOLING is implemented via the communication object Toggle HEATING/COOLING.
  - The corresponding inactive/non-actuated valve is thus automatically closed when toggled.

For further information see: [Configuration of a HVAC system with Fan Coil units](#), page 121

**Operation heat/cool after bus voltage recovery**

Options:  
- unchanged
- Heating
- Cooling

Using this parameter, the reaction after bus voltage recovery is set.

- *unchanged*: After bus voltage recovery, the state which existed before bus voltage failure is set.
- *Heating*: After bus voltage recovery, the HEATING state is set.
- *Cooling*: After bus voltage recovery, the COOLING state is set.

**Object value for heating the object “Toggle heating/cooling”**

Options:  
- 1
- 0

With this parameter, you set the communication object value used to toggle between HEATING and COOLING.

- **1**: As soon as a telegram with the value 1 is received, HEATING is activated and COOLING is deactivated.
- **0**: As soon as a telegram with the value 0 is received, HEATING is activated and COOLING is deactivated.
3.2.3 HVAC system – 2 Control values/2-pipe

If option 2 Control values/2-pipe is selected, then further parameters appear:

**Toggle Heating/Cooling via automatically controlled value**

This parameter serves as a note or remark.

**Valve HEATING/Valve COOLING**

Toggling between HEATING and COOLING is implemented by updating the control values. The HEATING/COOLING status is then set accordingly.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The switchover between HEATING/COOLING should occur exclusively in the respective thermostat. Here only HEATING or COOLING is always active depending on the last control value received.</td>
</tr>
<tr>
<td>• If a control with a value &gt; 0 is received, the fan and the corresponding valve are controlled.</td>
</tr>
<tr>
<td>• The other valve is closed.</td>
</tr>
<tr>
<td>• If a control value with a value = 0 is received, this is ignored if the other control value &gt; 0.</td>
</tr>
</tbody>
</table>

**Caution**

With a 2-pipe HVAC system, both the Control value HEATING as well as the Control value COOLING act on the HEATING valve (electronic outputs O, P). Please note that the last control value received always controls the heating valve.

For 2-pipe systems only the communication objects for the HEATING valve are relevant. The communication objects in conjunction with the COOLING valve, e.g. status, forced operation or valve purge are not effective.

For further information see: Configuration of a HVAC system with Fan Coil units, page 121

**Operation heat/cool after bus voltage recovery**

Options:  
- unchanged
- Heating
- Cooling

Using this parameter, the reaction after bus voltage recovery is set.

- **unchanged**: After bus voltage recovery, the state which existed before bus voltage failure is set.
- **Heating**: After bus voltage recovery, the HEATING state is set.
- **Cooling**: After bus voltage recovery, the COOLING state is set.
3.2.3.4 HVAC System – 2 Control values/2-pipe, with switching object

If option 2 Control values/2-pipe with switching object is selected, further parameters appear:

**Toggle Heating/Cooling via object**

This parameter serves as a note or remark.

**Valve HEATING/Valve COOLING**

The valve is controlled via the communication object Control value HEATING.

Toggle between HEATING and COOLING is implemented via the communication object Toggle HEATING/COOLING.

**Caution**

With a 2-pipe HVAC system, both the Control value HEATING as well as the Control value COOLING act on the HEATING valve (electronic outputs O, P). Please note that always the last control value received and the switching object control the HEATING valve.

For 2-pipe systems only the communication objects for the HEATING valve are relevant. The communication objects in conjunction with the COOLING valve, e.g. status, forced operation or valve purge are not effective.

For further information see: Configuration of a HVAC system with Fan Coil units, page 121

**Operation heat/cool after bus voltage recovery**

Options: unchanged

HEATING

COOLING

Using this parameter, the reaction after bus voltage recovery is set.

- **unchanged**: After bus voltage recovery, the state which existed before bus voltage failure is set.
- **Heating**: After bus voltage recovery, the HEATING state is set.
- **Cooling**: After bus voltage recovery, the COOLING state is set.

**Object value for heating the object “Toggle heating/cooling”**

Options: 1

0

With this parameter, you set the communication object value used to toggle between HEATING and COOLING.

- **1**: As soon as a telegram with the value 1 is received, HEATING is activated and COOLING is deactivated.
- **0**: As soon as a telegram with the value 0 is received, HEATING is activated and COOLING is deactivated.
3.2.3.5 HVAC system – 2 Control values/4-pipe

If option 2 Control values/4-pipe is selected, then further parameters appear:

**Toggle Heating/Cooling via automatically controlled value**

This parameter serves as a note or remark.

**Valve HEATING/Valve COOLING**

The HEATING valve is controlled via the communication object Control value HEATING.

The COOLING valve is controlled via the communication object Control value COOLING.

Toggling between HEATING and COOLING is implemented by updating the control values. The HEATING/COOLING status is then set accordingly.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The switchover between HEATING/COOLING should occur exclusively in the respective thermostat. Here only HEATING or COOLING is always active depending on the last control value received.</td>
</tr>
<tr>
<td>• If a control with a value &gt; 0 is received, the fan and the corresponding valve are controlled.</td>
</tr>
<tr>
<td>• The other valve is closed.</td>
</tr>
<tr>
<td>• If a control value with a value = 0 is received, this is ignored if the other control value &gt; 0.</td>
</tr>
</tbody>
</table>

For further information see: [Configuration of a HVAC system with Fan Coil units](#), page 121

**Operation heat/cool after bus voltage recovery**

Options: unchanged Heating Cooling

Using this parameter, the reaction after bus voltage recovery is set.

- **unchanged**: After bus voltage recovery, the state which existed before bus voltage failure is set.
- **Heating**: After bus voltage recovery, the HEATING state is set.
- **Cooling**: After bus voltage recovery, the COOLING state is set.
3.2.4 Parameter window *Multi-level fan*

In this parameter window, all settings for the *Multi-level fan* are undertaken.

<table>
<thead>
<tr>
<th>General</th>
<th>Fan type</th>
<th>multi-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>Speed on 2 limit</td>
<td>no</td>
</tr>
<tr>
<td>Control input</td>
<td>Fan Operation Mode note technical data of Fan III</td>
<td>Changeover switch</td>
</tr>
<tr>
<td>Fan</td>
<td>Delay between fan speed switching in ms [50..3,000]</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Fan speed on bus voltage failure</td>
<td>unchanged</td>
</tr>
<tr>
<td></td>
<td>Fan speed on bus voltage recovery</td>
<td>unchanged</td>
</tr>
<tr>
<td>Valve Heating</td>
<td>Enable communication object &quot;Forced operation&quot; 1 bit</td>
<td>no</td>
</tr>
<tr>
<td>- Function</td>
<td>Enable automatic operation</td>
<td>yes</td>
</tr>
<tr>
<td>Valve Cooling</td>
<td>Enable direct operation</td>
<td>no</td>
</tr>
<tr>
<td>- Function</td>
<td>Starting characteristic of fan</td>
<td>no</td>
</tr>
</tbody>
</table>

**Fan type**

Option:  
- *multi-level*: A fan with up to three speeds is controlled.
- *one-level*: A fan with one speed should be controlled.

**Speed on 2 limit**

Option:  
- *no*: A three speed fan is controlled.
- *yes*: A two speed fan is controlled via fan speeds 1 and 2. Fan speed 3 is non-functional.
Fan Operation Mode note techn. data of Fan !!!

Option: Changeover switch
Step switch

The control of the fan is set with this parameter. The mode of fan control should be taken from the technical data of the fan.

**How does a two-way changeover circuit function?**

Only the corresponding output of the assigned fan speed is switched on with the parameterization as a changeover switch.

The delay time between the stage switch over and a minimum dwell time in a valve stage are programmable. The minimum dwell time in a fan speed is only active in automatic mode.

**How does speed switching function?**

With step switch control, no erratic and sudden switch on of the fan is possible. The individual fan speeds are activated consecutively (outputs switched on) until the required fan speed is achieved.

The parameterized delay time between two fan speeds has the effect that the current fan speed must be switched on for at least this time before the next valve speed is switched on. The parameterized minimum dwell time in a fan speed has the same effect as a changeover switch, i.e. it is only active in automatic mode and is added to the switchover delay.

- **Changeover switch:** The following parameter appears:

  **Delay between fan speed switching**
  in ms [50...5,000]
  Option: 50...500...5,000
  A switchover delay can be programmed with this parameter. As this time is a fan specific factor, it is always considered.

**Fan speed on bus voltage failure**

Option: unchanged
off

**Fan speed on bus voltage recovery**

Options: unchanged
off
1
2
3

- **unchanged:** The fan speeds of the fan remain unchanged.
- **off:** The fan is switched off.
- **1, 2 or 3:** The fan switches to fan speed 1, 2 or 3.
Caution

The RM/S is supplied ex-works with a default setting (factory default). This ensures the fan setting is switched off when the bus voltage is applied to the relay for the first time. Thus, damage to the device due to unintentional switch on during transport, e.g. due to vibration, is avoided.

It is advisable to apply a bus voltage before connecting the fan in order to achieve a defined switch state of the fan. This eliminates the possibility of the destruction of the fan due to an incorrect contact setting.

Enable communication object
"Forced operation" 1 bit
Options: no yes

Through forced operation for example, a recirculation: Valve OFF and fan ON can be implemented.

- yes: A 1 bit communication object Forced operation is enabled. The following parameters appear at the same time:

  Forced operation on object value
  Options: 1 0

  - 1: Forced operation is activated by a telegram with value 1.
  - 0: Forced operation is activated by a telegram with value 0.

Note

During forced operation, the settings set in Automatic operation are ignored. Automatic operation is updated after forced operation has been rescinded.

Important

Forced operation remains active until:
- the complementary set values are sent.
- the assignment is changed.
- the fan type is changed.

The forced operation is not deactivated by a download of the application program, in which the fan type and the respective group addresses are retained.
The forced operation is reset if an ETS reset has occurred.
**Limitation with forced operation**

Options:
- 3, 2, 1, off
- unchanged
- off
- 1
- 1, off
- 2
- 2, 1
- 2, 1, off
- 3
- 3, 2
- 3, 2, 1

This parameter sets which fan speed is set with active forced operation or which may not be exceeded or undershot.

- 3, 2, 1, off: Everything is possible.
- Unchanged: The state is retained.
- Off: Off.
- 1: limited to speed 1.*
- 1, off: limited to speed 1 and off.
- 2: limited to speed 2.*
- 2, 1: limited to speed 2 and 1.
- 2, 1, off: limited to speed 2, 1 and off.
- 3: limited to speed 3.*
- 3, 2: limited to speed 3 and 2.
- 3, 2, 1: limited to speed 3, 2 and 1.

* The control value is ignored.

**Enable automatic operation**

Options: no
- yes

- yes: Automatic operation is enabled. Furthermore, the Parameter window - Automatic operation, page 48 appears.

**Enable direct operation**

Options: no
- yes

- yes: Direct operation is enabled. Furthermore, the Parameter window - Direct operation, page 54 appears.
**Starting characteristic of fan**

Options:  no  yes

This parameter enables the fan to start from the OFF state with a defined fan speed. This fan stage is immediately applied.

In order to guarantee a safe start of the fan motor, it can be useful to start the fan motor first with a higher fan speed. Thus, a higher torque for the start-up phase of the fan is achieved.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A step switch normally means however that the previous fan stages are usually switched on consecutively. With the changeover switch, the fan speed is directly switched on.</td>
</tr>
</tbody>
</table>

The delay between the switchover of two fan speeds (contact change) is considered.

The dwell times in a fan speed, which are considered in automatic mode, are inactive and will only be considered after the start-up phase.

The start-up behaviour is a technical characteristic of the fan. For this reason, this behaviour has a higher priority than an active limitation or forced operation.

With the option yes in the parameter *Starting characteristic of fan*, the two additional parameters appear:

**Switch on over fan speed**

Options:  1/2/3

Here you set which fan stage the fan uses to start from the OFF state.

**Minimum dwell period in switch on fan speed in s [1...65,535]**

Options:  1…5…65,535

This parameter defines the length of the minimum dwell time in a switch on speed.
Example: Starting characteristic of a three speed fan
The illustration shows the response in automatic operation with the option Switch on over fan speed 3, if the fan receives the telegram from the OFF state to set Speed 1.

* The parameter Minimum dwell period in fan speed in s [0...65,535] in the parameter window Automatic operation is only active and programmable, if the option yes has been selected in the parameter Enable automatic operation. In the parameter window Fan, you can find the parameter Enable automatic operation.

Important
The forced operation remains valid and is considered.
The parameterized minimum dwell time in the fan speed for automatic mode is ignored during manual operation. Accordingly, an immediate reaction to the manual operation is detected.
The delay time with speed switch over remains active to protect the fan.
3.2.4.1 Parameter window - Status messages

In this parameter window, the Status messages are defined.

Enable communication object
"Status fan speed x" 1 bit
Options: no yes

The setting of a fan speed is displayed via these communication objects. You can parameterize the status to indicate a current fan speed or a required fan speed.

- yes: Three 1 bit communication objects, Status fan speed x, x = 1 to 3 are enabled. The following parameters appear:

  Meaning
  Options: current fan speed required fan speed

  This parameter defines whether the status of the current fan speed or the required fan speed is displayed.

  What is the current fan speed?
  The current fan speed is the speed at which the fan is actually operating.
What is the required fan speed?
The required fan speed is the fan speed which has to be achieved, e.g. when the transition and dwell times are completed.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The limitations are included in this observation, i.e. if a limitation allows only fan speed 2 and the fan is operating at fan speed 2, and for example, a telegram to switch up is received, the required fan speed remains at 2 as fan speed 3 cannot be achieved due to the limitation.</td>
</tr>
</tbody>
</table>

Send object values
Options: no, update only
after a change
after request
after a change or request

- no, update only: The status is updated but not sent.
- after a change: The status is sent after a change.
- after request: The status is sent after a request.
- after a change or request: The status is sent after a change or a request.

Enable communication object
"Status fan speed" 1 byte
Options: no
yes

This status byte defines the figure value of the fan speed.
This display can be differentiated with the selection of current fan speed from the required fan speed. Initially, the switchover times, dwell times and the start-up phase must be completed before the required fan speed is achieved.

- yes: The communication object Status fan speed is enabled.

What is the current fan speed?
The current fan speed is the speed at which the fan is actually operating.

What is the required fan speed?
The required fan speed is the fan speed which has to be achieved, e.g. when the transition and dwell times are completed.

With option yes the following parameters appear:

<table>
<thead>
<tr>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options: current fan speed</td>
</tr>
<tr>
<td>required fan speed</td>
</tr>
</tbody>
</table>

This parameter defines whether the status of the current fan speed or the required fan speed is displayed.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The limitations are included in this observation, i.e. if a limitation allows only fan speed 2 and the fan is operating at fan speed 2, and for example, a telegram to switch up is received, the required fan speed remains at 2 as fan speed 3 cannot be achieved due to the limitation.</td>
</tr>
</tbody>
</table>
Send object value
Options:  no, update only
          after a change
          after request
          after a change or request
- no, update only: The status is updated but not sent.
- after a change: The status is sent after a change.
- after request: The status is sent after a request.
- after a change or request: The status is sent after a change or a request.

Enable communication object
"Status byte mode" 1 bit
Options:  no
          yes
From this status byte, the states HEATING, COOLING, automatic, forced operation and the four limitations are indicated directly via a 1 bit coding.
For further information see: Status byte forced/operation, page 152
- yes: The communication object Status byte mode is enabled. The following parameter appears:

Send object values
Options:  no, update only
          after a change
          after request
          after a change or request
- no, update only: The status is updated but not sent.
- after a change: The status is sent after a change.
- after request: The status is sent after a request.
- after a change or request: The status is sent after a change or a request.

Enable communication object
"Status Fan On/Off" 1 bit
Options:  no
          yes
The communication object Status fan can be enabled with this parameter.
Some fans must receive an ON telegram before they are set to a fan speed from the OFF state. This ON telegram acts on a main switch which has to be switched on. This demand can be implemented with any switch output which is controlled via the Status fan communication object. The corresponding switch communication object of the switch actuator should be connected with the Status fan communication object.
With the option yes, the following parameters appear:

**Send object value**

Options:  no, update only
          after a change
          after request
          after a change or request

- **no, update only**: The status is updated but not sent.
- **after a change**: The status is sent after a change.
- **after request**: The status is sent after a request.
- **after a change or request**: The status is sent after a change or a request.

The following parameter only becomes visible if the option yes has been selected in the Enable automatic operation parameter in the Fan parameter window.

**Enable communication object**

"Status automatic" 1 bit

Options:  no
          yes

The communication object Status automatic is enabled with this parameter.

Telegram value:

- **1** = Room Master is in automatic operation.
- **0** = automatic operation switched off

- **yes**: The following parameter appears:

  **Send object value**

  Options:  no, update only
            after a change
            after request
            after a change or request

  - **no, update only**: The status is updated but not sent.
  - **after a change**: The status is sent after a change.
  - **after request**: The status is sent after a request.
  - **after a change or request**: The status is sent after a change or a request.
3.2.4.2 Parameter window - Automatic operation

This parameter window is visible if in parameter window Fan, the option Enable automatic operation has been selected with the option yes.

In this parameter window, the threshold values for switchover of the fan speed are defined. Furthermore, the limitations can also be enabled.

### Important

The Fan Coil Actuator evaluates the threshold values in ascending order, i.e. first of all the threshold value for OFF <-> Fan speed 1 is checked followed by Fan speed 1 <-> Fan speed 2 etc. The correct method of function is only assured if the threshold value for OFF <-> Fan speed 1 is less than the threshold value Fan speed 1 <-> Fan speed 2 and this is less than Fan speed 2 <-> Fan speed 3, etc.

#### Object value "automatic On/Off"
switch on to the automatic

Options: 1 0

This parameter defines how to react to a telegram.

- 1: Automatic is activated by a telegram with value 1.
- 0: Automatic is activated by a telegram with value 0.
Threshold value OFF <-> speed 1 in %
[1...100]
Options: 1…10…100
Here the threshold value is set, at which switch on of fan speed 1 occurs. If the value in the control value communica-
tion object is greater than the parameterized threshold value, fan speed 1 is switched on. If the value is less, than it is
switched off.

Threshold value speed 1 <-> speed 2 in %
[1...100]
Options: 1…30…100
Here the threshold value, at which switch over to fan speed 2 occurs, is set. If the value in the communication object
Control value HEATING or Control value COOLING is greater than the parameterized threshold value, switch over to
fan speed 2 occurs.

Threshold value speed 2 <-> speed 3 in %
[1...100]
Options: 1…70…100
Here the threshold value, at which switch over to fan speed 3 occurs, is set. If the value in the communication object
Control value HEATING or Control value COOLING is greater than the parameterized threshold value, switch over to
fan speed 3 occurs.

Hysteresis
threshold value in % +/- [0…20 %]
Options: 0…5…20
Here a hysteresis is set at which switchover to the next fan speed occurs. The hysteresis applies for all three threshold
values.

The setting 0 causes immediate switching without hysteresis.

The entered percentage value is directly added to or subtracted from the percentage value of the Fan speed threshold
value x. The result is a new upper or lower threshold value.

Switch threshold top (switch on) = threshold value + hysteresis
Switch threshold bottom (switch off) = threshold value - hysteresis
Example: Three speed fan, hysteresis with fan control

Using hysteresis, a continuous switching between the fan speeds around the threshold value with deviating input signals can be avoided.

Important

How does the fan react if the switch thresholds overlap by the use of hysteresis?

1) The hysteresis defines from which point the set speed transition occurs.
2) If the speed transition occurs, the new speed is determined using the control value and the set switch thresholds. The hysteresis is not considered.
3) A control variable with the value 0 always results in speed 0.

An example:

Parameterized:  
<table>
<thead>
<tr>
<th>Threshold value</th>
<th>&lt;&gt; speed 1 = 10 %</th>
<th>&lt;&gt; speed 2 = 20 %</th>
<th>&lt;&gt; speed 3 = 30 %</th>
<th>Hysteresis 15 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Behaviour when ascending from speed 0:
- Speed 0 transition at 25 % (≥ 10 % + hysteresis).
- The new speed is 2 (25 % is between 20 and 30 %).
- Accordingly, speed 1 is omitted.

Behaviour when descending from speed 3:
- Speed 3 transition at 14 % (< 30 % – hysteresis).
- The new speed is 1 (15 % is between 10 and 20 %).
- Accordingly, speed 2 is omitted.
Minimum dwell period in fan speed
in s [0...65,535]
Options: 0...30...65,535
This parameter defines the dwell time for a fan speed of the fan until it switches to the next higher or lower
fan speed. The input is made in seconds.
A setting of 0 means non-delayed switching. The minimum switch times of the relay can be found in the
Technical data, page 7.
The dwell time in a fan stage is only considered in automatic mode.
Enable limitations
Option: no
yes
• yes: Other parameters appear.
  At the same time, 4 communication objects for limitation of the fan speed are enabled:
  • Limitation 1, e.g. for frost/heat protection
  • Limitation 2, e.g. for comfort operation
  • Limitation 3, e.g. for night shutdown
  • Limitation 4, e.g. for standby operation
  Speed ranges (limitations) are defined for the fan with the function Speed limitation which may not
  be exceeded or undershot.
  Four limitations are available. They can be used, for example, for the control of various operating
  modes, e.g. frost/heat protection, comfort, night shut down and standby. In normal cases, the ther-
  mostat takes these operating modes into account in its control variable for the actuator.
  Important
  The parameterized starting behaviour, which is a technical characteristic of the fan, has a higher
  priority than a limitation or forced operation, i.e. if a limitation is activated in fan speed 2 and a
  start-up behaviour is parameterized via fan speed 3, the following behaviour will result: The fan
  is in the OFF state and receives a control signal for fan speed 1. Initially, the fan operates at fan
  speed 3 (start-up speed) and then proceeds to fan speed 2 that is defined by the limitation. The
  actual required fan speed 1 will not be achieved due to the limitation.
  The sequence of the displayed parameters corresponds with their priorities, i.e. the parameter with the
  highest priority has limitation 1 followed by limitation 2, 3 and 4.
  Note
  The fault operation, e.g. as with a malfunction of the thermostat has a lower priority than the fan limita-
  tion, i.e. by a limitation of the fan speed during a thermostat malfunction only the upper or the lower limit
  of the fan limitation can be set at best.
When automatic mode is exited, e.g. by a manual action, the limitations 1 to 4 are inactive. The set limitations are reactivated after automatic operation is reactivated.

The following points apply for limitations:

- The fan speed and valve position can be parameterized independently.
- The limitation need not necessarily apply to one fan speed only. It can also encompass another range of the fan speeds, i.e. only certain fan speeds can be set if the limitation is active. In this way, a limited control is also possible.
- The Limitation is activated if a telegram with the value 1 is received on the communication object Limitation x. The Limitation is deactivated if a telegram with the value 0 is received on the communication object Limitation x. A manual action ends automatic mode.
- If a limitation is activated, the Fan Coil Actuator switches to the parameterized fan speed regardless of the control value. If during the activation of the limitation another fan stage or a fan stage outside the range of the “limitation range” is set, the required fan stage or the limit fan stage of the range is set.
- After switch off of the limitations, the fan speed and the communication objects for valve control are recalculated and executed. This means that during limitation the actuator operates normally in the background, the outputs are not changed and implementation only occurs after the end of limitation.

There are the same parameters for each of the individual four limitations used to limit the fan speeds.

<table>
<thead>
<tr>
<th>Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>The priority is according to the listed sequence. The highest priority is assigned to limitation 1, e.g. Frost/Heat protection; the lowest priority is assigned to limitation 4, e.g. standby operation.</td>
</tr>
</tbody>
</table>
Speed with limitation 1
Speed with limitation 2
Speed with limitation 3
Speed with limitation 4
Options: 3, 2, 1, off
\[\text{unchanged}\]
on
1
1, off
2
2, 1
2, 1, off
3
3, 2
3, 2, 1

With this parameter, you set which fan speed is set with active limitation or which speed is not exceeded or undershot.

- 3, 2, 1, off: Everything is possible.
- unchanged: The state is retained.
- Off: Off.
- 1: limited to speed 1.*
- 1, off limited to speed 1 and off.
- 2: limited to speed 2.*
- 2, 1: limited to speed 2 and 1.
- 2, 1, off: limited to speed 2, 1 and off.
- 3: limited to speed 3.*
- 3, 2: limited to speed 3 and 2.
- 3, 2, 1: limited to speed 3, 2 and 1.

* The control value is ignored.
### Parameter window - Direct operation

This parameter window is visible if in parameter window **Fan**, the option **Enable direct operation** has been selected with the option **yes**.

<table>
<thead>
<tr>
<th>General</th>
<th>Enable communication object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>&quot;Switch speed x&quot; 1 bit</td>
</tr>
<tr>
<td>Control Input</td>
<td>&quot;Fan speed up/down&quot; 1 bit</td>
</tr>
<tr>
<td>Fan</td>
<td>&quot;Fan speed switch&quot; 1 byte</td>
</tr>
<tr>
<td>- Status messages</td>
<td></td>
</tr>
<tr>
<td>- Automatic operation</td>
<td></td>
</tr>
</tbody>
</table>

**Enable communication object**

**"Switch speed x" 1 bit**

Options:  
- No
- Yes

- **Yes**: Three 1 bit communication objects **Speed 1**, **Speed 2** and **Speed 3** are enabled.

The Room Master receives a setting telegram via these communication objects.

<table>
<thead>
<tr>
<th>Telegram value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fan speed x is switched on</td>
</tr>
<tr>
<td>0</td>
<td>Fan speed x is switched on</td>
</tr>
</tbody>
</table>

If several ON/OFF telegrams are received consecutively in a short period of time at various communication objects **Fan speed 1-3**, the value last received by the fan control is the decisive value. An OFF telegram to one of the three communication objects, **Fan speed 1...3**, switches off the fan completely.

### Important

- The forced operation remains valid and is considered.
- The parameterized minimum dwell time in the fan speed for automatic mode is ignored during manual operation. Accordingly, an immediate reaction to the manual operation is detected.
- The delay time with speed switch over remains active to protect the fan.
Enable communication object
"Fan speed up/down" 1 bit
Options: no
yes
• yes: A communication object 1 bit Fan speed UP/DOWN is enabled.
Telegram value
1 = a fan speed is switched UP
0 = a fan speed is switched DOWN
If the maximum fan speed is achieved and a further telegram with the value 1 is received the fans speed will remain as it is.

<table>
<thead>
<tr>
<th>Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>The forced operation remains valid and is considered.</td>
</tr>
<tr>
<td>The parameterized minimum dwell time in the fan speed for automatic mode is ignored during manual operation. Accordingly, an immediate reaction to the manual operation is detected.</td>
</tr>
<tr>
<td>The delay time with speed switch over remains active to protect the fan.</td>
</tr>
</tbody>
</table>

With multiple manual UP or DOWN switching, the target speed will be increased or reduced by a speed step. This is possible until the maximum or minimum possible speed is achieved. Further UP or DOWN telegrams are ignored and not executed. Each new switching telegram initiates a new calculation of the target speed. This means that the target speed can be changed by switching telegrams until the target speed is achieved.

Enable communication object
"Fan speed switch" 1 byte
Options: no
yes
• yes: The 1 byte communication object Fan speed switch is enabled.
### 3.2.5 Parameter window Two level fan

In this parameter window, all settings for the *Two-level fan* are undertaken.

<table>
<thead>
<tr>
<th>General</th>
<th>Fan type</th>
<th>multi-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>Speed on 2 limit</td>
<td>yes</td>
</tr>
<tr>
<td>Control input</td>
<td>Fan Operation Mode note technical data of Fan III</td>
<td>Changeover switch</td>
</tr>
<tr>
<td>Fan</td>
<td>Delay between fan speed switching in ms [0..3,000]</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Fan speed on bus voltage failure</td>
<td>unchanged</td>
</tr>
<tr>
<td></td>
<td>Fan speed on bus voltage recovery</td>
<td>unchanged</td>
</tr>
<tr>
<td></td>
<td>Enable communication object “Forced operation” 1 bit</td>
<td>no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enable automatic operation</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable direct operation</td>
<td>no</td>
</tr>
<tr>
<td>Starting characteristic of fan</td>
<td>no</td>
</tr>
</tbody>
</table>

If a fan with two fan speeds is to be controlled via the FCA/S, the following parameters must be set:

- Select the option *multi-level* with parameter *Fan type* in the parameter window *Fan*.
- For parameter *Speed on 2 limit*, the option *yes* must be selected.

Now a two speed fan is controlled via fan speeds 1 and 2.

Fan speed 3 with all its parameters and options is now non-functional.

**Note**

Further parameters and their settings can be found in *Parameter window Multi-level fan*, page 38.
### Parameter window One-level fan

In this parameter window, all settings for the one-level fan are undertaken.

<table>
<thead>
<tr>
<th>General</th>
<th>Fan type</th>
<th>Fan speed on bus voltage failure</th>
<th>Fan speed on bus voltage recovery</th>
<th>Enable communication object “Forced operation” 1 bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>one-level</td>
<td>unchanged</td>
<td>unchanged</td>
<td>no</td>
</tr>
<tr>
<td>Control input</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fan type**

Option: multi-level

The fan type to be controlled is set with this parameter.

If a fan with up to three speeds is to be controlled, the option multi-level must be selected.

If a fan with one speed is to be controlled, the option one-level must be selected.

**Fan speed on bus voltage failure**

Option: unchanged

The behaviour of the fan on bus voltage failure is defined here.
Fan speed on bus voltage recovery
Options:  unchanged
          off
          on

The behaviour of the fan on bus voltage recovery is defined here.

- **unchanged**: The fan speed of the fan remains unchanged.
- **Off**: The fan is switched off.
- **On**: The fan is switched on.

**Caution**
The FCA/S is supplied ex-works with a default setting (factory default). This ensures the fan setting is switched off when the bus voltage is applied to the relay for the first time. Thus, damage to the device due to unintentional switch on during transport, e.g. due to vibration, is avoided.

It is advisable to apply a bus voltage before connecting the fan in order to achieve a defined switch state of the fan. This eliminates the possibility of the destruction of the fan due to an incorrect contact setting.

Enable communication object
“Forced operation” 1 bit
Options:  no
          yes

- **yes**: A 1 bit communication object *Forced operation* is enabled. The following parameters appear at the same time:

  **Forced operation on object value**
  Options:  1
             0

  - **1**: Forced operation is activated by a telegram with value 1.
  - **0**: Forced operation is activated by a telegram with value 0.

**Behaviour with forced operation**
Options:  unchanged
          off
          on

This parameter defines how the fan should respond with forced operation.
Enable automatic operation
Options: no yes
- yes: Automatic mode is enabled; an additional parameter window Automatic operation appears.

Time function on ON
Options: none switching delay minimum time
The function Time at fan ON is defined here with this parameter.
- none: No function Time is executed.
- switching delay: The fan is switched on using this delay.
- minimum time: The fan remains ON for at least this time.
With option switching delay, the following parameters appear:

   Time in s [1…65,535 x 0.1]
   Options: 1…20…65,535
   The fan is switched on using this delay.

With option minimum time, the following parameters appear:

   Time in s [1…65,535]
   Options: 1…20…65,535
   The fan remains ON for at least this time.

Function time on OFF
Options: none switching delay minimum time
The function Time at fan ON is defined here with this parameter.
- none: No function Time is executed.
- switching delay: The fan is switched off using this delay.
- minimum time: The fan remains OFF for at least this time.
With option switching delay, the following parameters appear:

   Time in s [1…65,535 x 0.1]
   Options: 1…20…65,535
   The fan is switched off using this delay.

With option minimum time, the following parameters appear:

   Time in s [1…65,535]
   Options: 1…20…65,535
   The fan remains OFF for at least this time.
3.2.6.1 Parameter window - Status messages

In this parameter window, the Status messages are defined.

<table>
<thead>
<tr>
<th>General</th>
<th>Enable communication object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>“Status byte mode” 1 byte</td>
</tr>
<tr>
<td>Control input</td>
<td>Enable communication object</td>
</tr>
<tr>
<td>Fan</td>
<td>“Status Fan ON/OFF” 1 bit</td>
</tr>
<tr>
<td>Status messages</td>
<td></td>
</tr>
<tr>
<td>Valve Heating</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
</tr>
<tr>
<td>Valve Cooling</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
</tr>
</tbody>
</table>

Enable communication object
“Status byte mode” 1 bit
Options: no, yes

From this status byte, the states HEATING, COOLING, automatic, forced operation and the four limitations are indicated directly via a 1 bit coding.

For further information see: Status byte forced/operation, page 152

- yes: The communication object Status byte mode is enabled. The following parameter appears:

  Send object values
  Options: no, update only
  after a change
  after request
  after a change or request

  - no, update only: Der Status wird aktualisiert, aber nicht gesendet.
  - after a change: The status is sent after a change.
  - after request: The status is sent after a request.
  - after a change or request: The status is sent after a change or a request.
Enable communication object
“Status Fan On/Off” 1 bit
Options: no yes
The communication object Status fan can be enabled with this parameter.

Some fans initially require an ON telegram before they are set to a fan speed from the OFF state. This ON telegram acts on a main switch, which has to be switched on. This demand can be implemented with any switch output which is controlled via the Status fan communication object. The corresponding switch communication object of the switch actuator should be connected with the Status fan communication object.

With the option yes, the following parameters appear:

Send object value
Options: no, update only after a change after request after a change or request

- no, update only: The status is updated but not sent.
- after a change: The status is sent after a change.
- after request: The status is sent after a request.
- after a change or request: The status is sent after a change or a request.

Enable communication object
"Status automatic" 1 bit
Options: no yes
The communication object Status automatic is enabled with this parameter.

Telegram value 1 = automatic operation active
0 = automatic operation inactive

- yes: The following parameter appears:

Send object values
Options: no, update only after a change after request after a change or request

- no, update only: The status is updated but not sent.
- after a change: The status is sent after a change.
- after request: The status is sent after a request.
- after a change or request: The status is sent after a change or a request.
### 3.2.6.2 Parameter window - Automatic operation

This parameter window is visible if in parameter window Fan, the option Enable automatic operation has been selected with the option yes.

<table>
<thead>
<tr>
<th>General</th>
<th>Manual</th>
<th>Control input</th>
<th>Fan</th>
<th>Status messages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Automatic operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Valve Heating</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Valve Cooling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Function</td>
</tr>
</tbody>
</table>

The corresponding valve control communication object receives the value 1 if a fan speed is set. If a fan speed is not set, the communication object will receive the value 0.

**Object value "automatic On/Off" switch on to the automatic**

Options: 1 0

This parameter defines how to react to a telegram.

- 1: Automatic is activated by a telegram with value 1.
- 0: Automatic is activated by a telegram with value 0.

**Threshold value OFF -> ON in % [1…100]**

Options: 1…10…100

Here the threshold value, at which switch on occurs, is defined. If the value in the control value communication object is greater than or equal to the parameterized threshold value, it is switched on. If the value is less, then it is switched off.
Hysteresis
threshold value in % +/- [0…20 %]
Options: 0…5…20

Using this parameter a hysteresis, at which switchover to the next fan speed occurs, is set. The hysteresis applies for all three threshold values.

The setting 0 causes immediate switching without hysteresis.

The entered percentage value is directly added to or subtracted from the percentage value of the Fan speed threshold value x. The result is a new upper or lower threshold value.

Example, a three speed fan, hysteresis with fan control

Using hysteresis, a continuous switching between the fan speeds around the threshold value with deviating input signals can be avoided.

Enable limitations
Option: no
yes

yes: Other parameters appear.

At the same time, 4 communication objects for limitation of the fan speed are enabled:

- Limitation 1, e.g. for frost/heat protection
- Limitation 2, e.g. for comfort operation
- Limitation 3, e.g. for night shutdown
- Limitation 4, e.g. for standby operation

Speed ranges (limitations) are defined for the fan with the speed limitation function which may not be exceeded or undershot.
Four limitations are available. These can be used, for example, for the control of various operating modes such as frost/heat protection, night shut-down and standby. In normal cases, the thermostat takes these operating modes into account in its control variable for the actuator.

**Important**

The parameterized starting behaviour, which is a technical characteristic of the fan, has a higher priority than a limitation or forced operation, i.e. if a limitation is activated in fan speed 2 and a start-up behaviour is parameterized via fan speed 3, the following behaviour will result: The fan is in the OFF state and receives a control signal for fan speed 1. Initially, the fan operates at fan speed 3 (start-up speed) and then proceeds to fan speed 2 that is defined by the limitation. The actual required fan speed 1 will not be achieved due to the limitation.

The sequence of the displayed parameters corresponds with their priorities, i.e. the parameter with the highest priority has limitation 1 followed by limitation 2, 3 and 4.

**Note**

The fault operation, e.g. as with a malfunction of the thermostat has a lower priority than the fan limitation, i.e. by a limitation of the fan speed during a thermostat malfunction only the upper or the lower limit of the fan limitation can be set at best.

When automatic mode is exited, e.g. by a manual action, the limitations 1…4 remain.

The following points apply for limitations:

- The fan speed and valve position can be parameterized independently.
- The limitation need not necessarily apply to one fan speed only. It can also encompass another range of the fan speeds, i.e. only certain fan speeds can be set if the limitation is active. In this way, a limited control is also possible.
- The limitation is activated if a telegram with the value 1 is received on the limitation communication object. The Limitation is deactivated if a telegram with the value 0 is received on the communication object Limitation x. A manual action ends automatic mode.
- If a limitation is activated, the Fan Coil Actuator switches to the parameterized fan speed regardless of the control value. If during the activation of the limitation another fan stage or a fan stage outside the range of the “limitation range” is set, the required fan stage or the limit fan stage of the range is set.
- After switch off of the limitations, the fan speed and the communication objects for valve control are recalculated and executed. This means that during limitation the actuator operates normally in the background, the outputs are not changed and implementation only occurs after the end of limitation.

There are the same parameters for each of the individual four limitations used to limit the fan speeds. The priority is according to the listed sequence. The highest priority is assigned to limitation 1, e.g. Frost/Heat protection; the lowest priority is assigned to limitation 4, e.g. standby operation.
Fan with limitation 1
Fan with limitation 2
Fan with limitation 3
Fan with limitation 4
Options:  inactive
          unchanged
          OFF
          ON

With this parameter, you set which fan speed is set with active limitation, or which speed is not exceeded or undershot.
Parameter window Valve HEATING – 3-point, opening and closing

In this parameter window, all settings for the Valve HEATING are undertaken.
This parameter is visible if in parameter Valve control, the option 3 point, opening and closing has been selected.

Valve control
Options: Continuous, PWM
3 point, opening and closing

With this parameter, the properties of the connected valve are set (Pulse width modulation (PWM), page 139).

Observe reversing time
Options: no
100/300/500/700/1,000 ms

A reversing time pause is set via this parameter.
The time should be taken from the technical data of the valve.

Valve position on bus voltage failure in % [0…100]
Note: unchanged

The valve remains unchanged at its position with a bus voltage failure.
Valve position after bus voltage recovery
Option: unchanged
select

Using this parameter, the position of the valves after bus voltage recovery can be set.

- select: The following parameter appears:
  - Valve position in % [0…100]
  Option: 0…100

  Using this parameter, the position of the valves after bus voltage recovery can be set as a percentage.

Valve control duration from 0 to 100 % in s [10…6,000]
Option: 10…180…6,000

With this parameter, a time is set in seconds that the connected valve requires to move from position 0 % (valve closed) to position 100 % (valve fully open).

Note
The time should be taken from the technical data of the valve.

Correct valve characteristic curve
Option: no
yes

If the option yes is set in the parameter, the Parameter window - Curve, page 76 appears, in which the valve curve is set.

Automatically adjust valve position
Option: no
yes

- no: Nothing happens.
- yes: A further parameter appears:

Note
A manual triggering of the adjustment is not possible!

Adjust with control value 0 %
Any action with control value 0 % is executed as an adjustment, i.e.:

- The valve is fully closed regardless of the curve.
- The closing position is exceeded by 5 % of the total time, max. one minute.
- This function cannot be interrupted!
- Thereafter, the current valve position is approached, and the adjustment counter is set to 0.
The following applies with automatic adjustment

- The adjustment counter is incremented by 1 every time the valve stops.
- If the parameterized limit of the adjustment counter is exceeded in the closing direction, the adjustment starts.
- If higher priorities are activated at the time of automatic adjustment, the adjustment will be performed later.
- The adjustment is interrupted by higher priority events.
- The valve is fully closed regardless of the curve.
- The closing position is exceeded by 5% of the total time, max. one minute. This function cannot be interrupted! Thereafter, the current valve position is approached, and the adjustment counter is set to 0.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A valve adjustment has occurred if a control of the drive has actually been undertaken. If priorities and curves prevent this, the adjustment counter will not change.</td>
</tr>
</tbody>
</table>

Reference movement

A referencing or homing run can be understood as a complete closing of the valve.

Referencing is undertaken after:

- Every reset of the bus.
- A change of version.
- Every reset of an un-parameterized device
- A download with modified adjustment time.

The following should be considered:

- Referencing cannot be interrupted.
- The closing position is exceeded by 5% of the total time, max. one minute.
- After the reference movement, the current valve position is moved to and the adjustment counter is set to 0.

For further information see: Priorities with..., page 148

Number of valve controls

up to adjustment [1...65,535]

Option: 1...100...65,535

With this parameter, the number of operations (valve controls), after which automatic adjustment is undertaken, can be set.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>All actions greater than zero (motor does not move) are counted. The number should be taken from the technical data of the valve manufacturer.</td>
</tr>
</tbody>
</table>
3.2.7.1 Parameter window Valve HEATING – Continuous PWM

This parameter appears if the option Continuous, PWM has been selected with the Valve control parameter.

For further information see: Pulse width modulation (PWM), page 139

Valve control
Options: Continuous, PWM

Valve type
Options: de-energised closed, de-energised opened

Using this parameter the valve type for the connected valve is set.

**How does a de-energised closed (normally closed) valve behave?**
If no current flows in the control circuit the valve is closed. The valve is opened as soon as current flows in the control circuit.

**How does a de-energised opened (normally open) valve behave?**
If no current flows in the control circuit the valve is opened. The valve is closed as soon as current flows in the control circuit.

- **de-energised closed**: The following parameter appears:

  **Valve position on bus voltage failure**
  Note: closed
  The valve remains closed at bus voltage failure.
• *de-energized opened*: The following parameter appears:

  **Valve position on bus voltage failure**
  
  Note: opened
  
  The valve remains opened at bus voltage failure.

**Valve position after bus voltage recovery**

Option: unchanged
select

Using this parameter, the position of the valves after bus voltage recovery can be set.

• *select*: The following parameter appears:

  **Valve position in % [0...100]**
  
  Option: 0...100

  Using this parameter, the position of the valves after bus voltage recovery can be set as a percentage.

**Cycle time of the PWM in s**

[10...6,000]

Option: 10...180...6,000

This is used to set the cycle time of the PWM control.

<table>
<thead>
<tr>
<th>Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>The minimum pulse length is defined as 0.5 seconds, so that with very short cycle times (&lt; 1 min.), there are very short switch on times (with small percentage values) or switch off times (with higher percentage values).</td>
</tr>
</tbody>
</table>

**Valve control duration from 0 to 100 % in s [10...6,000]**

Option: 10...180...6,000

With this parameter, a time is set in seconds that the connected valve requires to move from position 0 % (valve closed) to position 100 % (valve fully open).

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The time should be taken from the technical data of the valve and corresponds with the total runtime.</td>
</tr>
</tbody>
</table>

**Valve control duration from 100 to 0 % in s [10...6,000]**

Option: 10...180...6,000

With this parameter, a time is set in seconds that the connected valve requires to move from position 100 % (valve open) to position 0 % (valve fully closed).

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The time should be taken from the technical data of the valve and corresponds with the total runtime.</td>
</tr>
</tbody>
</table>
Fast heat up/cool down

In addition to the adjustable time, an additional time is determined in dependence on the change in control value. Thus, faster heat up or cool down of a room is achieved. For determination of the additional time the difference between the current and the new control value is determined. The additional time is dependent on how large the control value change should be from the current control value to the new control value.

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the change in control value ascends, i.e. the current control value is at 10 % and the new control value is at 20 %, fast heat up is activated.</td>
</tr>
<tr>
<td>If the change in control value descends, i.e. the current control value is at 60 % and the new control value is at 40 %, fast cool down is activated.</td>
</tr>
</tbody>
</table>

For further information see: Fast heat up/cool down, page 149

Correct valve characteristic curve

Option: no yes

If the option yes is set in the parameter, the Parameter window - Curve, page 76 appears, in which the valve curve is set.
3.2.7.2 Parameter window - Function

Various communication objects can be enabled in the parameter window - *Function*.

Enable communication object "Block" 1 bit
Options: no yes
- yes: The 1 bit communication object *Block* is enabled and can then be used for blocking. The following parameter appears:

  Disable on object value
  Options: 1 0

  This parameter defines the communication object value, which disables/blocks the valve.

Enable communication object "Forced operation" 1 bit
Options: no

Enable communication object "Valve position status" 1 byte/2 bit
Options: no

Enable valve purge
Options: no
Enable communication object
"Forced operation" 1 bit
Options:  no  yes
- yes: The 1 bit communication object Forced operation is enabled and can thus be forced operated. The following parameters appear:

  Forced operation on object value
  Options:  1  0
  This parameter defines the communication object value which forcibly operates the valve.

  Valve position on forced operation
  in % [0…100]
  Options:  0…30…100
  This parameter determines the valve position in percent during forced operation.

Enable communication object
"Valve position status" 1 byte/1 bit
Options:  no
- 1 bit
  1 byte

Note
The valve position status is sent immediately after the control value is received.

- 1 bit The following parameters appear:
  Send object value
  Options:  no, update only
  after a change
  after request
  after a change or request
  - no, update only: The status is updated but not sent.
  - after a change: The status is sent after a change.
  - after request: The status is sent after a request.
  - after a change or request: The status is sent after a change or a request.

Object value with valve position >0
Options:  1  0
• **1 byte:** The following parameter appears:

  **Send object value**
  Options: 
  - no, update only
  - after a change
  - after request
  - after a change or request

  - **no, update only:** The status is updated but not sent.
  - **after a change:** The status is sent after a change.
  - **after request:** The status is sent after a request.
  - **after a change or request:** The status is sent after a change or a request.

**Enable valve purge**
Options: 
- no
- yes

  - **yes:** The 1 bit communication object *Trigger valve purge* is enabled. The following parameters appear:

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the valve purge is interrupted by a higher priority, it will restart after the completion of the priority task, unless, for example, the control value was 100 % or it was active for the duration of the purge time due to the higher priority. The valve position for purging is always the control value 100 %. For further information see: Priorities with ..., page 148</td>
</tr>
</tbody>
</table>

**Enable communication object**
"*Status valve purge*" 1 bit
Options: 
- no
- yes

  - **yes:** The 1 bit communication object *Status valve purge* is enabled.

The status of the valve purge is visible via this communication object. The following parameter appears:

  **Send object value**
  Options: 
  - no, update only
  - after a change
  - after request
  - after a change or request

  - **no, update only:** The status is updated but not sent.
  - **after a change:** The status is sent after a change.
  - **after request:** The status is sent after a request.
  - **after a change or request:** The status is sent after a change or a request.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The status is sent immediately as soon as a new control value is received.</td>
</tr>
</tbody>
</table>
### Duration of valve purge in min.

| Options: | 1...10...255 |

This parameter defines the time duration for the valve purge. In this time, the valve is fully opened. When the time has elapsed, the state before the purge is re-established.

**Note**
The opening time of the valve must be considered when entering the purge time.

### Automatic valve purge

**Options:**
- no
- yes

- yes: The following parameters appear:
  - **Purge cycle in weeks**
    | Options: | 1...6...12 |

  The counter for automatic purging starts to run when the parameter is downloaded. The time is reset each time it is downloaded.

  The time is reset as soon as purging is completed. This can occur either through automatic purging or via the communication object *Trigger valve purge*.

  **Note**
Purging can also be triggered via the bus with the communication object *Trigger valve purge*. After bus voltage recovery and download the purge cycle continues, the bus failure time – the time for which the bus actually failed – is not considered.

  The purging cycle will restart if *Purge cycle in weeks* [1...12] is changed after the download.

### Reset purge cycle from control value in % [1...99]

**Options:**
- 1...99

Hereby, the purge cycle from the set control value is reset.
3.2.7.3 Parameter window - Curve

The parameter window - Curve is visible if in the parameter window Valve HEATING, the Correct valve characteristic curve has been selected with the option yes.

The following must be considered with the curve entries:

- The value pairs can be entered in any sequence. They are sorted in ascending order of the control value in the device, and intermediate values are interpolated.
- If value pairs have the same control value, the value pair with the largest value position applies. All other value pairs are ignored.
- The value pair with the smallest valve position applies for the correction of the smaller control values.
- If no value pair has been entered for the control value 0 %, the valve position of the first value pair applies for all control values from 0 to the first value pair.
- If no value pair has been entered for the control value 100 %, the valve position from the last value pair up to 100 % applies for the last value pair.

Note

The characteristic curve adjustment is active with forced operation.

Caution

A parameterization of the value pair with the same control value leads to an undefined state and should be strictly avoided. Otherwise it can lead to destruction of the HVAC system.
Value pair 1
Control value in % [0...100]
Options: 0…100
Valve position in % [0…100]
Options: 0…100

Value pair 2
Control value in % [0...100]
Options: 0…100
Valve position in % [0…100]
Options: 0…100

Value pair 1 forms the lower limit and value pair 2 forms the upper limit of the curve.
The possibility of activating other value pairs allows different curve characteristics to be realised.
For further information see: Valve curve, page 135

A total of four value pairs can be set.

Further value pair
Options: no
yes

• yes: A further value pair can be set.

Value pair 3
Control value in % [0...100]
Options: 0…50…100
Valve position in % [0…100]
Options: 0…50…100

Further value pair
Options: no
yes

• yes: A further value pair can be set.

Value pair 4
Control value in % [0...100]
Options: 0…50…100
Valve position in % [0…100]
Options: 0…50…100
3.2.8 Parameter window Valve COOLING

The setting options of Valve COOLING do not differentiate from those of Valve HEATING.

The descriptions of the parameter setting options and adjustable communication objects for the valve COOLING are described under Parameter window Valve HEATING – 3-point, opening and closing, page 66.
3.2.9 Parameter window Input A

In this parameter window, all settings for the Input A are undertaken.

This parameter window is visible if in Parameter window General, page 24, in parameter Input a (binary input, contact scanning), the option yes has been selected.

<table>
<thead>
<tr>
<th>General</th>
<th>Distinction between long and short operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>on</td>
</tr>
<tr>
<td>Control input</td>
<td>off</td>
</tr>
<tr>
<td>Fan</td>
<td></td>
</tr>
<tr>
<td>- Status messages</td>
<td></td>
</tr>
<tr>
<td>- Automatic operation</td>
<td></td>
</tr>
<tr>
<td>Valve Heating</td>
<td></td>
</tr>
<tr>
<td>- Function</td>
<td></td>
</tr>
<tr>
<td>Valve Cooling</td>
<td></td>
</tr>
<tr>
<td>- Function</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input A</th>
<th>Reaction on opening the contact (falling edge)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scan input after download, bus reset and bus voltage recovery</th>
<th>debounce time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cyclic sending of object “Switch”</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activate minimum signal time with rising edge</th>
<th>Activate minimum signal time with falling edge</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

Distinction between long and short operation
Options: no yes

Using this parameter, you decide if the input differentiates between short and long operation.

- yes: After opening/closing of the contact, it must first of all be ascertained if a short or long operation has occurred here. Only thereafter will a possible reaction be triggered.

The following drawing shows the function in detail:

\[ T_l \] is the time duration from where a long operation is detected.
### 3.2.9.1 Parameter Distinction between long and short operation – no

If the option **no** is selected with the parameter *Distinction between long and short operation*, the following parameters in the parameter window *Input A* are visible.

**General**
- Manual
- Control input
  - Fan
    - Status messages
    - Automatic operation
  - Valve Heating
    - Function
  - Valve Cooling
    - Function

<table>
<thead>
<tr>
<th>Input A</th>
<th>Distinction between long and short operation</th>
<th>Reaction on closing the contact (rising edge)</th>
<th>Reaction on opening the contact (falling edge)</th>
<th>Scan input after download, ETS reset and bus voltage recovery</th>
<th>Debounce time</th>
<th>Cyclic sending of object “Switch”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no</td>
<td>0 off</td>
<td>0 off</td>
<td>0 off</td>
<td>50 ms</td>
<td>0 no</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reaction on closing the contact (rising edge)**
- Options: on
  - off
  - TOGGLE
  - no reaction
  - terminate cyclic sending

**Reaction on opening the contact (falling edge)**
- Options: on
  - off
  - TOGGLE
  - no reaction
  - terminate cyclic sending

For each edge, a definition is made to determine if the object value **ON**, **OFF** or **TOGGLE** is switched or if there should be **no reaction**.

**Scan input after download, ETS reset and bus voltage recovery**
- Options: no
  - yes
  - no: The communication object value is not scanned after a download, ETS reset and bus voltage recovery.
  - yes: The communication object value is scanned after a download, ETS reset and bus voltage recovery. The following parameter appears:
Inactive wait state after bus voltage recovery in s \([0...30,000]\)
Options: \(0...30,000\)

Here the waiting time after a bus voltage recovery is set. After the waiting time has elapsed, the state on the input terminals is scanned. The input reacts as if the state on the input terminals has just been set/not set.

**Note**
The inactive waiting time does not add to the actual, adjustable send delay time. This can be set separately.

### Debounce time
Options: \(20/30/50/70/100/150\) ms

Debouncing prevents unwanted multiple operations of the input, e.g. due to bouncing of the contact.

**What is the debounce time?**
If an edge is detected at an input, the input will react immediately to this edge (e.g. by sending a telegram). At the same time, the duration of the debounce time \(T_D\) starts. The signal on the input is not evaluated within the debounce time duration.

**Example: Debounce time of the input signal for a detected edge:**

![Debounce time diagram](image)

After detection of an edge on the input, further edges are ignored for the debounce time \(T_D\).

### Cyclic sending of object “Switch”
Options: 
- no
- yes
- yes: The following parameters appear:
with object value
Options:  
1
0
0 or 1

- 1: The communication object value is sent cyclically with 1.
- 0: The communication object value is sent cyclically with 0.
- 0 or 1: The communication object is sent cyclically.

What is cyclic sending?
Cyclic sending enables the communication object Switch to send automatically at a fixed interval.

If cyclic sending is only carried out for a specific communication object value (ON or OFF), this condition refers to the value of the communication object. It is therefore possible in principle to start cyclic sending by sending a value to the communication object Switch. As this behaviour is generally unwanted, the flags Write and Update of the communication object are deleted in the preliminary setting so that they cannot be changed via the bus. If this functionality is still required however, these flags should be set accordingly.

With changes to the communication object Switch and after bus recovery changes (after the send delay time has elapsed), the communication object value is sent immediately on the bus and the transmission cycle time restarts.

Telegram repeated
in s [1…65,535]
Options: 1…60…65,535

The send cycle time describes the time used between two cyclically sent telegrams.

Activate minimum signal time
with rising edge
Options: no
yes

- yes: The following parameter appears:

  in value x 0.1 s [1…65,535]
Options: 1…65,535
Activate minimum signal time with falling edge
Options: no yes
  yes: The following parameter appears:
  in value x 0.1 s [1...65,535]
  Options: 1...65,535

What is the minimum signal time?
In contrast to the debounce time, a telegram is only sent after the minimum signal duration has elapsed.

The individual functions:
If an edge is detected on the input, the minimum signal duration will commence. No telegram is sent on the bus at this time. The signal on the input is observed within the minimum signal duration. If a further edge appears at the input during the minimum signal duration, it will be interpreted as a new operation, and the minimum signal duration restarts. If the input signal duration has not changed during the minimum signal duration, an edge is detected and a telegram is sent on the bus.

Example: Minimum signal duration of the input signal for a detected edge:

As only two edges remain stable for the minimum signal time $T_M$, only these are detected as valid.
3.2.9.2 Parameter Distinction between short and long operation – yes

If with parameter Distinction between long and short operation, the option yes has been selected, the following parameters in parameter window Input A are visible.

**Reaction on short operation**
Options: on
off
TOGGLE
no reaction

**Reaction on long operation**
Options: on
off
TOGGLE
no reaction

For each edge, a definition is made to determine if the object value ON, OFF or TOGGLE is switched or if there should be no reaction.

**Long operation after...**
Options: 0.3/0.4/0.5/0.6/0.8 s
1/1.2/1.5 s
2/3/4/5/6/7/8/9/10 s

Here the time period T_l after which an actuation is considered a “long” operation, is defined.
Input is by operation
Options: closed, opened
- closed: The input is closed with actuation.
- opened: The input is opened with actuation.

Enable communication object with "Long operation" 1 bit
Options: no, yes

Debounce time
Options: 20/30/50/70/100/150 ms

Debouncing prevents unwanted multiple operations of the input, e.g. due to bouncing of the contact.

What is the debounce time?
If an edge is detected at an input, the input will react immediately to this edge (e.g. by sending a telegram). At the same time, the duration of the debounce time $T_D$ starts. The signal on the input is not evaluated within the debounce time duration.

Example: Debounce time of the input signal for a detected edge:

After detection of an edge on the input, further edges are ignored for the debounce time $T_D$. 

![Diagram of debounce time](image-url)
3.2.10 Parameter window Input B

The Input B does not differ from Input A.

The descriptions of the parameter setting options and adjustable communication objects for the Input B described under Input A, page 79.
3.2.11 Parameter window Output

All settings for the Output A are made in this parameter window.

<table>
<thead>
<tr>
<th>General</th>
<th>Reaction of output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>normally opened contact</td>
</tr>
<tr>
<td>Control input</td>
<td>Normally closed contact</td>
</tr>
<tr>
<td>- Status messages</td>
<td></td>
</tr>
<tr>
<td>- Automatic operation</td>
<td></td>
</tr>
<tr>
<td>Valve Heating</td>
<td></td>
</tr>
<tr>
<td>- Function</td>
<td></td>
</tr>
<tr>
<td>Valve Cooling</td>
<td></td>
</tr>
<tr>
<td>- Function</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td></td>
</tr>
</tbody>
</table>

Reaction of output
Options: 
- normally opened contact
- Normally closed contact

It can be set in this parameter whether the output operates as a Normally closed contact or Normally open contact.

- Normally opened contact: An ON telegram (1) closes the contact and an OFF telegram (0) opens the contact.
- Normally closed contact: An ON telegram (1) opens the contact and an OFF telegram (0) closes the contact.

Contact position on bus voltage failure
Options: 
- opened
- closed
- unchanged

The output can adopt a defined state on bus voltage failure using this parameter.

- opened: The contact is opened with bus voltage failure.
- closed: The contact is closed with bus voltage failure.
- unchanged: No change of the contact position.

Note

The reaction on bus voltage failure, recovery and download is to be monitored.
**Object value "Switch" on bus voltage recovery**

Options:  
- **not write**
- write with 0
- write with 1

With this parameter, the output can be influenced by the value of the communication object *Switch* on bus voltage recovery.

The communication object *Switch* can be written with either a 0 or 1 when the bus voltage recovers. The contact position is redefined and set in dependence on the set device parameterization.

- **not write**: The communication object assumes the value 0. This value remains as it is until modified via the bus. The contact position is only re-evaluated at this time.

**Note**

The reaction on bus voltage failure, recovery and download is to be monitored.

The Fan Coil Actuator draws the energy for switching the contact from the bus. After bus voltage is applied, sufficient energy is only available after about ten seconds in order to switch all contacts simultaneously.

Depending on the set transmission and switching delay after recovery of bus voltage set in the parameter window *General*, the individual outputs will only assume the desired contact position after this time. If a shorter time is set, the device will only switch the first contact when sufficient energy is stored in the device, in order to ensure that enough energy is available to immediately bring all outputs safely to the required position with a renewed bus voltage failure.

**Enable time function**

Options:  
- **no**
- **yes**

- **no**: The parameter window remains disabled and invisible.
- **yes**: The communication object *Block staircase lighting* as well as the parameter window - *Time* are enabled.
Enable communication object
"Status switch" 1 bit
Options: no
yes

- yes: The following parameters appear:
  Send object value
  (Object “Status switch”)
  Options: no, update only
          after a change
          after request
          after a change or request
  - no, update only: The status is updated but not sent.
  - after a change: The status is sent after a change.
  - after request: The status is sent after a request.
  - after a change or request: The status is sent after a change or a request.

Object value of contact position
(Object “Status switch”)
Options: 1=closed, 0=open
        0=closed, 1=open

With this parameter, the communication object value of the switch status (Status switch) is defined.

- 1=closed, 0=open A closed contact is represented by communication object value 1 and an open contact is represented by the value 0.
- 0=closed, 1=open A closed contact is represented by communication object value 0 and an open contact is represented by the value 1.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The contact position and thus the switch status can result from a series of priorities and links.</td>
</tr>
</tbody>
</table>
3.2.11.1 Parameter window - Time function

In this parameter window, all settings for the function *Time* are undertaken:

This parameter window is visible if in Parameter window Output, page 87, with parameter *Enable function Time*, the option *yes* has been selected.

### Object value "Disable time function" on bus voltage recovery

Options:
- unchanged: The function *Time* can continue unchanged.
- 1, i.e. Disable function Time: The function *Time* is disabled.

**Note**

They can only be enabled via the communication object *Disable function Time*.

- 0, i.e. Enable function Time: The function *Time* is enabled and active after a bus failure.

**Note**

If the staircase light is disabled when the function *Time* is operational, the light will stay ON until it is switched OFF manually.
Staircase lighting time in s
[1…65,535]
Options: 1…30…65,535
The staircase lighting defines how long the contact is closed – provided that the contact is pro-
grammed as a normally open contact – and how long the light remains on after an ON telegram.
The input is made in seconds.

Staircase lighting can be switched
Options: ON with 1 and OFF with 0
ON with 1 no action with 0
ON with 0 or 1, switch OFF not possible
This parameter defines the telegram value used for switching the staircase lighting on and off
prematurely.
• ON with 0 or 1, switch OFF not possible: The function Staircase lighting is switched on inde-
dependently of the value of the incoming telegram. Premature switch off is not possible.

Enable communication object
“Change duration of staircase lighting” 2
byte
Options: no
yes
• yes: A 2 byte communication object Change duration of staircase lighting is enabled. The stair-
case lighting time can be changed via the bus with this communication object. The value de-
fines the staircase lighting time in seconds. The staircase lightning time which has already
commenced is completed. A change of the staircase lighting time is used the next time it is ac-
cessed.
• no: No modification of the staircase lighting time is possible via the bus.

Note
With bus voltage failure the changed staircase lighting time is saved. Only after a renewed down-
load of the application program is the staircase lighting time overwritten.

How does the staircase lighting behave with bus voltage failure?
The behaviour at bus voltage failure is determined by the parameter Reaction on bus volt-
age failure in the parameter window General.

How does the staircase light behave with bus voltage recovery?
The reaction at bus voltage recovery is defined by two conditions:
• With the communication object Block staircase light: If the staircase lighting is blocked
after bus voltage recovery, the staircase lighting can only be switched on or off via the
communication object Switch.
• Using the parameterization of the communication object Switch: Whether the light is
switched on or off with bus voltage recovery depends on the programming of the com-
munication object Switch.
Enable communication object
"Permanent ON" 1 bit
Options: no
yes

If the communication object Permanent ON is assigned with the value 1, the output is switched on irrespective of the value of the communication object Switch and remains switched on until the communication object Permanent ON has the value 0. After ending the Permanent ON state, the staircase will react as defined in the following parameters.

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>This communication object can be used, for example, to allow the caretaker or maintenance and cleaning personnel to initiate a permanent ON.</td>
</tr>
</tbody>
</table>

- yes: The communication object Permanent ON is enabled. The following parameter appears:
  
  Restart of staircase after end of permanent ON
  Options: no
  yes

  The function of continuously ON is controlled via the communication object value Permanent ON. If the communication object receives a telegram with the value 1, the output is switched ON regardless of the value of the communication object Switch and remains switched on until the communication object Permanent ON has the value 0.
  
  - yes: The lighting remains on and the staircase lighting time restarts.
  - no: The lighting switches off if Permanent ON is ended.
3.2.12 Commissioning without bus voltage

How is the device switched on and put into operation?
The device can be made operational by applying an auxiliary voltage from the power supply (NTI).

After applying the voltage, the LED will indicate its current state.

The manual switchover button 📻 must be pressed to light up the respective LED. Thereafter, the device can be operated via the foil keypad. It is thus possible to try out all functions of the Fan Coil Actuator via the buttons, before the complete installation is put into operation, e.g. you can test if the fan switches UP and DOWN to suit the fan speed.

If the manual switchover button 📻 is pressed until the corresponding LED switches off, the device will switch off again.

The LEDs indicate the current input state.
## 3.3 Communication objects

### 3.3.1 Short overview of the communication objects

<table>
<thead>
<tr>
<th>CO no.</th>
<th>Function</th>
<th>Name</th>
<th>Data Point Type (DPT)</th>
<th>Length</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>In operation</td>
<td>System</td>
<td>1.002</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>1</td>
<td>Request status values</td>
<td>General</td>
<td>1.017</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>2</td>
<td>Enable/disable manual operation</td>
<td>Manual operation</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>3</td>
<td>LED On/Off</td>
<td>Manual operation</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>4</td>
<td>Button On/Off</td>
<td>Manual operation</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>5</td>
<td>Status manual Operation</td>
<td>Manual operation</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>6</td>
<td>Overload</td>
<td>Valve heating</td>
<td>1.005</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>7</td>
<td>Overload</td>
<td>Valve cooling</td>
<td>1.005</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>8...9</td>
<td>Not assigned</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Fan speed switch</td>
<td>Fan (multi-level)</td>
<td>5.010</td>
<td>1 byte</td>
<td>x x</td>
</tr>
<tr>
<td>11</td>
<td>Switch speed 1</td>
<td>Fan (multi-level)</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>12</td>
<td>Switch speed 2</td>
<td>Fan (multi-level)</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>13</td>
<td>Switch speed 3</td>
<td>Fan (multi-level)</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>14</td>
<td>Fan speed UP/DOWN</td>
<td>Fan (multi-level)</td>
<td>1.007</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>15</td>
<td>Status fan ON/OFF</td>
<td>Fan</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>16</td>
<td>Status fan speed</td>
<td>Fan (multi-level)</td>
<td>5.010</td>
<td>1 byte</td>
<td>x x x</td>
</tr>
<tr>
<td>17</td>
<td>Status fan speed 1</td>
<td>Fan (multi-level)</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>18</td>
<td>Status fan speed 2</td>
<td>Fan (multi-level)</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>19</td>
<td>Status fan speed 3</td>
<td>Fan (multi-level)</td>
<td>1.001</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>20</td>
<td>Not assigned</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Limitation 1</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>22</td>
<td>Limitation 2</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>23</td>
<td>Limitation 3</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>24</td>
<td>Limitation 4</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>25</td>
<td>Forced operation</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>26</td>
<td>Automatic ON/OFF</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>27</td>
<td>Not assigned</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Status automatic</td>
<td>Fan</td>
<td>1.003</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>29</td>
<td>Status byte mode</td>
<td>Fan</td>
<td>non DPT</td>
<td>1 byte</td>
<td>x x x</td>
</tr>
<tr>
<td>30</td>
<td>Control Value, Heating/Cooling</td>
<td>Control input</td>
<td>5.001</td>
<td>1 byte</td>
<td>x x</td>
</tr>
<tr>
<td>31</td>
<td>Control Value, Heating (extra!)</td>
<td>Control input</td>
<td>5.001</td>
<td>1 byte</td>
<td>x x</td>
</tr>
<tr>
<td>32</td>
<td>Control Value, Cooling</td>
<td>Control input</td>
<td>5.001</td>
<td>1 byte</td>
<td>x x</td>
</tr>
<tr>
<td>33</td>
<td>Control Value, Cooling (extra!)</td>
<td>Control input</td>
<td>5.001</td>
<td>1 byte</td>
<td>x x</td>
</tr>
<tr>
<td>34</td>
<td>Toggle, Heating / Cooling</td>
<td>Control input</td>
<td>1.100</td>
<td>1 bit</td>
<td>x x</td>
</tr>
<tr>
<td>35</td>
<td>Fault control value</td>
<td>Control input</td>
<td>1.005</td>
<td>1 bit</td>
<td>x x x</td>
</tr>
<tr>
<td>36</td>
<td>Not assigned</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO no.</td>
<td>Function</td>
<td>Name</td>
<td>Data Point Type (DPT)</td>
<td>Length</td>
<td>Flags</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------</td>
<td>-----------------------</td>
<td>-----------------------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>35</td>
<td>Block</td>
<td>Valve heating</td>
<td>1.003</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>36</td>
<td>Forced operation</td>
<td>Valve heating</td>
<td>1.003</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>37</td>
<td>Trigger valve purge</td>
<td>Valve heating</td>
<td>1.017</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>38</td>
<td>Status valve purge</td>
<td>Valve heating</td>
<td>1.003</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>39</td>
<td>Status valve position</td>
<td>Valve heating</td>
<td>1.001</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>39</td>
<td>Status valve position</td>
<td>Valve heating</td>
<td>5.001</td>
<td>1 byte</td>
<td>x</td>
</tr>
<tr>
<td>40...44</td>
<td>the same CO as Valve HEATING</td>
<td>Valve cooling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Switch</td>
<td>Output</td>
<td>1.001</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>46</td>
<td>Permanent ON</td>
<td>Output</td>
<td>1.003</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>47</td>
<td>Disable function Time</td>
<td>Output</td>
<td>1.001</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>48</td>
<td>Change duration of staircase lighting</td>
<td>Output</td>
<td>7.005</td>
<td>2 byte</td>
<td>x</td>
</tr>
<tr>
<td>49</td>
<td>Status Switch</td>
<td>Output</td>
<td>1.001</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>50</td>
<td>Block</td>
<td>Input A</td>
<td>1.003</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>51</td>
<td>Switch</td>
<td>Input A</td>
<td>1.001</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>52</td>
<td>Long switch operation</td>
<td>Input A</td>
<td>1.001</td>
<td>1 bit</td>
<td>x</td>
</tr>
<tr>
<td>53...54</td>
<td>Not assigned</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55...57</td>
<td>the same CO as input A</td>
<td>Input B</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Communication objects *General*

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>In operation</td>
<td>System</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.002</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Request status values</td>
<td>General</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.017</td>
<td></td>
</tr>
<tr>
<td>2…5</td>
<td>Manual operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Overload</td>
<td>Valve heating</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.005</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Overload</td>
<td>Valve cooling</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.005</td>
<td></td>
</tr>
<tr>
<td>8…9</td>
<td>Not assigned</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window *General*, the parameter *Send communication object "In operation" has been selected with option yes.*

In order to regularly monitor the presence of the device on the KNX, an In operation monitoring telegram can be sent cyclically on the bus.

As long as the communication object is activated, it sends a programmable In operation telegram.

If a telegram with the value \(x = 0/1/0\) or 1) is received in the communication object, all status communication objects are sent on the bus, as long as these have not been programmed with the option *after a change or request*.

The following function results for the option \(x = 1\):
- Telegram value: 1 = all status messages, provided they are programmed with the option *after a change or request*, are sent.
- 0 = no reaction.

See description *Manual operation*, page 96

The communication object sends a 1 with a fault, e.g. through a thermal overload on the output of the valve HEATING. The communication object is always visible.

Telegram value:
- 1 = there is a fault on the output Valve HEATING.
- 0 = fault acknowledgement.

The communication object sends a 1 with a fault, e.g. through a thermal overload on the output of the COOLING valve. The communication object is always visible.

Telegram value:
- 1 = there is a fault on the output Valve COOLING.
- 0 = fault acknowledgement.
### Communication objects *Manual*

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Enable/disable manual operation</td>
<td>Manual operation</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td>3</td>
<td>LED On/Off</td>
<td>Manual operation</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td>4</td>
<td>Button On / Off</td>
<td>Manual operation</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td>5</td>
<td>Status manual Operation</td>
<td>Manual operation</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
</tbody>
</table>

**No. 2 - Enable/disable manual operation**

This communication object is enabled when in parameter window *Manual*, the parameter *Manual operation* has been selected with the option *enable/disable via communication object*. Manual operation of the device is blocked or enabled via this communication object.

Using the value 0, the button is blocked on the device. If the device is in *Manual operation*, it toggles immediately to KNX operation.

Using the value 1, the button is enabled on the device.

Telegram value:
- 0 = button disabled
- 1 = button enabled

**No. 3 - LED On/Off**

This communication object is enabled when in parameter window *Manual*, the parameter *On/Off* has been selected with the option *LED/button with objects*.

Telegram value:
- 0 = LED OFF
- 1 = LED ON

**No. 4 - Button On / Off**

This communication object is enabled when in parameter window *Manual*, the parameter *On/Off* has been selected with the option *LED/button with objects*.

Only by pressing the button will a telegram with the communication object value be sent.

Telegram value:
- 0 = button OFF
- 1 = button ON

**No. 5 - Status manual Operation**

The communication object is enabled if in parameter window *Manual*, the parameter *Enable communication object "Status man. operation" 1 bit* has been selected with the option *yes*.

This communication object indicates whether manual operation is activated.

Telegram value:
- 0 = manual operation not active
- 1 = manual operation active

The status of manual operation is sent after a change, after request or after a change and request as programmed.
### Communication objects Control input

#### 3.3.4.1 Communication objects HVAC System – 1 Control value/2 pipe

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Control Value, Heating/Cooling</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window *Control input*, the parameter *HVAC System* has been selected with the option *1 Control value/2 pipe*.

Using this communication object, the control value HEATING or COOLING is predefined as a 1 byte value [0…255].

Telegram value:
- 0 = OFF, no heating or cooling
- 255 = ON, largest control value, maximum heating or cooling

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Control Value, Cooling (extra!)</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
</tbody>
</table>

Note

Independent of communication object 30, the COOLING valve can be additionally controlled without monitoring via the communication object 31.

The communication object is enabled if in parameter window *Control input*, the parameter *HVAC System* has been selected with the option *1 Control value/2 pipe*.

Using this communication object, the control value COOLING is predefined as a 1 byte value [0…255].

Telegram value:
- 0 = OFF, no cooling
- 255 = ON, largest control value, maximum cooling

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not assigned.
### 3.3.4.2 Communication objects *HVAC System 1 Control value/4 pipe, with switching object*

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Control Value, Heating/Cooling</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 1 *Control value/4 pipe, with switching object*.

Using this communication object, the control value HEATING or COOLING is predefined as a 1 byte value [0…255].

Telegram value:
- 0 = OFF, no heating or cooling
- 255 = ON, largest control value, maximum heating or cooling

#### Note

If communication object 32 *Toggle HEATING/COOLING – Control input* receives a value, the monitoring time is started.

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

not assigned.

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>Toggle, Heating / Cooling</td>
<td>Control input</td>
<td>1 bit DPT 1.100</td>
<td>C, W</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 1 *Control value/4 pipe, with switching object*.

If the value 1 is set in the parameter:

Telegram value:
- 0 = COOLING activated
- 1 = HEATING activated

If the value 0 is set in the parameter:

Telegram value:
- 0 = HEATING activated
- 1 = COOLING activated
### 3.3.4.3 Communication objects HVAC System – 2 Control values/2 pipe

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Control Value, Heating</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 2 Control values/2 pipe.

Using this communication object, the control value HEATING is predefined as a 1 byte value \([0…255]\).

Telegram value:
- 0 = OFF, no heating
- 255 = ON, largest control value, maximum heating

| 31  | Control Value, Cooling | Control input              | 1 byte DPT 5.001   | C, W  |

The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 2 Control values/2 pipe.

Using this communication object, the control value COOLING is predefined as a 1 byte value \([0…255]\).

Telegram value:
- 0 = OFF, no cooling
- 255 = ON, largest control value, maximum cooling

| 32  |                      |                           |                    |       |

Not assigned.
### 3.3.4.4 Communication objects HVAC System 2 Control values/2 pipe, with switching object

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Control Value, Heating</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td>The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 2 Control values/2 pipe, with switching object. Using this communication object, the control value HEATING is predefined as a 1 byte value [0…255]. Telegram value:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Control Value, Cooling</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td>The communication object is enabled if in parameter window Control input the parameter HVAC system has been selected with the option 2 Control values/2-pipe, with switching object. Using this communication object, the control value COOLING is predefined as a 1 byte value [0…255]. Telegram value:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Toggle, Heating / Cooling</td>
<td>Control input</td>
<td>1 bit DPT 1.100</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td>The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 2 Control values/2 pipe, with switching object. If the value 1 is set in the parameter: Telegram value:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**

If communication object 32 Toggle HEATING/COOLING – Control input receives a value, the monitoring time is started.
### Communication objects HVAC System – 2 Control values/4 pipe

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Control Value, Heating</td>
<td>Control input</td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
<tr>
<td>31</td>
<td>Control Value, Cooling</td>
<td></td>
<td>1 byte DPT 5.001</td>
<td>C, W</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Control input, the parameter HVAC System has been selected with the option 2 Control values/2 pipe.

Using this communication object, the control value HEATING is predefined as a 1 byte value [0…255].

Telegram value:
- 0 = OFF, no heating
- 255 = ON, largest control value, maximum heating

Using this communication object, the control value COOLING is predefined as a 1 byte value [0…255].

Telegram value:
- 0 = OFF, no cooling
- 255 = ON, largest control value, maximum cooling

| 32  | Not assigned.           |                            |                 |       |
3.3.4.6 Communication object *Fault control value*

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Fault control value</td>
<td>Control input</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DPT 1.005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Control input, the parameter Monitoring control values e.g. thermostat has been selected with the option yes.

This communication object indicates a malfunction of the control value, e.g. of a thermostat.

The Fan Coil control reports a fault and assumes the safety position with the communication object *Fault control value*. This safety position affects the fan speed and the valves.

Telegram value: 0 = no fault 1 = fault

**Note**

If the communication object value Control value HEATING, Control value COOLING or Control value, HEATING/COOLING remains off for a parameterized time, a fault of the thermostat is assumed. If communication object 32 Toggle HEATING/COOLING – Control input receives a value, the monitoring time is started.
### Communication objects *Multi-level fan*

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Fan speed switch</td>
<td>Fan</td>
<td>1 byte</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 5.010</td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window *Fan* the parameter *Enable direct operation* and *Enable communication object “Fan speed switch” 1 byte* are selected with option *yes*.

With this communication object, the fan can be switched on via a 1 byte communication object of a fan speed. If another fan speed is switched on at this point it will be switched off. A new fan speed is switched on taking the transition times, dwell times and start-up phase into consideration.

Limitations through forced operation or one of the four limitations 1…4 are retained. Automatic operation is disabled. A renewed activation of automatic mode occurs via the communication object *Automatic ON/OFF*.

The following telegram values result:

<table>
<thead>
<tr>
<th>1 byte value</th>
<th>Hexadecimal</th>
<th>Binary value bit 76543210</th>
<th>Fan speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>00</td>
<td>00000000</td>
<td>0 (OFF)</td>
</tr>
<tr>
<td>1</td>
<td>01</td>
<td>00000001</td>
<td>Fan speed 1</td>
</tr>
<tr>
<td>2</td>
<td>02</td>
<td>00000010</td>
<td>Fan speed 2</td>
</tr>
<tr>
<td>3</td>
<td>03</td>
<td>00000011</td>
<td>Fan speed 3</td>
</tr>
<tr>
<td>&gt;3</td>
<td>&gt;03</td>
<td>&gt;00000011</td>
<td>Values greater than 3 are ignored</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11</th>
<th>Switch speed 1</th>
<th>Fan</th>
<th>1 bit: DPT 1.001</th>
<th>C, W</th>
</tr>
</thead>
</table>

The communication object is enabled if in parameter window *Fan*, the parameter *Enable direct operation* and *Enable communication object “Switch speed x” 1 bit* are selected with option *yes*.

Via the 1 bit communication object, the Fan Coil Actuator can receive a control value for fan speed 1. Limitations through forced operation or one of the four limitations 1…4 are retained. Automatic operation is disabled. A renewed activation occurs via the communication objects *Automatic ON/OFF*.

If several 1 ON telegrams are received by the various speed communication objects *Speed x*, the value last received for the fan control is decisive. This also applies for the OFF telegram 0. If the actuator for a switched OFF speed again receives an OFF command it is carried out, this means that another speed switched on at this time will be switched off even though the respective fan speed communication object does not act directly on the fan speed. The last telegram – in this case the OFF telegram of another fan speed – is always executed.

Telegram value:  
0 = fan OFF  
1 = fan ON in speed 1

<table>
<thead>
<tr>
<th>12</th>
<th>Switch speed 2</th>
</tr>
</thead>
</table>

See communication object 11

<table>
<thead>
<tr>
<th>13</th>
<th>Switch speed 3</th>
</tr>
</thead>
</table>

See communication object 11
<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Fan speed UP/DOWN</td>
<td>Fan</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The communication object is enabled if in parameter window Fan, the parameter Enable direct operation and Enable communication object &quot;Fan speed UP/DOWN&quot; 1 bit are selected with option yes. With this communication object, the fan can be switched one fan speed further up or down via a 1 bit telegram. Switching (UP/DOWN) is determined by the telegram value. With multiple manual UP or DOWN switching, the target speed will be increased or reduced by a speed step. This is possible until the maximum or minimum possible speed is achieved. The parameterized limitations are considered here. Further UP or DOWN telegrams are ignored and not executed. Each new switching telegram initiates a recalculation of the target speed. Telegram value: 0 = switch fan speed DOWN 1 = switch fan speed UP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 15  | Status fan ON/OFF  | Fan                       | 1 bit     | C, T  |
|     |                     |                            | DPT 1.001 |       |
|     | The communication object is enabled if in parameter window Status messages, the parameter Enable communication object "Status fan ON/OFF" 1 bit have been selected with option yes. The communication object receives the communication object value 1 (ON), if at least one fan speed is not equal to zero (OFF). The value of the communication object is sent if not equal to zero. This communication object thus defines the status of the fan and whether it is switched on or switched off. The target speed is also indicated. Telegram value: 0 = OFF 1 = ON |

**Note**

Some fans require an ON telegram before you set a fan speed. Using the communication object Status fan ON/OFF, the fan can, for example, be switched on centrally with a switch actuator via the main switch.
The communication object is enabled if in parameter window Status messages, the parameter Enable communication object "Status fan speed" 1 byte has been selected with option yes.

You can parameterize whether only the communication object value is updated or if they are only sent on the bus after a change or on request. It is possible to parameterize if the actual or required stages are displayed with the communication object Status fan speed x.

With this communication object, it is possible, for example, to display the fan speed on the display as a direct figure value.

The following telegram values apply for the 1 byte communication object:

<table>
<thead>
<tr>
<th>Figure value</th>
<th>Hexadecimal</th>
<th>Binary value bit 76543210</th>
<th>Fan speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>00</td>
<td>00000000</td>
<td>0 (OFF)</td>
</tr>
<tr>
<td>1</td>
<td>01</td>
<td>00000001</td>
<td>Fan speed 1</td>
</tr>
<tr>
<td>2</td>
<td>02</td>
<td>00000010</td>
<td>Fan speed 2</td>
</tr>
<tr>
<td>3</td>
<td>03</td>
<td>00000011</td>
<td>Fan speed 3</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Status messages, the parameter Enable communication object "Status fan speed 1" 1 bit has been selected with option yes.

It is possible to parameterize if a communication object value is only updated and not sent, sent on request, or only sent when changed.

Furthermore, you can parameterize if the status should indicate a current fan speed or a required fan speed. With this communication object, it is possible to display the fan speed in a visualisation or to indicate it on a display.

Telegram value:
- 0 = fan speed OFF
- 1 = fan speed ON

Not assigned.
<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Limitation 1</td>
<td>Fan</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window **Automatic operation**, the parameter **Enable limitations** has been selected with the option yes.

The limitation 1 is active if a telegram with the value 1 is received on the communication object **Limitation 1**. The **Limitation 1** is deactivated if a telegram with the value 0 is received on the communication object **Limitation 1**.

When **Limitation 1** is activated, the fan can only assume the set fan speed or fan speed range in the parameter window **Fan B Limitation**. The valve position is independently programmable from the fan limitation.

<table>
<thead>
<tr>
<th>Telegram value: 0 = limitation x inactive 1 = limitation x active</th>
</tr>
</thead>
</table>

22 Limitation 2
See communication object 21

23 Limitation 3
See communication object 21

24 Limitation 4
See communication object 21

25 Forced operation
Fan
1 bit
DPT 1.003
C, W

The communication object is enabled if in parameter window **Direct operation**, the parameter **Enable communication object “Forced operation”** 1 bit has been selected with the option yes.

If forced operation is activated, the Fan Coil Actuator switches independently from the control value and its parameterized **Limitation 1…4** to forced operation.

The fan speed and valve position(s) during forced operation can be parameterized individually from one another.

<table>
<thead>
<tr>
<th>Telegram value: 0 = no forced operation 1 = forced operation</th>
</tr>
</thead>
</table>

26 Automatic ON/OFF
Fan
1 bit
DPT 1.003
C, W

The communication object is enabled if in parameter window **Fan**, the parameter window **Enable automatic operation** has been enabled.

If automatic mode is enabled, it will be activated on this communication object with the value 1 after a download, ETS reset or via a telegram.

Automatic mode is switched off, if a telegram is received on a "manual communication object".

Manual communication objects are:
- Fan: Fan speed switch
- Fan: Switch speed x (x = 1, 2 or 3)
- Fan: Fan speed UP/DOWN
- Fan: Limitation x (x = 1, 2, 3 or 4)

During forced operation the automatic mode remains active; however, it is only operated within the allowed limits.

If the value 1 is set in the parameter:

<table>
<thead>
<tr>
<th>Telegram value: 0 = automatic operation OFF 1 = automatic operation ON</th>
</tr>
</thead>
</table>

If the value 0 is set in the parameter:

<table>
<thead>
<tr>
<th>Telegram value: 0 = automatic operation ON 1 = automatic operation OFF</th>
</tr>
</thead>
</table>

27 Not assigned.
### No. Function Communication object name Data type Flags

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Status automatic</td>
<td>Fan</td>
<td>1 bit</td>
<td>C, R, W</td>
</tr>
<tr>
<td>29</td>
<td>Status byte mode</td>
<td>Fan</td>
<td>1 byte</td>
<td>C, R, T</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Status messages, the parameter Enable communication object “Status automatic” 1 bit has been selected with option yes.

It is possible to parameterize if a communication object value is only updated and not sent, sent on request, or only sent when changed.

The communication object indicates the status of the automatic mode.

#### Telegram value:
- 0 = inactive
- 1 = activated

#### Note:
Bit 0: If toggling between HEATING and COOLING is undertaken automatically using control variables, the status HEATING/COOLING is only switched in bit 0 if a value > 0 is received on the control value.

For further information see: Status byte code table, page 152
### Communication objects *Fan one-level*

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not assigned.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Switch</td>
<td>Fan</td>
<td>1 bit DPT 1.001</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window *Fan*, the parameter *Fan type* has been selected with the option *one-level*.

With this 1 bit communication object, the fan can be switched on or off. Limitations through forced operation or one of the four limitations 1…4 are retained. Automatic operation is disabled. A renewed activation occurs via the communication objects *Automatic ON/OFF*.

If several ON telegrams 1 are received, the value last received for the fan control is decisive. This also applies for the OFF telegram 0.

If the actuator for the switched off fan speed again receives an OFF telegram, it is carried out, i.e. another speed switched on at this time will be switched off even though the respective fan speed communication object does not act directly on the fan speed. The last telegram – in this case the OFF telegram of another fan speed – is always executed.

Telegram value: 0 = fan OFF  
1 = fan ON

| 12…14 |               |                            |               |       |
|       | Not assigned. |                            |               |       |
| 15    | Status fan ON/OFF | Fan                      | 1 bit DPT 1.001 | C, T  |
|       |               |                            |               |       |

The communication object is enabled if in parameter window *Status messages*, the parameter *Enable communication object “Status fan ON/OFF” 1 bit* have been selected with option *yes*.

The communication object receives the communication object value 1 (ON), if the fan speed is not equal to zero (OFF). The value of the communication object is updated and sent when the fan speed is changed. This communication object thus defines the status of the fan and whether it is switched on or switched off. It can also be used for control of a main switch for the fan.

Telegram value: 0 = OFF  
1 = ON

**Note**

Some fans require an ON telegram before you set a fan speed. Using the communication object *Status fan ON/OFF*, the fan can, for example, be switched on centrally with a switch actuator via the main switch.
### Limitation 1

**Function:** Fan  
**Communication object name:** Limitation 1  
**Data type:** 1 bit  
**Flags:** DPT 1.003, C, W

The communication object is enabled if in parameter window **Automatic operation**, the parameter **Enable limitations** has been selected with the option yes.

**Note**

Limitation 1 is only active in automatic mode.

The limitation 1 is active if a telegram with the value 1 is received on the communication object Limitation 1. The Limitation 1 is deactivated if a telegram with the value 0 is received on the communication object Limitation 1.

When Limitation 1 is activated, the fan can only assume the set fan speed or speed range in the parameter window Fan limitation. The valve position is independently programmable from the fan limitation.

Telegram value: 0 = limitation x inactive  
1 = limitation x active

### Limitation 2

See communication object 21

### Limitation 3

See communication object 21

### Limitation 4

See communication object 21

### Forced operation

**Function:** Fan  
**Communication object name:** Forced operation  
**Data type:** 1 bit  
**Flags:** DPT 1.003, C, W

The communication object is enabled if in parameter window Fan, the parameter **Enable communication object "Forced operation"** 1 bit has been selected with the option yes.

If Forced operation is activated, the Fan Coil Actuator switches independently from the control value and its parameterized Limitation 1…4 to forced operation.

The fan speed and valve position(s) during forced operation can be parameterized individually from one another.

Telegram value: 0 = no forced operation  
1 = forced operation
<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Automatic ON/OFF</td>
<td>Fan</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Fan, the parameter window Enable automatic operation has been enabled.

If automatic mode is enabled, it will be activated on this communication object with the value 1 after a download, ETS reset or via a telegram. Automatic mode is switched off, if a signal has been received on a "manual communication object".

Manual communication objects are:
- Fan: Fan speed switch
- Fan: Switch speed x (x = 1, 2 or 3)
- Fan: Fan speed UP/DOWN
- Fan: Limitation x (x = 1, 2, 3 or 4)

During one of the four limitations or forced operation, the automatic mode remains active, but however, it is only operated in the allowed limits.

If the value 1 is set in the parameter:
Telegram value:
- 0 = automatic operation OFF
- 1 = automatic operation ON

If the value 0 is set in the parameter:
Telegram value:
- 0 = automatic operation ON
- 1 = automatic operation OFF

<table>
<thead>
<tr>
<th>27</th>
<th>Status automatic</th>
<th>Fan</th>
<th>1 bit</th>
<th>C, R, W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window Status messages, the parameter Enable communication object "Status automatic" 1 bit has been selected with option yes.

It is possible to parameterize if a communication object value is only updated and not sent, sent on request, or only sent when changed.

The communication object indicates the status of the automatic mode.
Telegram value:
- 0 = inactive
- 1 = activated
<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Status byte mode</td>
<td>Fan</td>
<td>1 byte</td>
<td>C, R, T</td>
</tr>
</tbody>
</table>

The communication object is enabled if in parameter window – Status messages, the parameter Enable communication object "Status byte mode” 1 byte is selected with option yes.

The operating state of the fan can be displayed or sent on the bus via this communication object. It is possible to parameterize if a communication object value is only updated and not sent, sent on request, or only sent when changed.

Bit sequence: 76543210

Bit 7: Forced operation
Telegram value: 0: inactive
1: active

Bit 6: Limitation 1
Telegram value: 0: inactive
1: active

Bit 5: Limitation 2
Telegram value: 0: inactive
1: active

Bit 4: Limitation 3
Telegram value: 0: inactive
1: active

Bit 3: Limitation 4
Telegram value: 0: inactive
1: active

Bit 2: Thermostat fault
Telegram value: 0: inactive
1: active

Bit 1: Automatic
Telegram value: 0: inactive
1: active

Bit 0: HEATING/COOLING
Telegram value: 0: COOLING
1: HEATING

**Note**

Bit 0: If toggling between HEATING and COOLING is undertaken automatically using control variables, the status HEATING/COOLING is only switched in bit 0 if a value > 0 is received on the control value.

For further information see: Status byte code table, page 152
3.3.7 Communication objects Valve Heating, Valve Cooling

The communication objects of all valves do not differentiate from one another and are explained using Valve HEATING.

The descriptions of the parameter setting options of Valve COOLING are described from Parameter window Valve HEATING – 3-point, opening and closing on page 66.

The communication objects Valve HEATING have the nos. 35…39.

The communication objects Valve COOLING have the nos. 40…44.

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Block</td>
<td>Valve heating</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

The valve is disabled with this communication object. If the block is enabled, the highest priority is retained and the current control value is retained, i.e. the valve remains stationary. Movement to a target position which may not have yet been achieved will be performed to completion. If the block is removed, the target position which has been set without the block is approached.

Telegram value:

- 0 = valve not blocked
- 1 = valve blocked

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Forced operation</td>
<td>Valve heating</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

This communication object sets the output in a defined state and blocks it. If the value 1 is received, forced operation is activated and the output triggers the programmed valve position. If the value 0 is received, forced operation ends. The contact position is retained until the FCA/S receives a new setting signal.

Telegram value:

- 0 = end forced operation
- 1 = start forced operation

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Trigger valve purge</td>
<td>Valve heating</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.017</td>
<td></td>
</tr>
</tbody>
</table>

The valve purge is triggered using this communication object.

Telegram value:

- 0 = end valve purge, valve will be closed
- 1 = start valve purge, valve will be opened

**Note for value 0**

- A purge currently underway is interrupted.
- A purge not undertaken due to a higher priority will no longer be undertaken.
- The purge cycle with automatic purge will be restarted.
<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Status valve purge</td>
<td>Valve heating</td>
<td>1 bit</td>
<td>C, R, T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The status of the valve purge is visible via this communication object.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telegram value:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 = valve purge not active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = valve purge active</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**

The status is displayed as soon as a purge has been activated. Selbst wenn die Spülung, z.B. durch eine Priorität, unterbrochen wird, bleibt der Staus aktiv.

<table>
<thead>
<tr>
<th>39</th>
<th>Status valve position</th>
<th>Valve heating</th>
<th>1 bit</th>
<th>C, R, T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dieses Kommunikationsobjekt ist freigegeben, wenn im Parameterfenster Ventil Heizen der Parameter Kommunikationsobjekt freigeben „Status Ventilstellung“ die Option 1 Bit ausgewählt wurde.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The status of the valve position is visible via this communication object. Dabei wird immer die Zielstellung übertragen, wohin das Ventil fahren soll. Die Anzeige LED HEIZEN (%) zeigt den gleichen Wert wie der Status an.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telegram value:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 = Valve position equal to zero/LED HEATING off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = Valve position not equal to zero/LED HEATING on</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>39</th>
<th>Status valve position</th>
<th>Valve heating</th>
<th>1 byte</th>
<th>C, R, T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 5.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dieses Kommunikationsobjekt ist freigegeben, wenn im Parameterfenster Ventil Heizen der Parameter Kommunikationsobjekt freigeben „Status Ventilstellung“ die Option 1 Bit ausgewählt wurde.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The status of the valve position is visible via this communication object. Dabei wird immer die Zielstellung übertragen, wohin das Ventil fahren soll. Die Anzeige LED HEIZEN (%) zeigt den gleichen Wert wie der Status an.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telegram value:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…255 = valve position is displayed directly as a figure value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At 0 = LED HEATING off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At &gt; 0 = LED HEATING on</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.3.7.1 Communication objects Input A, Input B

The communication objects of all Inputs do not differ from one another and are explained using Input A.

The descriptions of the parameter setting options of Input A are described in Parameter window Input A, page 79.

The communication objects Input A have the nos. 50…52.

The communication objects Input B have the nos. 55…57.

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>Block</td>
<td>Input A</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td>51</td>
<td>Switch</td>
<td>Input A</td>
<td>1 bit</td>
<td>C, W, T</td>
</tr>
<tr>
<td>52</td>
<td>Long switch operation</td>
<td>Input A</td>
<td>1 bit</td>
<td>C, W, T</td>
</tr>
</tbody>
</table>

#### Note

When the input is blocked there is fundamentally no reaction, but:
- Waiting for a long button operation or a minimum signal duration is suspended.
- A signal change on the terminals or with manual operation is ignored.
- Communication objects continue to be updated and sent if necessary.

When enabling an input a change of the signal states (compared to before the block) leads to immediate processing, e.g.:
- The minimum actuation or detection of a long/short button push starts.
- Communication objects are sent if necessary.

Telegram value: 0 = enable input 1 = block input

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not assigned
### 3.3.8 Communication objects **Output**

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>Switch</td>
<td>Output</td>
<td>1 bit</td>
<td>C, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.001</td>
<td></td>
</tr>
</tbody>
</table>

This communication object is used for switching of the output ON/OFF. The device receives a switch telegram via the communication object.

- **Normally opened contact:**
  - Telegram value: 1 = switch ON
  - Telegram value: 0 = switch OFF

- **Normally closed contact:**
  - Telegram value: 1 = switch OFF
  - Telegram value: 0 = switch ON

<table>
<thead>
<tr>
<th>46</th>
<th>Permanent ON</th>
<th>Output</th>
<th>1 bit</th>
<th>C, W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

This communication object is enabled if in parameter window **Time function**, the parameter **Enable communication object *Permanent ON* 1 bit** has been selected with the option yes.

With this communication object, the output can be forcibly switched on. If the communication object is assigned with the value 1, the output is switched on irrespective of the value of the object **Switch** and remains switched on until the communication object **Permanent ON** has the value 0. After ending the permanent ON state, the state of the communication object **Switch** is used.

**Permanent ON** only switches ON and "masks" the other functions. This means that the other functions (e.g. staircase lighting) continue to run in the background but do not initiate a switching action. After the end of **Permanent ON**, the switching state, which would result without the **Permanent ON** function, becomes active. For the function **Staircase lighting** the response after **Permanent ON** is parameterized in **Parameter window - Time function**, page 89.

This communication object can be used for example to allow the service or maintenance and cleaning personnel to initiate a permanent ON. The device receives a switch telegram via the communication object **Switch**.

After a download or bus voltage recovery, **Permanent ON** becomes inactive.

- Telegram value: 1 = activates Permanent ON
- Telegram value: 0 = deactivates Permanent ON

<table>
<thead>
<tr>
<th>47</th>
<th>Disable function Time</th>
<th>Output</th>
<th>1 bit</th>
<th>C, W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPT 1.003</td>
<td></td>
</tr>
</tbody>
</table>

This communication object is enabled if in parameter window **Output (16 A/10 AX)**, the parameter **Enable function Time** has been selected with the option yes.

After bus voltage recovery, in parameter window **- Time**, the communication object value with the parameter **Object value "Disable time function" on bus voltage recovery** can be determined.

With the blocked function **Time** the output can only be switched on or off, the function **Staircase lighting** is not triggered.

- Telegram value: 1 = staircase lighting disabled
- Telegram value: 0 = staircase light enabled

The contact position at the time of disabling and enabling is retained and will only be changed with the next switch telegram to the communication object **Switch**.
<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Communication object name</th>
<th>Data type</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Change duration of staircase lighting</td>
<td>Output</td>
<td>2 byte DPT 7.005</td>
<td>C, R, W</td>
</tr>
</tbody>
</table>

This communication object is enabled if in parameter window - Time, the parameter Enable communication object "Change duration of staircase lighting" 2 byte has been selected with option yes.

The duration of staircase lighting is set here. The time is defined in seconds. After bus voltage recovery, the value of the communication object is set by the programmed value and the value set via the bus is overwritten.

The staircase lighting time can changed via the bus with this communication object. The time is defined in seconds.

The staircase lighting time which has already commenced is completed. A change of the staircase lighting time is used the next time it is accessed.

With bus voltage failure the changed staircase lighting time is retained. Only after a complete download of the application program, a version change, when the device has been discharged or with an ETS reset, is the staircase lighting time duration overwritten with the value set in the parameters.

| 49  | Status switch | Output | 1 bit DPT 1.001 | C, R, T |

In the parameter window Output, you can parameterize whether the communication object value no, update only, after a change or after request is sent on the bus.

The communication object value directly indicates the current contact position of the switching relay.

The status value can be inverted.

Telegram value  
1 = relay ON or OFF depending on the parameterization  
0 = relay OFF or ON depending on the parameterization
4 Planning and Application

In this section, you will find a description of different types of fans, blowers and fan coil controls. Here also are some tips and application examples are described for practical use of the device.

4.1 Heating, ventilation, climate control with Fan Coil units

The Fan Coil Actuator FCA/S controls single-phase fans, blowers or fan coil units. Three speed single phase fans with step or changeover control are possible. Special fan properties such as switchover pauses, dwell times and a start-up phase can be parameterized. Up to two input variables for heating and cooling signals, e.g. for a thermostat, are available. As output variables, the Fan Coil Actuators generate up to two valve communication objects, which they can use to control the valves in a heating or cooling circuit.

The separate fan and valve parameterization in the FCA/S provides a maximum in flexibility and very many combination possibilities for various applications in the heating, ventilation and air-conditioning (HVAC) field.

4.1.1 Terms

Fan Coil unit is a term used for a fan convector or blower convection unit.

The Fan Coil unit is connected to a central heating and cooling water supply and generates the desired temperature for the room. A room can be heated, cooled and ventilated using a Fan Coil unit.

4.1.2 Fan operation

In fan operation a single phase fan, blower or convector can be controlled. In combination with a valve control 2, 3 or 4 pipe system can be implemented. The fans are controlled via a 3 speed controller. For this purpose 3 windings are tapped off of the fan motor. The speed which results is dependent on the tap-off. It must be ensured that two contacts are not switched on simultaneously. For control purposes at least one 3 speed changeover switch with zero position is usually used. This switch is simulated with a group of outputs in the Fan Coil Actuator.

```
0
__
1
__
2
__
3

Three speed changeover switch
```
The control of the FCA/S is implemented in accordance with the following schematic principle:

With three Fan stage x switch (x = 1, 2, or 3) communication objects that are independent of each other, the fan stages are controlled via the outputs of the Fan Coil Actuator.

Alternatively, the fan control can be implemented via a 1 byte communication object Switch speed or via the communication object Fan speed UP/DOWN.

Some ventilation controls require an additional central switch on mechanism (main switch) in addition to the speed switch. This can be implemented with a further output of the Fan Coil Actuator. The output must be linked to the communication object Status Fan ON/OFF. Hereby, the main switch is switched on if at least one fan speed is set. If the fan is OFF (Status Fan ON/OFF = 0), the main switch is also switched off.
4.1.2.1 Fan in a two-way connection

Control of a fan is usually implemented with a changeover switch.

The following control table results for a three-stage fan, which simulates the RM/S with a group of switch outputs:

<table>
<thead>
<tr>
<th>Fan speed</th>
<th>Connector block 4</th>
<th>Connector block 5</th>
<th>Connector block 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan speed 1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fan speed 2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fan speed 3</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

4.1.2.2 Fan with speed switching

In some cases, the fan is controlled via a step switch. The following control table results for a three-speed fan, which simulates the RM/S with its outputs:

<table>
<thead>
<tr>
<th>Fan speed</th>
<th>Connector block 4</th>
<th>Connector block 5</th>
<th>Connector block 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan speed 1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fan speed 2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fan speed 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The step switch cannot be switched on rapidly. If for example, fan speed 3 is to be switched on from the OFF state, fan speeds 1 and 2 must be controlled with the associated dwell times first.

4.1.3 Configuration of a HVAC system with Fan Coil units

A HVAC system with Fan Coil units (HVAC = heating, ventilation, air-conditioning) consists of a central heating and cooling water system. The Fan Coil units are installed in rooms and directly connected to the heating and cooling circuit.
4.1.4 Design of a Fan Coil unit

The Fan Coil unit consists of a fan or blower-convector and one or two heat exchangers, which emit heating or cooling power to the room.

If only one heat exchanger and one heating or cooling circuit is available, you have a 2 pipe system.

If two heat exchangers with two separate heating and cooling circuits are in use, you have a 4 pipe system. The Fan Coil Actuator directly controls the fan.

The heat exchanger and the fan are the most important components of a Fan Coil unit. Heating or cooling water flows in the heat exchanger depending on the desired room temperature. The flow of water through the heat exchanger is controlled via the valves.

The fan blows air past the heat exchanger and into the room through a filter. The air is heated or cooled in the heat exchangers and thus generates the desired room temperature. The fan is driven by a motor. The motor and the valves are controlled by a Fan Coil Actuator.

The water condensation which results during cooling collects in a condensation water trough.
A Fan Coil unit can be configured as a 2-, 3- or 4-pipe system.
4.1.5.1 2 pipe system, configuration

The 2 pipe system consists of just a single water circuit which is heated or cooled alternately to suit the season. In a 2 pipe Fan Coil unit there is only one heat exchanger with a valve.

Note

In some HVAC systems, cooling is undertaken exclusively using a 2 pipe Fan Coil unit. The heating function is undertaken by a conventional heater or an electrical heater.
4.1.5.2  2 pipe system HEATING and COOLING

In this system, only one heat exchanger is available for HEATING and COOLING. Depending on the weather, warm or cold water is supplied centrally to the pipe system (2 pipes). The Fan Coil Actuator or the thermostat is informed if warm or cold water is currently flowing through the system. Depending on this setting, both control values act on just a single valve. The thermostat decides which control value (HEATING/COOLING) is actively sent. The FCA/S controls the fan speed and only one valve.
4.1.5.3 2 pipe system HEATING or COOLING

In this system, one heat exchanger is available for HEATING or COOLING. The control value for HEATING or COOLING is provided by a thermostat. Only warm or only cold water is supplied centrally to the pipe system (2 pipes). Depending on this setting one control value acts on one valve. The thermostat sends the control value (COOLING) and the FCA/S controls the fan speed and the valve.

Note
Both 2-pipe systems can be established using a 3 stage fan or blower. Depending on the control value (1 byte or 1 bit), which is sent from a thermostat, the Fan Coil Actuator determines the corresponding fan stages (speeds) via programmable threshold values.
For a continuous control value (1 byte; 0…100 %), the threshold values for the fan speeds can be defined for example as follows:

Example

Three speed fan: Switch thresholds in the RM/S:

- Fan speed 1: 1…29 %  
  Off -> Fan speed 1 = 1%
- Fan speed 2: 30…59%  
  Fan speed 1 -> 2 = 30%
- Fan speed 3: 60…100%  
  Fan speed 2 -> 3 = 60%

3 pipe system, configuration

The 3 pipe system has a similar design to the 4 pipe system. There is a separate inlet for heating and cooling water as well as two separate heat exchangers with one valve each. In contrast to a 4 pipe system, the 3 pipe system has a common return for heating and cooling water.

The Fan Coil Actuator directly controls the fan and provides two communication objects for control of the valves.
4.1.5.5  4 pipe system, configuration

In a 4 pipe system, two separate heat exchangers (for HEATING and COOLING) are available. Warm and cold water is provided centrally to two separate pipe systems (of 2 pipes each).

The thermostat on-site decides if heating or cooling is applied. The thermostat sends a separate heating and cooling signal.

The Fan Coil Actuator directly controls the fan.
4.2 System configuration with a Fan Coil Actuator

In this function, the Fan Coil Actuator is used for control of the heating and cooling valve as well as for switching the fan outputs. Temperature detection is undertaken by a thermostat.

Even the offset of the set point value as well as changeover of the operating modes is implemented by the thermostat. The sensors can be connected directly to the Fan Coil Actuator in order to consider the monitoring of the condensed water and the window contact.

In order to correctly implement this function the thermostat must send the actual temperature as well as the corresponding operating mode to the Fan Coil Actuator via the bus.

4.2.1 Automatic operation

With automatic fan control, a fan drive is connected directly to the Fan Coil Actuator and switched via three floating contacts. A single stage (speed), two stage or three stage fan can be connected.

The fan speed is set automatically in dependence on the control value. For example, the following control value ranges can be programmed for the corresponding fan speeds:

<table>
<thead>
<tr>
<th>Control value</th>
<th>Fan speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0… 9 %</td>
<td>0 (fan off)</td>
</tr>
<tr>
<td>10… 39 %</td>
<td>1</td>
</tr>
<tr>
<td>40… 69 %</td>
<td>2</td>
</tr>
<tr>
<td>70…100 %</td>
<td>3</td>
</tr>
</tbody>
</table>

Important

The Fan Coil Actuator FCA/S is purely an actuator, which does not have a controller for a room temperature controller (thermostat).
Control of the room temperature is implemented using a room temperature controller, which generally detects the room temperature. The FCA/S primarily controls a fan and valves. In addition to a manual control via the communication objects Fan speed x, Fan speed switch or Fan speed UP/DOWN, the Fan Coil Actuator can also operates in automatic mode together with a thermostat. Communication objects Control value HEATING, Control value COOLING or when operating with just a single input variable, the communication object Control value HEATING/COOLING, are available.

The automatic mode is enabled in the parameter window Fan with the parameter Enable automatic operation. Depending on the HVAC system, this is set in the parameter window Control input and the control value communication objects are enabled.

An automatic operation parameterized in the ETS only becomes active after the first download. With a subsequent download the automatic operating state (active, inactive) is retained as it was before the download. However, there is an exception when system properties such as HVAC systems, fan control (changeover, step control) or the fan stage count have been changed (1/2/3). In these cases the automatic mode is activated if the automatic mode has been enabled in the ETS.

Automatic mode is switched off either by a manual setting command via the communication objects Speed x, Fan speed switch or Fan speed UP/DOWN, or if a telegram with the value 0 is received via the communication object Automatic ON/OFF.

The automatic operation can be reactivated by the communication object Automatic ON/OFF or activated with the 1 byte communication object Change limitation.

An activation of one of the four limitations or the forced operation does not end automatic operation. By using a range limit (several fan stages are permissible), a limited automatic control with several fan stages (speeds) is possible.

The following functional diagram shows the relationship between automatic and manual operation of the Fan Coil Actuator.

---

1) An operating function can occur on the one hand by the change from HEATING to COOLING, by the switchover of the number of fan speeds, by the switchover from a switch to changeover switch or via the switchover to another HVAC system.
4.2.2 Direct operation

With direct fan control via the ABB i-bus®, a fan drive is connected directly to the Fan Coil Actuator and switched via three floating contacts. A single stage (speed), two stage or three stage fan can be connected.

The Fan Coil Actuator sets the fan speed in accordance with the value received via the ABB i-bus®. The value is received as a 1 byte value. The conversion of the received 1 byte value to the fan speed occurs in the same way as the automatic fan control via the parameterized threshold values.

<table>
<thead>
<tr>
<th>1 byte value</th>
<th>Fan speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0… 9 %</td>
<td>0 (fan off)</td>
</tr>
<tr>
<td>10… 39 %</td>
<td>1</td>
</tr>
<tr>
<td>40… 69 %</td>
<td>2</td>
</tr>
<tr>
<td>70…100 %</td>
<td>3</td>
</tr>
</tbody>
</table>

4.2.3 Switchover between automatic and direct operation

In the Fan Coil Actuator, you can switch between automatic operation and direct operation. The changeover to manual fan control is implemented via a 1 bit value. The fan stage is switched in accordance with the received 1 byte value.

The fan control is changed back to automatic operation if a 1 is received in the respective communication object.

The current status of automatic operation is fed-back via a 1 bit value.
4.2.4 Logic of the stage switching

The following illustration indicates the logic of a switchover stage for a Fan Coil Actuator in dependence on the control values and the parameterized threshold values and hysteresis.

The diagram relates to a three speed fan without parameterized fan limitations. The fan limitations are only relevant after the fan stage has been determined and do not change the flow chart.

Hy. = Hysteresis
If fan speed x - Hysteresis < 0 % the fan speed x - Hysteresis = 1 %
If fan speed x + Hysteresis > 100 % the fan speed x + Hysteresis = 99 %
4.2.5 Fan operation functional diagram

The following illustration indicates the sequence in which the functions of the fan control are processed. Communication objects, which lead to the same box, have the same priority and are processed in the sequence in which the telegrams are received.
4.3 Valve drives, valves and controller

4.3.1 Electromotor valve drives

Electromotor valve drives open and close valves via a small electric motor. Electromotor valve drives are offered as proportional or as 2 or 3-way valve drives.

Proportional valve drives are controlled via an analogue signal, e.g. 0…10 V. They can be controlled with the Fan Coil Actuator. 2 or 3-point valve drives are controlled via switching of the supply voltage.

2-point valve drives are controlled via the telegrams OPEN and CLOSE. The valve can be completely open or completely closed. 2-point valves are controlled via a 2-point control or pulse width modulation (PWM). 2-point valve drives, which require 2-point control, cannot be controlled with the Fan Coil Actuator.

The Fan Coil Actuator does not support the control of electric motor 3-point valve drives. These are normally connected via three connection cables to a Fan Coil unit: Neutral conductor, switched phase for OPEN, switched phase for CLOSE. Using 3-point control valve drives, the valve can be opened by any desired percentage and the position can be retained over an extended period. If the valve does not move, no voltage is applied to the motor.

The valve is opened wide enough to allow the exact quantity of hot or cold water to flow that is required to bring the heat exchanger to the required temperature. Thus the valve is controlled via the valve opening (0…100 %). The control usually used in most cases is continuous control.

4.3.2 Electro-thermal valve drives

Electro-thermal drives are adjusted due to heat expansion of a material caused by a flow of electric current. Electro-thermal valve drives are controlled by pulse width modulation. The Fan Coil Actuator supports the control of electro-thermal valve drives via pulse width modulation.

Electro-thermal valve drives are offered in the de-energised closed and de-energized opened variants. Depending on the variant, the valve is opened when voltage is applied and closed when no voltage is applied, or vice versa.

Electro-thermal valve drives are connected via two connection cables to the Fan Coil device.
4.3.3 Valve curve

The Fan Coil Actuator controls valves with linear valve curves. The valve control is matched linearly to the control value. The valve is closed with a control value of 0 %, i.e. also 0 %. The valve is fully open with a control value of 100 %, i.e. also 100 %. The same ratio also applies for all intermediate values.

![Linear valve curve](image)

These valve curves can be matched for different valve types. Many valves, for example, have practically no flow when barely opened and achieve maximum flow at 60…80 %. Furthermore, many valves emit an annoying whistling sound at low flows.
These effects can be taken into consideration by limitation of the active valve opening range. The positioning frequency of the valve drive may also be reduced by this limitation.

Limitation of the active valve opening range
A further adaption of the valve curve is implemented via the limitation of the valve control value. The valve output does not react in the upper and lower range due to this limitation. Thus, for example, a valve movement with a minimal heating or cooling requirement can be avoided.

![Limitation of the valve control value](image)

A further correction of the curve can be undertaken in the **Parameter window - Curve**, page 76, which is separately adjustable for the heating and the cooling valve. The valve control value can be adapted to the control value using the adjustable parameters there. The positioning frequency of the valve drive may also be reduced by this function.

A reduction of the positioning frequency reduces the current requirement for positioning and extends the service life of the valve. However, a reduced positioning frequency will also impair the accuracy of the temperature control.
4.3.4 Control types

The following control types are commonly used for the control of valves in heating, air-conditioning and ventilation applications.

- Continuous control
- Pulse width modulation (PWM)
- Pulse width modulation – calculation

4.3.4.1 Continuous control

With continuous control, a control value is calculated based on the target temperature and the actual temperature, and is used to optimally set the temperature. The valve is brought to a position which complies with the calculated control value. With this method the valve can be fully opened, fully closed and even positioned in every intermediate position.

Continuous control is the most precise form of temperature control. At the same time, the positioning frequency of the valve drive can be kept low. Continuous control can be implemented with the Room Master for electro-motor 3-point valve drives. This is implemented via a 1 byte control.

What is a 1 byte control?

For 1 byte control, a value of 0…255 (corresponds to 0 %…100 %) is preset by the room thermostat. At 0 % for example, the valve is closed and at 100 % it is fully opened.
Pulse width modulation (PWM)

With pulse width modulation, the valve is operated as with 2-point control exclusively in the positions **fully opened** and **fully closed**. In contrast to a 2-point control, the position is not controlled via limit values, but rather by calculated control values similar to continuous control.

The control value is fixed for a timed cycle and recalculated in the duration for valve opening. The control value 20 % at a cycle time of 15 minutes, for example, will be recalculated for a valve opening time of three minutes. The control value 50 % results in a valve opening time of 7.5 minutes.

With pulse width modulation, a relatively accurate setting of the temperature can be achieved without any resulting overshoots. Simple, attractively-priced control valves can be used. The positioning frequency of the control valve is relatively high.

Pulse width modulation can be used with the Fan Coil Actuator in conjunction with electromotor or electro-thermal valve drives.
An example: When the FCA/S receives a 1 byte control value (continuous control) as an input signal, this value together with the parameterized cycle time from a PWM calculation is converted into a signal for a 2-point control (ON-OFF-ON).

With PWM control, the received control value (0...100 %) calculated in the control algorithm is converted to a pulse width modulation. The conversion is based on a constant cycle time. If the FCA/S for example, receives a control value of 20%, then for a cycle time of 15 minutes the valve will be opened for three minutes (20% of 15 minutes) and closed for 12 minutes (80% of 15 minutes).
4.3.4.3  Pulse width modulation – calculation

With pulse width modulation, the control is implemented by a variable mark-space ratio.

During the time $t_{ON}$ the valve is opened and during the time $t_{OFF}$ it is closed. Due to $t_{ON} = 0.4 \times t_{CYC}$ the valve is set to about 40% on. $t_{CYC}$ is the so-called PWM cycle time for continuous control.
4.4 Behaviour with, ...

4.4.1 Bus voltage recovery

General

• At bus voltage recovery, the communication object values can be parameterized; if not they are set to the value 0.

• Timers are out of operation and should be restarted.

• Status communication objects are sent as long as the option after a change has been set.

• The contact position is not known with 100 % certainty after bus voltage recovery. It is assumed that the contact position has not changed during the bus voltage failure (no manual operation possibilities occur). Only after a new switch event is the contact position known to the Fan Coil Actuator.

• The send delay is only active at bus voltage recovery!

Switch contact output

• The communication object value Staircase lighting time remains unchanged as before bus voltage failure.

• The communication object value Disable function Time is independent of the selected option.

• The communication object value Permanent ON remains unchanged as before bus voltage failure.

• The switch contact output switches as follows:
  
  o After the set communication object value Switch with bus voltage recovery.
  
  o If the parameter Object value “Switch” at bus voltage recovery is not parameterized, the behaviour at bus voltage failure is decisive.
  
  o If none of the two above options is selected, the last position is retained as with bus voltage failure.

Note

If a staircase lighting time was active at bus voltage failure, it will restart.

Note

The values of the communication objects Logical connection 1/2 are stored at bus voltage failure. The values are set again after a bus voltage recovery. If values are not assigned for communication objects Logical connection 1/2, they will be deactivated. With a reset via the bus, the values of the communication objects Logical connection 1/2 remain unchanged.
Valves

- The purging cycle restarts if it was active before the failure.
- The priorities *Blocking*, *Forced operation*, *Purging* and *Adjustment* are re-established and executed as priorities.

The priorities are defined as follows:

1. Reference movement
2. Communication object *Block*
3. Communication object *Forced operation*
4. Valve Purge
5. Adjustment
6. Control values

**Note**

1 corresponds to the highest priority.

- The value parameterized for bus voltage recovery is only carried out if no higher priority (with the exception of manual operation/reference movement) was active before the failure. If a new control value is received during bus voltage recovery and an active priority, it will replace the control value that was defined in the parameterization.

### 4.4.2 ETS reset

**What is an ETS Reset?**

Generally an ETS reset is defined as a reset of the device via the ETS. The ETS reset is initiated in the ETS3 under the menu item *Commissioning* with the function *Reset device*. This stops the application program and it is restarted.

**Output (16 A/10 AX)**

- The communication object value *Staircase lighting time* receives its parameterized value.
- The communication object value *Disable function Time* is 0, i.e. function *Time* is not blocked.
- The object value *Permanent ON* is 0, i.e., permanent on is not active.
- The switch contact output goes to the safely opened state.

**Note**

For all resets after delivery including the first download, the response will comply with that of a reset via the bus. A send and switch delay is not executed. All states are reset.
4.4.3 Download (DL)

General
After a change of the fan control (stage control or changeover control) of the fan type, a full reset of the actuator is required in order to avoid incorrect function. This full reset has the same effect as reset of the device in the ETS. In this case, the communication objects are normally written with the value 0. The timers stop and are set to 0. Status communication objects are set to 0 (with the exception of automatic, if it is active) and contacts are opened.

With the normal download, where no re-parameterization of the fan type and fan control has occurred, an action has the effect that in the ideal case no unwanted reactions are initiated and thus normal operation is not influenced. Communication object values remain unchanged. Timer will not operate and must only be restarted. Status values are updated and sent. The contact position remains unchanged and only changes with the next switch telegram.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>After a download with a change, the application complies in behaviour to a reset of the device in the ETS. If the application of the same version is reloaded after discharge, the behaviour is the same as with a download</td>
</tr>
</tbody>
</table>

Output (16 A/10 AX)
The communication object value **Staircase lighting time** remains unchanged.

The communication object value **Disable function Time** remains unchanged.

**Exception**: The communication object value is set to 0 if there is no assignment to the communication object.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otherwise, the block for the function <strong>Time</strong> is removed if the communication object <strong>Disable function Time</strong> is not available. The switch contact output will otherwise use the new parameters.</td>
</tr>
</tbody>
</table>

The communication object value **Permanent ON** remains unchanged.

The switch contact output remains unchanged.

4.4.4 Bus voltage failure

After the contact positions have set with bus voltage recovery, the Fan Coil Actuator remains functional until the bus voltage recovers.

Only the energy for a non-delayed switching action is available when the bus voltage fails for each output. Reversing times, dwell times and start-up behaviour cannot be considered. For this reason, it is only possible for the fan at bus voltage recovery to retain the fan speed (unchanged) or to switch off.

The special behaviour is described in the following table.
### 4.4.5 Bus voltage failure, recovery and download

**Behaviour of the fan stage on a download, ETS reset, bus voltage failure and recovery**

<table>
<thead>
<tr>
<th>Behaviour with</th>
<th>Bus voltage recovery</th>
<th>Bus voltage failure</th>
<th>Download, if no change of the operating function(^1) occurs.</th>
<th>ETS bus reset and download (if a change of operating function(^1)) complete - Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan speed</td>
<td>Can be parameterized</td>
<td>Can be parameter-</td>
<td>Unchanged or moves from a previously selected required stage, if this has not been achieved by switchover pauses and dwell times.</td>
<td>OFF, contacts open</td>
</tr>
<tr>
<td>Forced operation</td>
<td>Inactive</td>
<td>No function. Fan stage as parameterized with BVF</td>
<td>OFF, inactive</td>
<td>OFF, inactive</td>
</tr>
<tr>
<td>Limitation (x = 1\ldots4)</td>
<td>Inactive</td>
<td>No function. Fan stage as parameterized with BVF</td>
<td>OFF, inactive</td>
<td>OFF, inactive</td>
</tr>
<tr>
<td>Automatic operation</td>
<td>Automatic mode is activated, if automatic mode is possible.</td>
<td>No function</td>
<td>Is retained if already available. Remains inactive, if already inactive.</td>
<td>Automatic mode is activated if automatic mode is possible, otherwise not active.</td>
</tr>
<tr>
<td>Communication object Status automatic</td>
<td>Is updated and sent in dependence on the parameterization.</td>
<td>No function</td>
<td>Is updated and sent in dependence on the parameterization.</td>
<td>Is updated and sent in dependence on the parameterization (always, after a change, not)</td>
</tr>
<tr>
<td>Communication object Status fan ON/OFF</td>
<td>Will be updated and sent</td>
<td>No function</td>
<td>Unchanged, implemented when the next telegram is received</td>
<td>Is updated (OFF, communication object value 0) and sent.</td>
</tr>
<tr>
<td>Communication object Valve control</td>
<td>Values are recalculated and sent after the parameterized send delay</td>
<td>No function</td>
<td>Unchanged and sent.</td>
<td>COOLING or COOLING/HEATING, communication object value 0</td>
</tr>
<tr>
<td>Status byte</td>
<td>Values are updated and sent in dependence on the parameterization.</td>
<td>No function</td>
<td>Values are updated and sent in dependence on the parameterization.</td>
<td>Values are updated and sent in dependence on the parameterization (always, when changed, not)</td>
</tr>
</tbody>
</table>

\(^1\) An operating function can occur by the change from fan stage 1, 2 or 3 or to the switchover to a stage and changeover circuit of the fan control.
## Behaviour of the output on a download, ETS reset, bus voltage failure and recovery

<table>
<thead>
<tr>
<th>Behaviour with</th>
<th>Bus voltage recovery</th>
<th>Bus voltage failure</th>
<th>Download, if no change of the operating function(^1) occurs.</th>
<th>ETS bus reset and download (if a change of operating function(^1)) complete - Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication object Switch</td>
<td>Can be parameterized</td>
<td>Communication object no longer available.</td>
<td>Unchanged. Evaluation only after a new event has been received.</td>
<td>Contacts go to a safe state. Renewed evaluation only after a new event has been received.</td>
</tr>
<tr>
<td>Function Time disable communication object Disable function Time</td>
<td>Can be parameterized</td>
<td>Communication object no longer available. Timer stops. Contact position parameterized with BVF</td>
<td>Unchanged.</td>
<td>Contacts go to a safe state. Renewed evaluation only after a new event has been received.</td>
</tr>
</tbody>
</table>
| Staircase light | In the parameter window, you can be set if the function Time is disabled or not disabled after bus voltage recovery. Timer stops. Light stays on, if staircase lighting time has run with BF. Otherwise unchanged. Change only after a new event has been received. The staircase lighting time is retained. | No function. Contact position with bus voltage failure can be parameterized | Unchanged. Change only after an event has been received. e.g. the staircase lighting remains on until it is started again or switched off. The staircase lighting time is accepted from the parameter. Exception:  
- New device  
- Initial parameterization | Running staircase lighting time stops. Switch contact is opened. Staircase lighting timer is set to 0. Staircase lighting time is set to the value parameterized in the ETS. The staircase lighting time sent via the bus is overwritten and is lost. If a function Time is parameterized this will remain active. The communication object Function time disable is reset to the value 0 (function Time activated). |
| Permanent ON  | Permanent ON becomes inactive. Contact position is determined via communication object value Switch. | No function. Contact position with bus voltage failure can be parameterized | Is inactive after a download. | Inactive |

\(^1\) An operating function can occur by the change from fan stage 1, 2 or 3 or to the switchover to a stage and changeover circuit of the fan control.
## Behaviour of the valves on a download, ETS reset, bus voltage failure and recovery

<table>
<thead>
<tr>
<th>Behaviour with</th>
<th>Bus voltage recovery</th>
<th>Bus voltage failure</th>
<th>Download, if no change of the operating function(^1) occurs.</th>
<th>ETS bus reset and download (if a change of operating function(^1)) complete - Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valves</td>
<td></td>
<td>Communication object values are available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve operation</td>
<td></td>
<td>Can be parameterized</td>
<td>Calculation (PWM) / evaluation will be continued with the existing communication object values (input values)</td>
<td>Calculation / evaluation for valve control is set. Valve is closed (reference run = run time (+ 5%)</td>
</tr>
<tr>
<td>Contact setting</td>
<td></td>
<td>Can be parameterized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functions</td>
<td>Unchanged</td>
<td>Unchanged, however without function. Contact position is programmable.</td>
<td>Will be accepted, if changed</td>
<td>Will be accepted, if changed</td>
</tr>
<tr>
<td>Monitoring (communication object Thermostat fault)</td>
<td>Monitoring time will be restarted. Communication object value is 0</td>
<td>No monitoring</td>
<td>Monitoring time will be restarted. Communication object value unchanged.</td>
<td>Monitoring time will be restarted. Thermostat fault is reset</td>
</tr>
<tr>
<td>Behaviour forced operation</td>
<td>Inactive, must be reactivated.</td>
<td>Inactive</td>
<td>Inactive</td>
<td>Becomes inactive</td>
</tr>
</tbody>
</table>

\(^1\) An operating function can occur by the change from fan stage 1, 2 or 3 or to the switchover to a stage and changeover circuit of the fan control.
4.5 Priorities with, ...

4.5.1 Valve HEATING/COOLING

The priorities are defined as follows:

- Reference movement
- Manual operation
- Communication object Block
- Communication object Forced operation
- Valve Purge
- Adjustment
- Control values

Note

1 corresponds to the highest priority.
4.6 Fast heat up/cool down

4.6.1 Heat up

If the new valve position is greater than the current position during heat up, the contact will close immediately.

The closing time is calculated from:

\[ T_{\text{up}} = \text{Valve adjustment duration from 0 to 100 \%} \]
\[ V_{\text{act}} = \text{Current valve position [0…255]} \]
\[ V_{\text{new}} = \text{New valve position [0…255]} \]
\[ T_{\text{new}} = \text{Switch on time of the PWM at the new valve position} \]
\[ T_{\text{cyc}} = \text{PWM cycle time} \]
\[ T_{\text{+1}} = \text{Is added on the way to } V_{\text{new}} \text{ at every position} \]

Calculation of the closing time

\[ T_{\text{new}} = \frac{T_{\text{cyc}}}{255} \times V_{\text{new}} \]

\[ T_{\text{+1}} = \frac{T_{\text{up}}}{255} \times \frac{V_{\text{act}}}{255} \]

Calculation of the closing time at switchover

\[ T = T_{\text{new}} + \left( T + \left[ atV_{\text{act}} \right] \right) + \left( T + \left[ atV_{\text{act}} + 1 \right] \right) + \ldots + \left( T + \left[ atV_{\text{new}} \right] \right) \]

This means:

For a movement from 0…99 \%, the contact remains closed for about \( T_{\text{up}} + T_{\text{cyc}} \).

A change in the lower % range it results in significantly shorter closing times than for changes in the upper % range.

Thereafter, the contact is opened in accordance with the new PWM cycle and the PWM cycle is started.
### 4.6.2 Cooling down

If the new valve position is less than the current position during cooling down, the contact will open immediately.

The opening time is calculated from:

\[ T_{\text{down}} = \text{Valve adjustment duration from 100 to 0 \%} \]

\[ V_{\text{old}} = \text{Current valve position [0…255]} \]

\[ V_{\text{new}} = \text{New valve position [0…255]} \]

\[ T_{\text{new}} = \text{Switch off time of the PWM at the new valve position} \]

\[ T_{\text{cyc}} = \text{PWM cycle time} \]

\[ T_{+1} = \text{Is added on the way to } V_{\text{new}} \text{ at every position} \]

#### Calculation of the opening time

\[
T_{\text{new}} = \frac{T_{\text{cyc}}}{255} \times (255 - V_{\text{new}})
\]

\[
T_{+1} = \frac{T_{\text{down}}}{255} \times \frac{255 - V_{\text{old}}}{255}
\]

#### Calculation of the opening time at switchover

\[
T = T_{\text{new}} + (T_{+1}[atV_{\text{old}}]) + (T_{+1}[atV_{\text{act}} + 1]) + \ldots + (T_{+1}[atV_{\text{new}}])
\]

This means:

For a movement from 99…0 \% the contact remains opened for about \( T_{\text{down}} + T_{\text{cyc}} \).

For a change in the lower \% range, it results in significantly shorter opening times than for changes in the upper \% range.

Thereafter, the contact is opened in accordance with the new PWM cycle and the PWM cycle is started.
A Appendix

A.1 Scope of delivery

The Fan Coil Actuator is supplied together with the following components. The delivered items should be checked according to the following list.

- 1 x FCA/S 1.1M, Fan Coil Actuator, 0-10 V, MDRC
- 1 x installation and operating instructions
- 1 x bus connection terminal (red/black)
## A.2 Status byte forced/operation

<table>
<thead>
<tr>
<th>Bit No.</th>
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<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
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### Manual Setting

#### Bits

- **Bit 0 to 7**: Reserved
- **Bit 8**: Heating
- **Bit 9**: Cooling
- **Bit 10**: Ventilation
- **Bit 11**: Fan
- **Bit 12**: Heating/Cooling

#### Settings

- **Setting**: Forced Operation
- **Setting**: Limitation
- **Setting**: Automatic

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### Limitations

- **Limitation 1**: Automatic
- **Limitation 2**: Heating
- **Limitation 3**: Cooling
- **Limitation 4**: Ventilation

### Automatic Setting

- **Setting**: Forced Operation
- **Setting**: Limitation
- **Setting**: Automatic

### Notes

- **= applicable**

---

[152 2CDC 508 062 D0203 | FCA/S 1.1M]
### A.3 Ordering information

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A.4 Notes
Notizen
Notizen
ABB STOTZ-KONTAKT GmbH
Eppelheimer Straße 82
69123 Heidelberg, Germany
Phone: +49 (0)6221 701 607 (Marketing)
      +49 (0)6221 701 434 (KNX Helpline)
Fax: +49 (0)6221 701 724
e-mail: knx.marketing@de.abb.com

Further information and local contacts:
www.abb.com/knx

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