SATION

SATION KNX
Fan Coil Actuator AC0501.4002
Product Manual

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1 General

Fans, also referred to blower convectors or Fan Coil units, are used for distributed HEATING and COOLING applications. There 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 SATION 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	Appendi

1.1.1 Note

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

Note
Tips for usage and operation

Examples
Application examples, installation examples, programming examples

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.

2 Product and functional overview

The Fan Coil Actuator 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 Actuator controls motor-power operated heating and cooling valves as well as multilevel fans via the KNX/EIB.

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 KNX/EIB 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.

3 Commissioning

3.1 Overview

The application program *Fan Coil Actuator* is available for the Fan Coil Actuator. Programming requi- res the ETS.

The following functions are available:

Fan	A three speed fan is controlled alternately with a two-way connection or with speed switching.
Valve HEATING/COOLING	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).

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

The Fan Coil Actuator features relays in each output which are mechanically independent of the other out- puts. 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 tempera- ture 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,

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 *SATION-AC0501.4002 Fan Coil Actuator* .

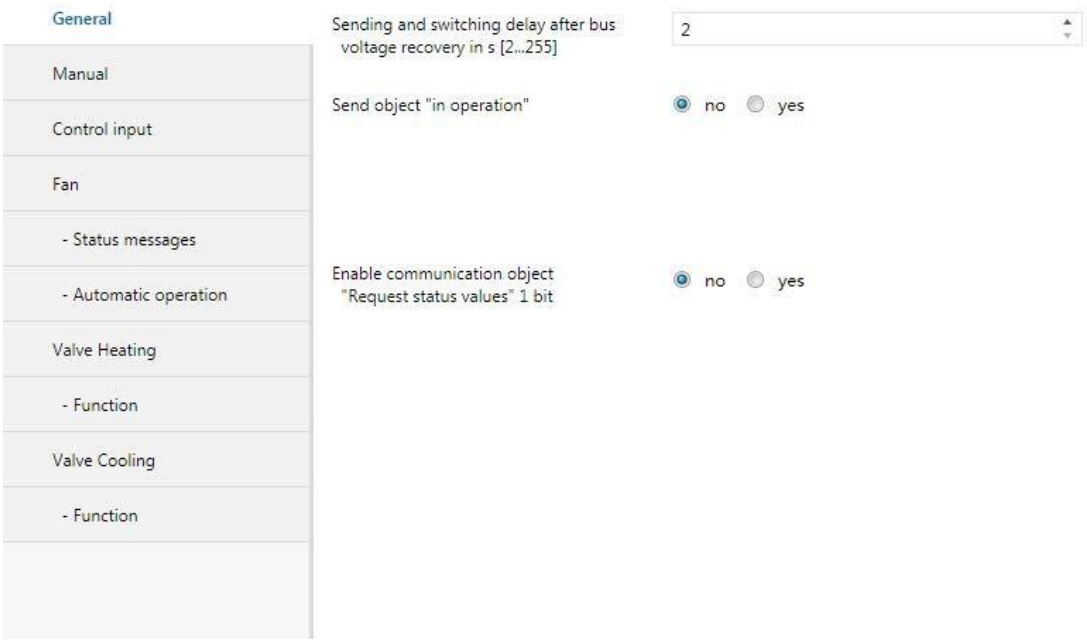
The following chapter describes the parameters of the device using the parameter window. The parameter window features a dynamic structure so that further parameters may be enabled depending on the parameterization and the function of the outputs.

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.

Note
The set switching delay does not act on the electronic outputs (valve HEATING/COOLING)!

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.

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 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.

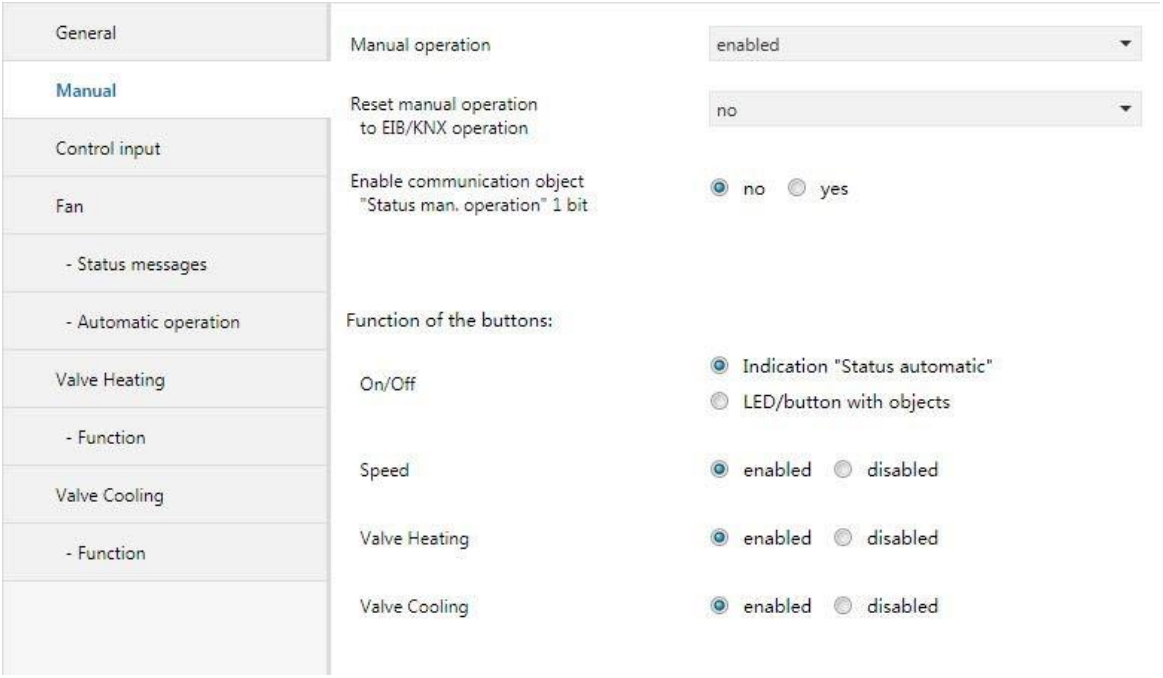
  recall with object value

  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.



Manual operation

Options: enable/disable via communication object
<u>enabled</u>
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
  afterachange
  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

Function of the buttons:

Note
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 operat- ing state *KNX operation* the respective LEDs again indicate their current input states. The communicati- on objects are updated and telegrams are sent.

On/Off

Options: Indication"Statusautomatic"
LED/button with objects

Note
The button *ON/OFF* has no further functions with both options.

- *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.

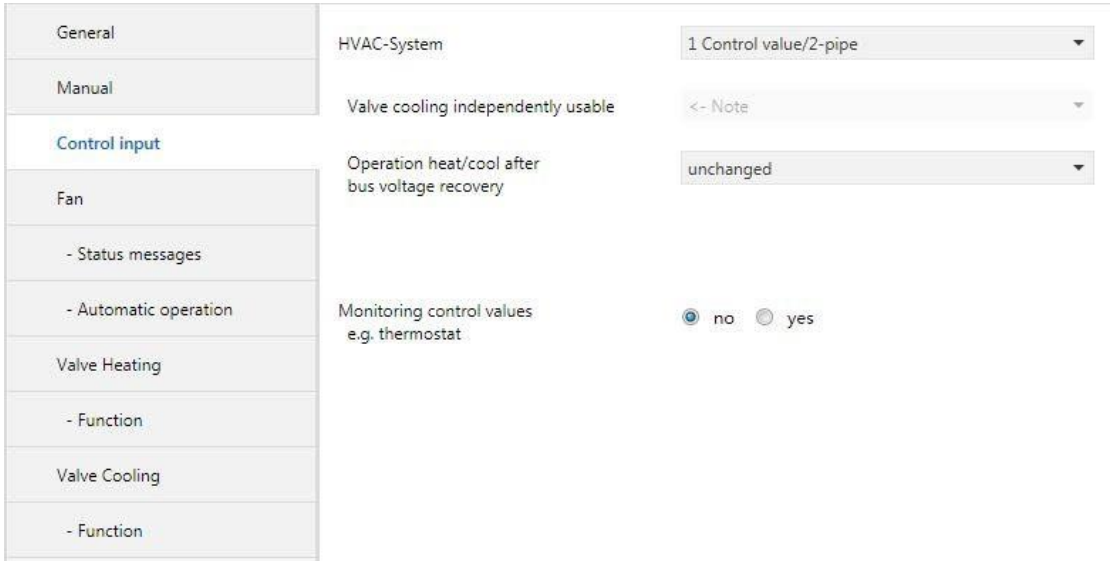
Valve Cooling

The operation of the COOLING valve does not differ from the operation of the HEATING valve.

For further information see: Parameter description Valve HEATING

3.2.3 Parameter window *Control input*

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



HVAC-System

Options: 1Controlvalue/2-pipe
1Controlvalue/4-pipe,with switching object
2Controlvalues/2-pipe
2Controlvalues/2-pipe,with switching object
2Controlvalues/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. 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 Actuator 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.

Important
It must be assured that the monitoring time is set to at least factor 3 larger than the set sending time of the thermostat.

The reaction of the Actuator 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
afterachange
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,

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,

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.

3.2.3.3 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.

Note
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. • If a control with a value > 0 is received, the fan and the corresponding valve are controlled. • The other valve is closed. • If a control value with a value = 0 is received, this is ignored if the other control value > 0.

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,

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,

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.

Note
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. • If a control with a value > 0 is received, the fan and the corresponding valve are controlled. • The other valve is closed. • If a control value with a value = 0 is received, this is ignored if the other control value > 0.

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

Operation heat/cool after bus voltage recovery

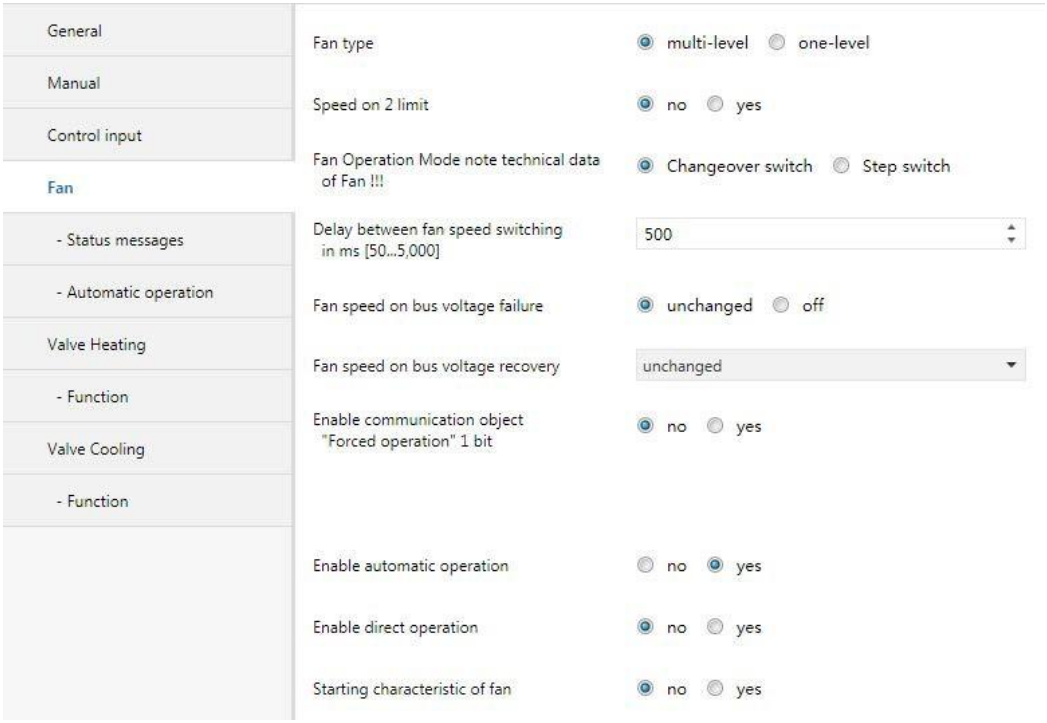
Options: unchanged
Heating
Cooling

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.



Fan type

Option: multi-level
one-level

This parameter defines the fan type which is to be controlled.

- *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
yes

The fan speeds can be limited to two here. The following settings are the same as those for a three speed fan, but are only limited to two speeds.

- *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: Changeoverswitch
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, paappears.

Enable direct operation

Options: no
yes

- *yes: Direct operation* is enabled. Furthermore, the Parameter window-Direct operation, 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.

Note
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.

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.

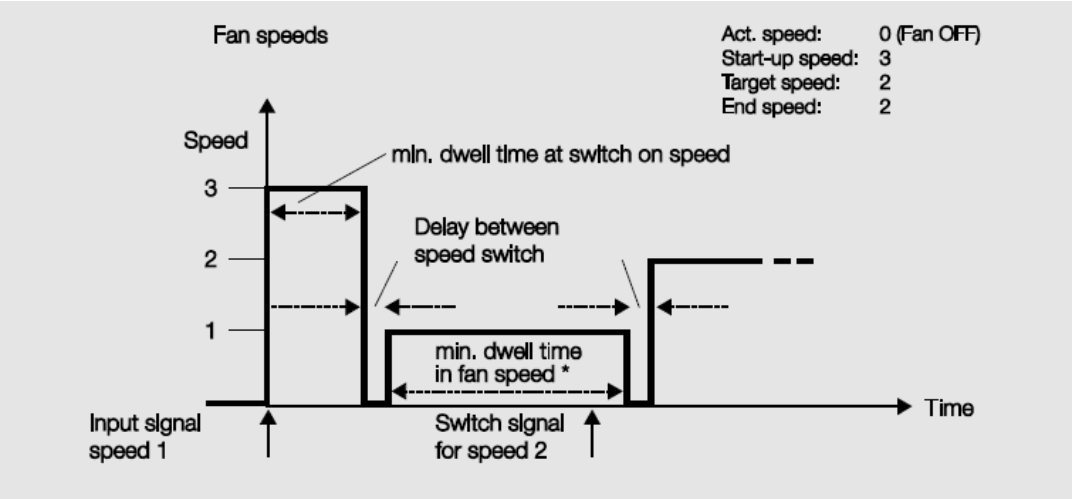
Minimum dwell period in switch on fan speed in s [1...65,535]

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*.

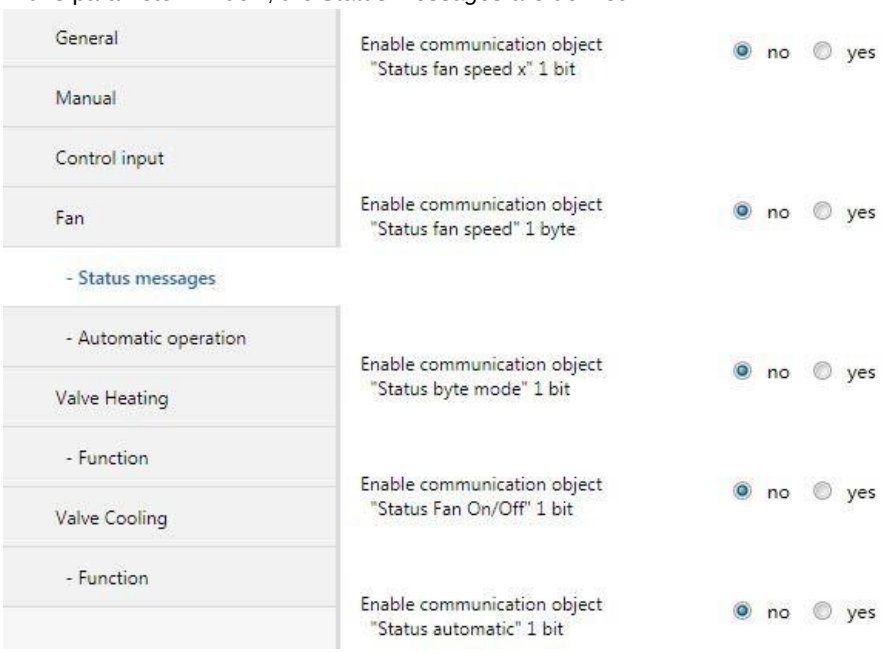


* The parameter *Minimum dwell period in fan speed in s [0...65,535]* in the parameter window *Automatic operation* is only active and programmable, if the option *yes* has been selected in the parameter *Enable automatic operation*. In the parameter window *Fan*, you can find the parameter *Enable automatic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

Note
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.

Send object values

Options: no, update only
afterachange
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:

Meaning

Options: currentfanspeed
required fan speed

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

Note
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.

Send object value

Options: no, update only
afterachange
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,

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

Send object values

Options: no, update only
afterachange
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
afterachange
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:

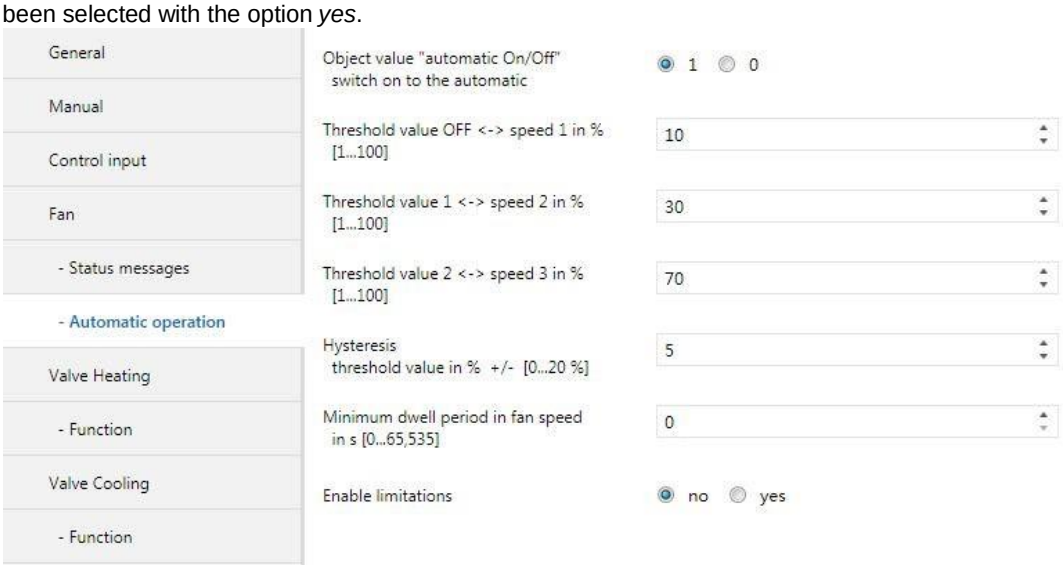
Send object value

Options: no, update only
afterachange
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 communication 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.

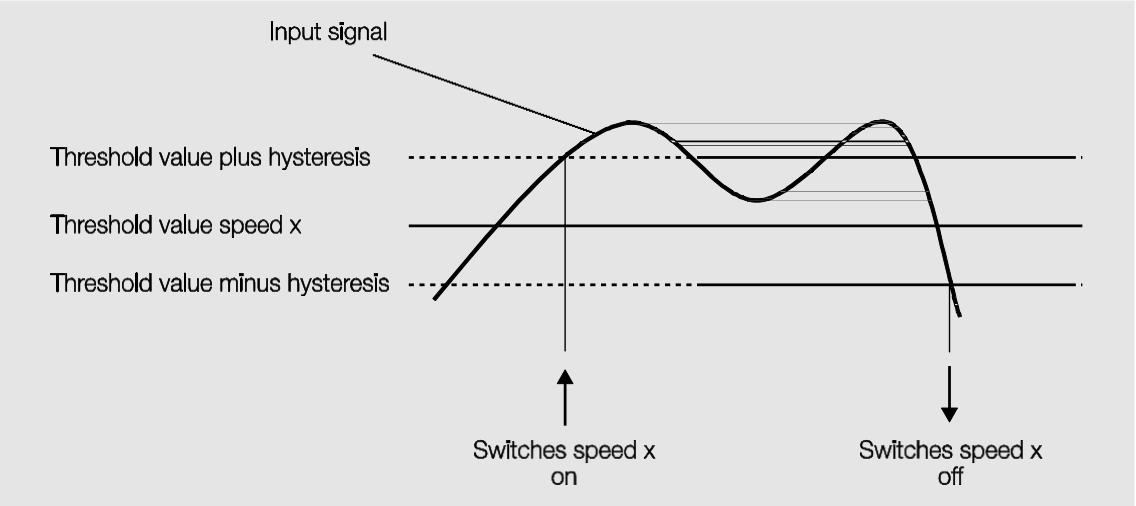
The setting 0 causes immediate switching without hysteresis.

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: Threshold value OFF <-> speed 1 = 10 % Threshold value 1 <-> speed 2 = 20 % Threshold value 2 <-> speed 3 = 30 % Hysteresis 15 % 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.

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 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 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.

Important
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.

Speed with limitation 1
Speed with limitation 2
Speed with limitation 3
Speed with limitation 4

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

3.2.4.3 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*.

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.

Telegram value 1 = Fan speed x is switched on
0 = Fan speed x is switched on

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.

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.

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.

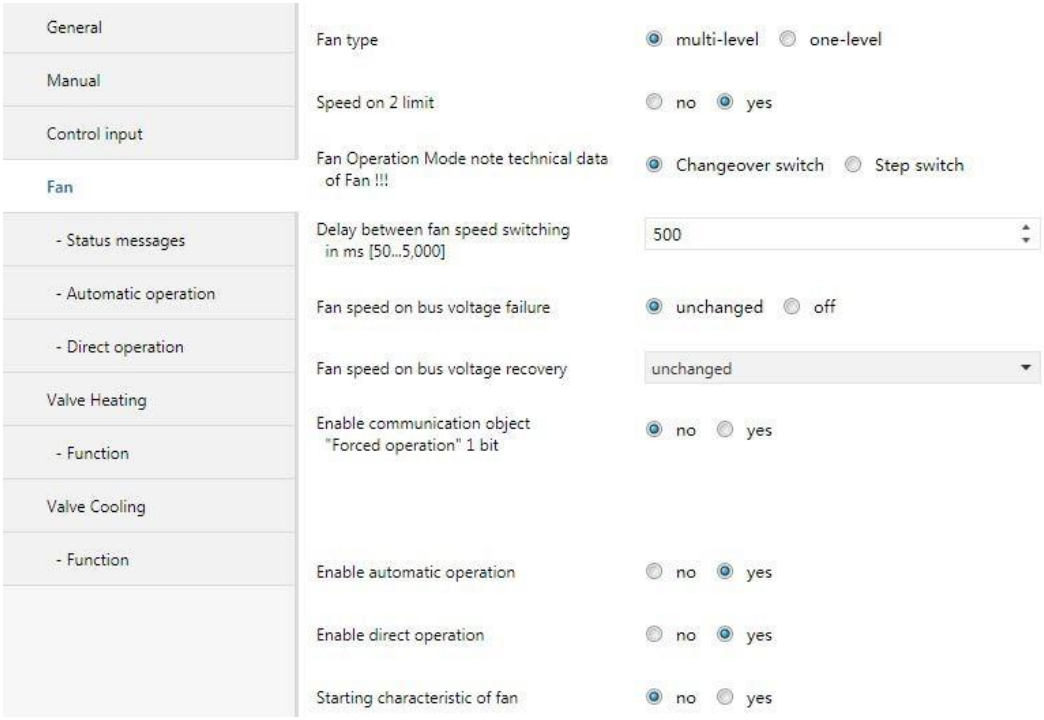
Enable communication object "Fan speed switch" 1 byte

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.



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.

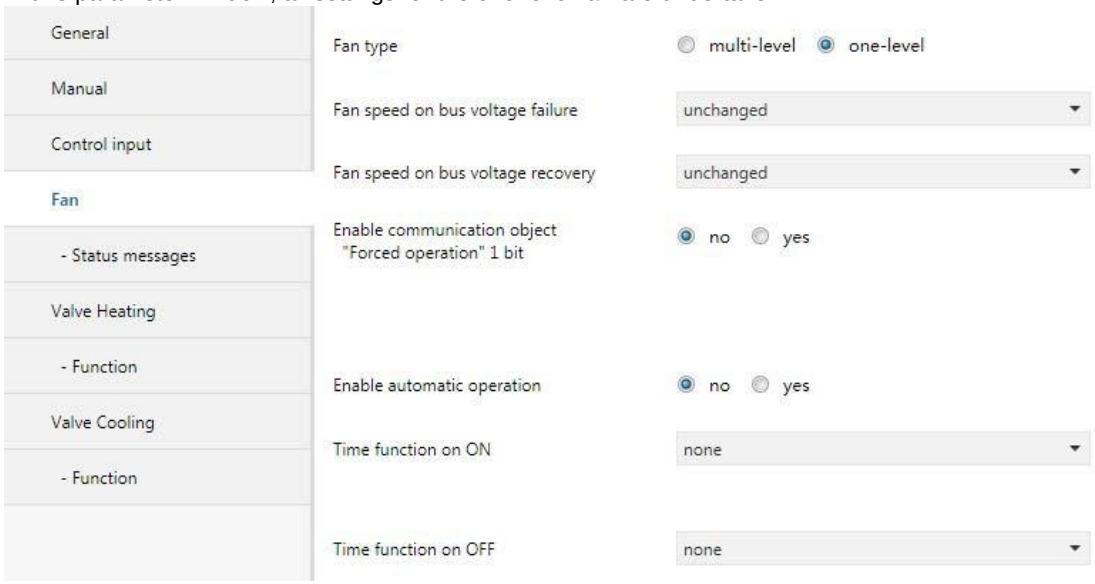
Now a two speed fan is controlled via fan speeds 1 and 2.

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,

3.2.6 Parameter window *One-level fan*

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



Fan type

Option: multi-level
one-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
off
on

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:

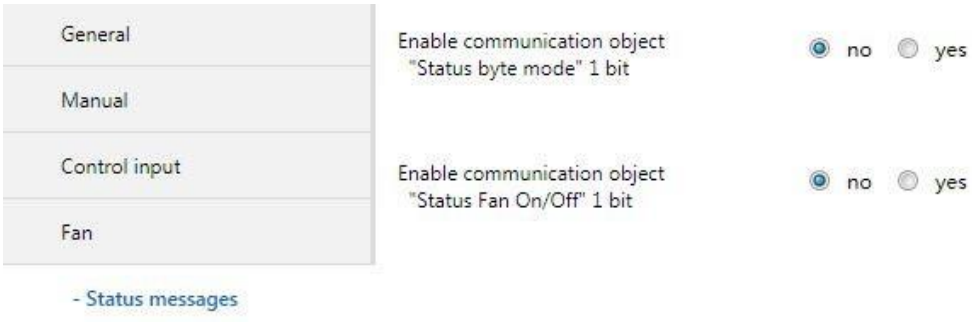
Time in s [1…65,535]

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.



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,

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

  Send object values

  Options: no, update only
  afterachange
  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
afterachange
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 are only 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 = automatic operation active
0 = automatic operation inactive

- *yes:* The following parameter appears:

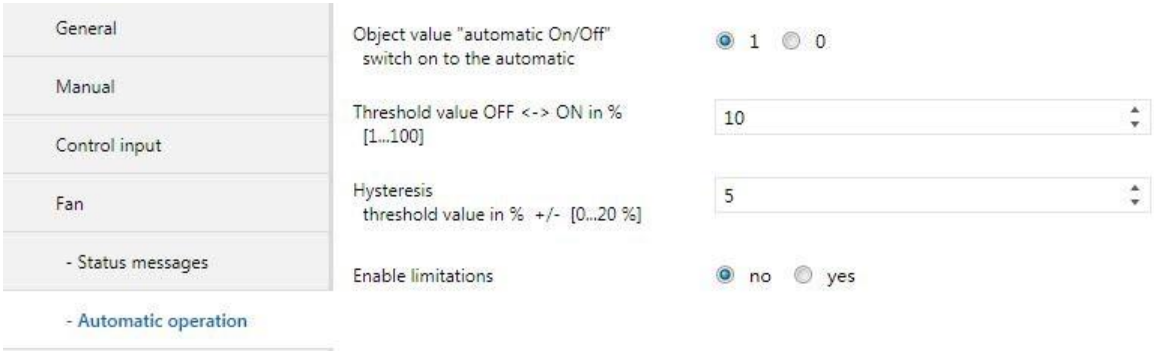
Send object values

Options: no,updateonly
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*.



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

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 %]

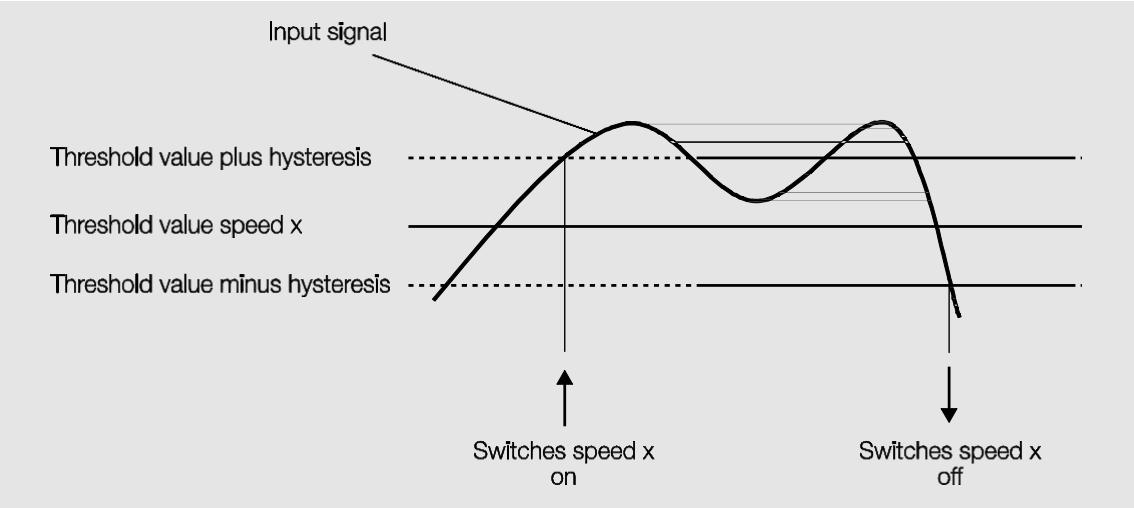
Options: 0…5…20

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

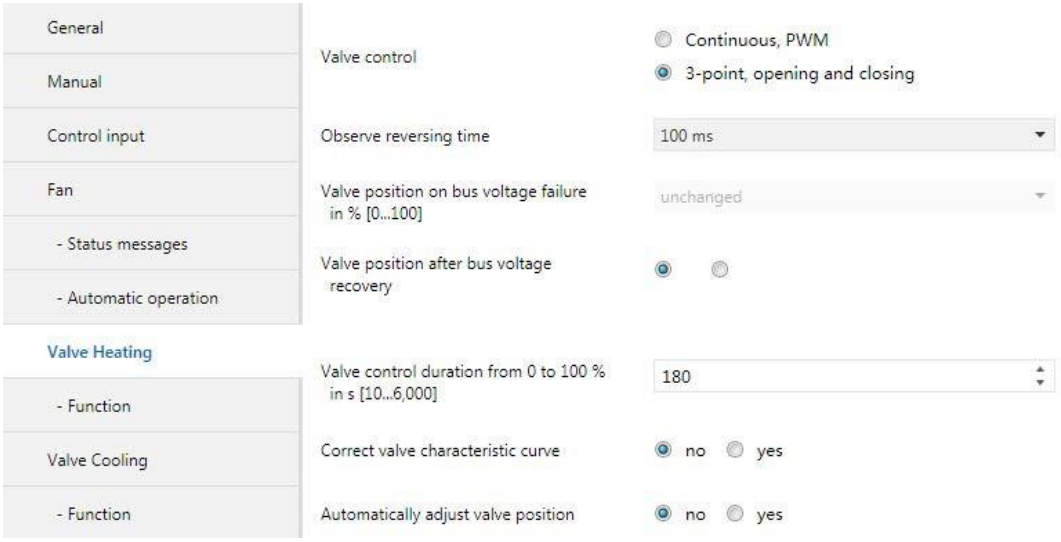
Options: inactive
unchanged
OFF
ON

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

3.2.7 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
1point,openingandclosing

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

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, 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.

Note
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.

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, …,

Number of valve controls up to adjustment [1...65,535]

Option: 1…100…65,535

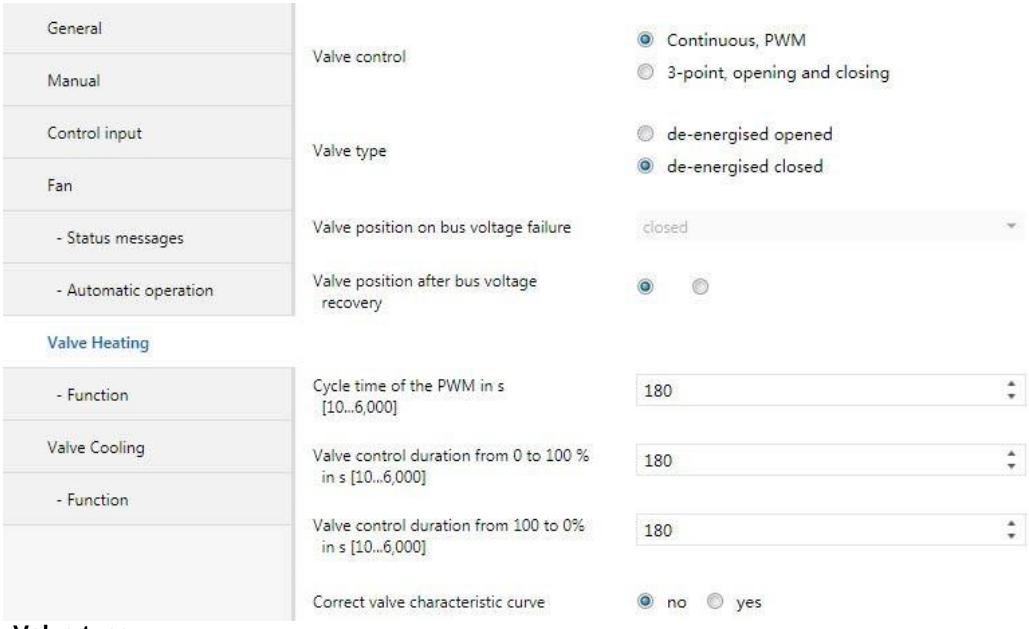
With this parameter, the number of operations (valve controls), after which automatic adjustment is undertaken, can be set.

Note
All actions greater than zero (motor does not move) are counted. The number should be taken from the technical data of the valve manufacturer.

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),



Valve type

Options: de-energisedclosed
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.

Important
The minimum pulse length is defined as 0.5 seconds, so that with very short cycle times (< 1 min.), there are very short switch on times (with small percentage values) or switch off times (with higher percentage values).

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 and corresponds with the total runtime.

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).

Note
The time should be taken from the technical data of the valve and corresponds with the total runtime.

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.

Example
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. 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.

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

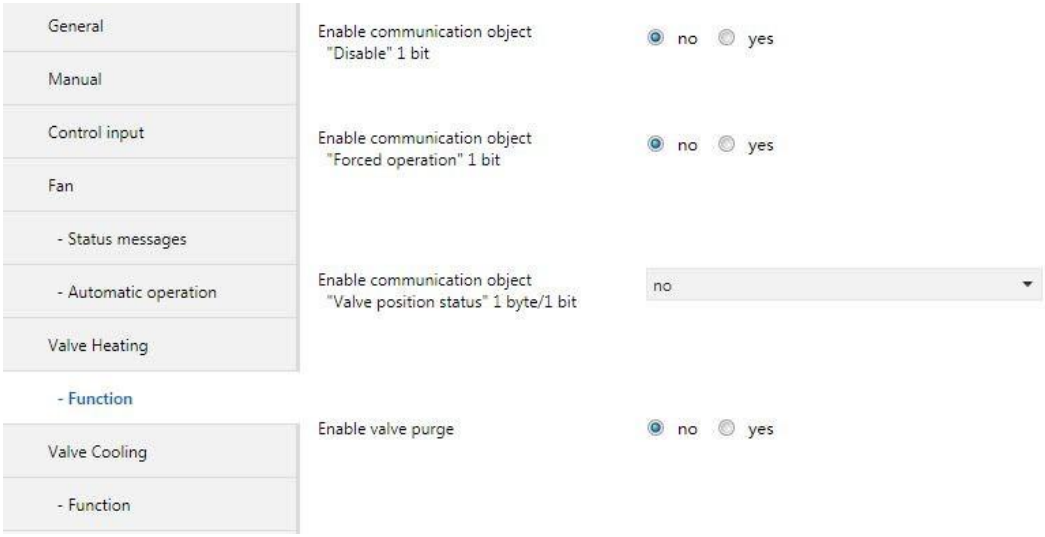
Correct valve characteristic curve

Option: no
yes

If the option *yes* is set in the parameter, the Parameter window-Curve, 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 "Disable" 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
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
afterachange
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
  afterachange
  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:

Note
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 …,**

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
afterachange
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.

Note
The status is sent immediately as soon as a new control value is received.

Duration of valve purge in min.
[1…255]

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
  [1…12]

  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.

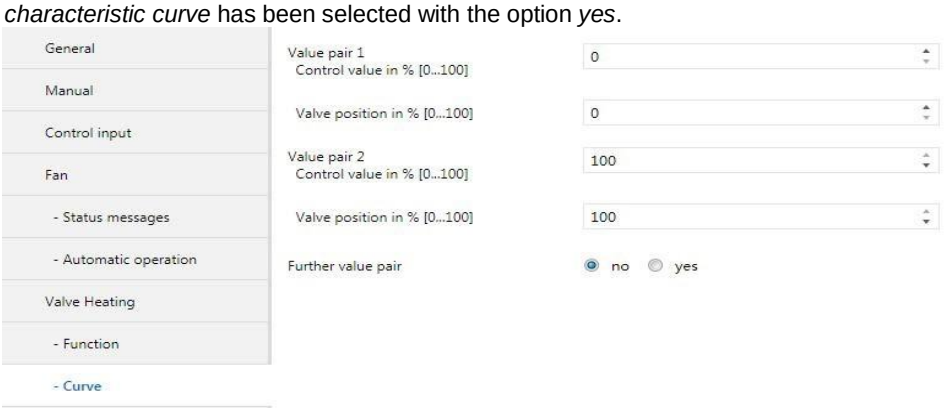
  Reset purge cycle
  from control value in % [1…99]

  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,

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,

3.2.9 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

CO no.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	W	T	A
0	In operation	System	1.002	1 bit	x	x		x	
1	Request status values	General	1.017	1 bit	x	x		x	
2	Enable/disable manual operation	Manual operation	1.003	1 bit	x		x		
3	LED On/Off	Manual operation	1.001	1 bit	x		x		
4	Button On / Off	Manual operation	1.001	1 bit	x	x		x	
5	Status manual Operation	Manual operation	1.003	1 bit	x	x		x	
6…9	Not assigned								
10	Fan speed switch	Fan (multi-level)	5.010	1 byte	x		x		
11	Switch speed 1	Fan (multi-level)	1.001	1 bit	x		x		
	Switch	Fan (one-level)	1.001	1 bit	x		x		
12	Switch speed 2	Fan (multi-level)	1.001	1 bit	x		x		
13	Switch speed 3	Fan (multi-level)	1.001	1 bit	x		x		
14	Fan speed UP/DOWN	Fan (multi-level)	1.007	1 bit	x		x		
15	Status fan ON/OFF	Fan	1.001	1 bit	x			x	
16	Status fan speed	Fan (multi-level)	5.010	1 byte	x	x		x	
17	Status fan speed 1	Fan (multi-level)	1.001	1 bit	x	x		x	
18	Status fan speed 2	Fan (multi-level)	1.001	1 bit	x	x		x	
19	Status fan speed 3	Fan (multi-level)	1.001	1 bit	x	x		x	
20	Not assigned								
21	Limitation 1	Fan	1.003	1 bit	x		x		
22	Limitation 2	Fan	1.003	1 bit	x		x		
23	Limitation 3	Fan	1.003	1 bit	x		x		
24	Limitation 4	Fan	1.003	1 bit	x		x		
25	Forced operation	Fan	1.003	1 bit	x		x		
26	Automatic ON/OFF	Fan	1.003	1 bit	x		x		
27	Not assigned								
28	Status automatic	Fan	1.003	1 bit	x	x	x		
29	Status byte mode	Fan	non DPT	1 byte	x	x		x	
30	Control Value, Heating/Cooling	Control input	5.001	1 byte	x		x		
	Control Value, Heating	Control input	5.001	1 byte	x		x		
31	Control Value, Cooling (extra!)	Control input	5.001	1 byte	x		x		
	Control Value, Cooling	Control input	5.001	1 byte	x		x		
32	Toggle, Heating / Cooling	Control input	1.100	1 bit	x		x		
33	Fault control value	Control input	1.005	1 bit	x	x		x	
34	Not assigned								

CO no.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	W	T	A
35	Block	Valve heating	1.003	1 bit	x		x		
36	Forced operation	Valve heating	1.003	1 bit	x		x		
37	Trigger valve purge	Valve heating	1.017	1 bit	x		x		
38	Status valve purge	Valve heating	1.003	1 bit	x	x		x	
39	Status valve position	Valve heating	1.001	1 bit	x	x		x	
39	Status valve position	Valve heating	5.001	1 byte	x	x		x	
40…44	the same CO as Valve HEATING	Valve cooling							

3.3.2 Communication objects *General*

No.	Function	Communication object name	Data type	Flags
0	**In operation**	**System**	**1 bit** **DPT 1.002**	**C, R, T**
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.				
1	**Request status values**	**General**	**1 bit** **DPT 1.017**	**C, R, T**
The communication object is enabled if in parameter window *General* , the parameter *Enable communication object "Request status values" 1 bit* has been selected with option *yes*. If a telegram with the value x (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.				
2…5		**Manual operation**		
See description Manual operation				
6…9				
Not assigned				

3.3.3 Communication objects *Manual*

No.	Function	Communication object name	Data type	Flags
2	**Enable/disable manual operation**	**Manual operation**	**1 bit** **DPT 1.003**	**C, W**
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				
3	**LED On/Off**	**Manual operation**	**1 bit** **DPT 1.001**	**C, W**
This communication object is enabled when in parameter window *Manual*, the parameter *On/Off* has been selected with the option *LED/button with objects*. Using this communication object the LED ON/OFF is controlled on the foil keypad. Telegram value: 0 = LED OFF 1 = LED ON				
4	**Button On / Off**	**Manual operation**	**1 bit** **DPT 1.001**	**C, R, T**
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				
5	**Status manual Operation**	**Manual operation**	**1 bit** **DPT 1.003**	**C, R, T**
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.				

3.3.4 Communication objects *Control input*

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

No.	Function	Communication object name	Data type	Flags
30	**Control Value, Heating/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 *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				
31	**Control Value, Cooling (extra!)**	**Control input**	**1 byte** **DPT 5.001**	**C, W**
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				
32				
Not assigned.				

3.3.4.2 Communication objects *HVAC System 1 Control value/4 pipe, with switching object*

No.	Function	Communication object name	Data type	Flags
30	**Control Value, Heating/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 *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				
31				
not assigned.				
32	**Toggle, Heating / Cooling**	**Control input**	**1 bit** **DPT 1.100**	**C, W**
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				

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

3.3.4.3 Communication objects *HVAC System – 2 Control values/2 pipe*

No.	Function	Communication object name	Data type	Flags
30	**Control Value, Heating**	**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 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*

No.	Function	Communication object name	Data type	Flags
30	**Control Value, Heating**	**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, with switching object*. 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, with switching object* . 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	**Toggle, Heating / Cooling**	**Control input**	**1 bit** **DPT 1.100**	**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, 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				

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

3.3.4.5 Communication objects *HVAC System – 2 Control values/4 pipe*

No.	Function	Communication object name	Data type	Flags
30	**Control Value, Heating**	**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 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.				

3.3.4.6 Communication object *Fault control value*

No.	Function	Communication object name	Data type	Flags
33	**Fault control value**	**Control input**	**1 bit** **DPT 1.005**	**C, R, T**

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.

3.3.5 Communication objects *Multi-level fan*

No.	Function	Communication object name	Data type	Flags
10	**Fan speed switch**	**Fan**	**1 byte** **DPT 5.010**	**C, W**

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:

1 byte value	**Hexadecimal**	**Binary value bit 76543210**	**Fan speed**
0	00	00000000	0 (OFF)
1	01	00000001	Fan speed 1
2	02	00000010	Fan speed 2
3	03	00000011	Fan speed 3
>3	>03	>00000011	Values greater than 3 are ignored

11	**Switch speed 1**	**Fan**	**1 bit:** **DPT 1.001**	**C, W**

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

12	**Switch speed 2**			

See communication object 11

13	**Switch speed 3**			

See communication object 11

No.	Function	Communication object name	Data type	Flags
14	**Fan speed UP/DOWN**	**Fan**	**1 bit** **DPT 1.007**	**C, W**

The communication object is enabled if in parameter window *Fan*, the parameter *Enable direct operation* and *Enable communication object "Fan speed UP/DOWN" 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

No.	Function	Communication object name	Data type	Flags
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 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.

No.	Function	Communication object name	Data type	Flags
16	**Status fan speed**	**Fan**	**1 byte** **DPT 5.010**	**C, R, T**

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:

Figure value	Hexadecimal	Binary value bit 76543210	Fan speed
0	00	00000000	0 (OFF)
1	01	00000001	Fan speed 1
2	02	00000010	Fan speed 2
3	03	00000011	Fan speed 3

No.	Function	Communication object name	Data type	Flags
17	**Status fan speed 1**	**Fan**	**1 bit** **DPT 1.001**	**C, R, T**

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*.

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

No.	Function	Communication object name	Data type	Flags
18	**Status fan speed 2**			

See communication object 17

No.	Function	Communication object name	Data type	Flags
19	**Status fan speed 3**			

See communication object 17

No.	Function	Communication object name	Data type	Flags
20				

Not assigned.

No.	Function	Communication object name	Data type	Flags
21	**Limitation 1**	**Fan**	**1 bit** **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*. 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. Telegram value: 0 = limitation x inactive 1 = limitation x active				
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. Telegram value: 0 = no forced operation 1 = forced operation				
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: 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				
27				
Not assigned.				

No.	Function	Communication object name	Data type	Flags
28	**Status automatic**	**Fan**	**1 bit** **DPT 1.003**	**C, R, W**

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

No.	Function	Communication object name	Data type	Flags
29	**Status byte mode**	**Fan**	**1 byte** **non DPT**	**C, R, T**

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,

3.3.6 Communication objects *Fan one-level*

No.	Function	Communication object name	Data type	Flags
10				
Not assigned.				
11	**Switch**	**Fan**	**1 bit** **DPT 1.001**	**C, W**
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.				

No.	Function	Communication object name	Data type	Flags
16…20				
Not assigned.				
21	**Limitation 1**	**Fan**	**1 bit** **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				
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 *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				

No.	Function	Communication object name	Data type	Flags
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 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				
27				
Not assigned.				
28	**Status automatic**	**Fan**	**1 bit** **DPT 1.003**	**C, R, W**
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				

No.	Function	Communication object name	Data type	Flags
29	**Status byte mode**	**Fan**	**1 byte** **non DPT**	**C, R, T**

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,

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

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

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

No.	Function	Communication object name	Data type	Flags
35	**Block**	**Valve heating**	**1 bit** **DPT 1.003**	**C, W**
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				
36	**Forced operation**	**Valve heating**	**1 bit** **DPT 1.003**	**C, W**
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				
37	**Trigger valve purge**	**Valve heating**	**1 bit** **DPT 1.017**	**C, W**
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.

No.	Function	Communication object name	Data type	Flags
38	**Status valve purge**	**Valve heating**	**1 bit** **DPT 1.003**	**C, R, T**

The status of the valve purge is visible via this communication object.

Telegram value: 0 = valve purge not active
1 = valve purge active

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.

No.	Function	Communication object name	Data type	Flags
39	**Status valve position**	**Valve heating**	**1 bit** **DPT 1.001**	**C, R, T**

Dieses Kommunikationsobjekt ist freigegeben, wenn im Parameterfenster *Ventil Heizen* der Parameter *Kommunikationsobjekt freigeben „Status Ventilstellung“* die Option *1 Bit* ausgewählt wurde.

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.

Telegram value: 0 = Valve position equal to zero/LED HEATING off
1 = Valve position not equal to zero/LED HEATING on

No.	Function	Communication object name	Data type	Flags
39	**Status valve position**	**Valve heating**	**1 byte** **DPT 5.001**	**C, R, T**

Dieses Kommunikationsobjekt ist freigegeben, wenn im Parameterfenster *Ventil Heizen* der Parameter *Kommunikationsobjekt freigeben „Status Ventilstellung“* die Option *1 Bit* ausgewählt wurde.

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.

Telegram value: 0…255 = valve position is displayed directly as a figure value
At 0 = LED HEATING off
At > 0 = LED HEATING on

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 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.

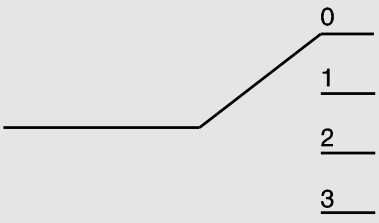
4.1.1 Terms

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.

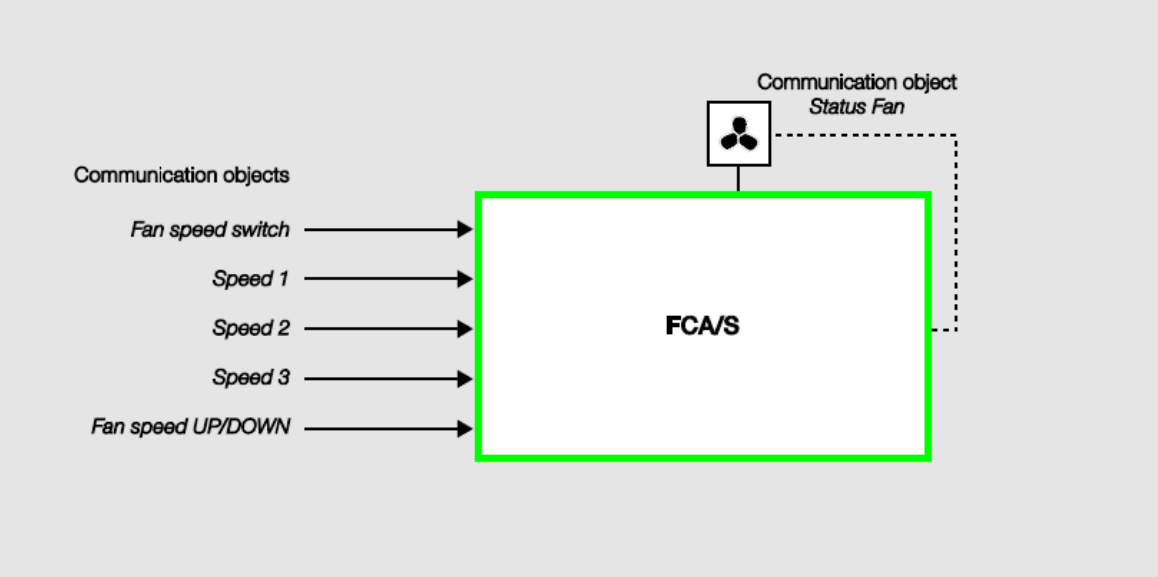
4.1.2 Fan operation

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.



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:

	Connector block 4	Connector block 5	Connector block 6
OFF	0	0	0
Fan speed 1	1	0	0
Fan speed 2	0	1	0
Fan speed 3	0	0	1

4.1.2.2 Fan with speed switching

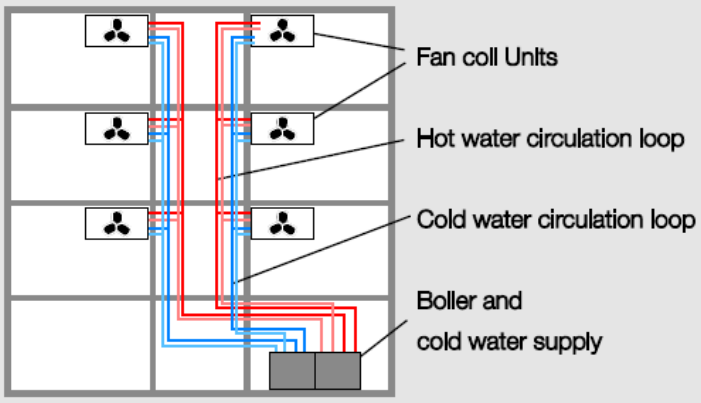
In some cases, the fan is controlled via a step switch. The following control table results for a three-speed fan, which simulates the RM/S with its outputs:

	Connector block 4	Connector block 5	Connector block 6
OFF	0	0	0
Fan speed 1	1	0	0
Fan speed 2	1	1	0
Fan speed 3	1	1	1

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.



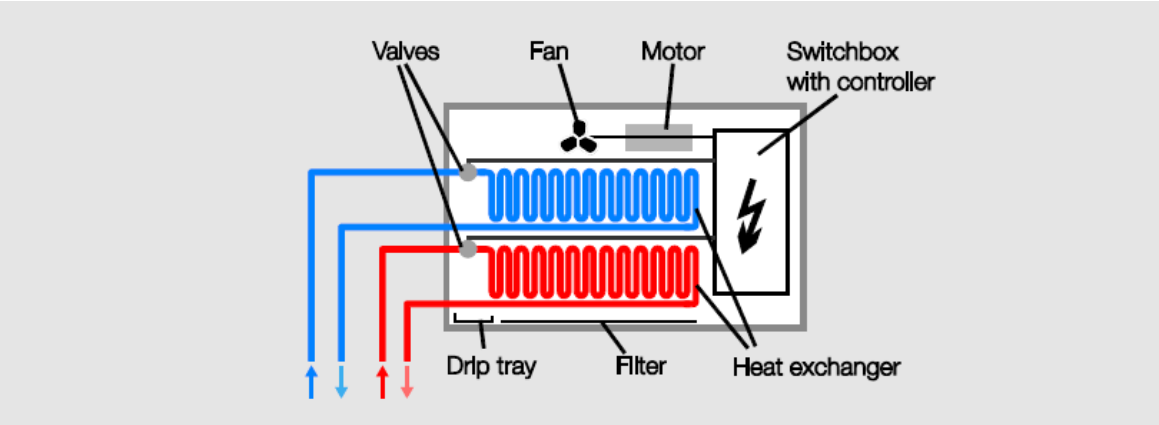
4.1.4 Design of a Fan Coil unit

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.

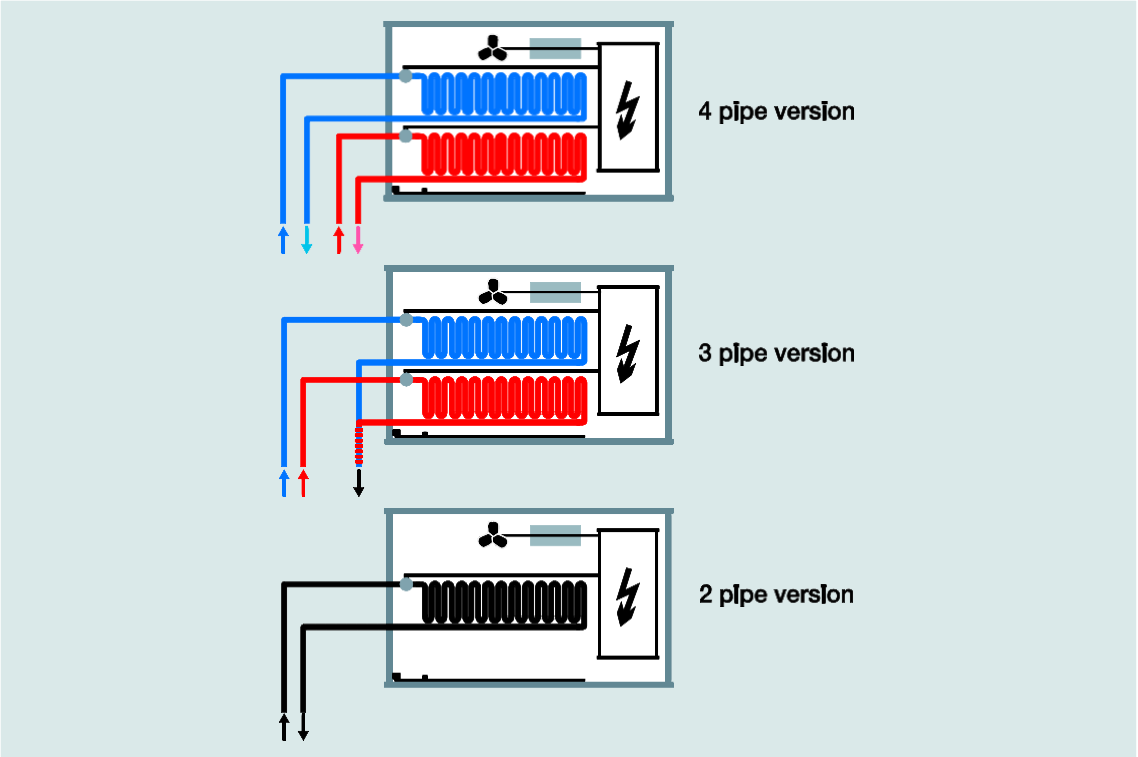


The fan blows air past the heat exchanger and into the room through a filter. The air is heated or cooled in the heat exchangers and thus generates the desired room temperature. The fan is driven by a motor. The motor and the valves are controlled by a Fan Coil Actuator.

The water condensation which results during cooling collects in a condensation water trough.

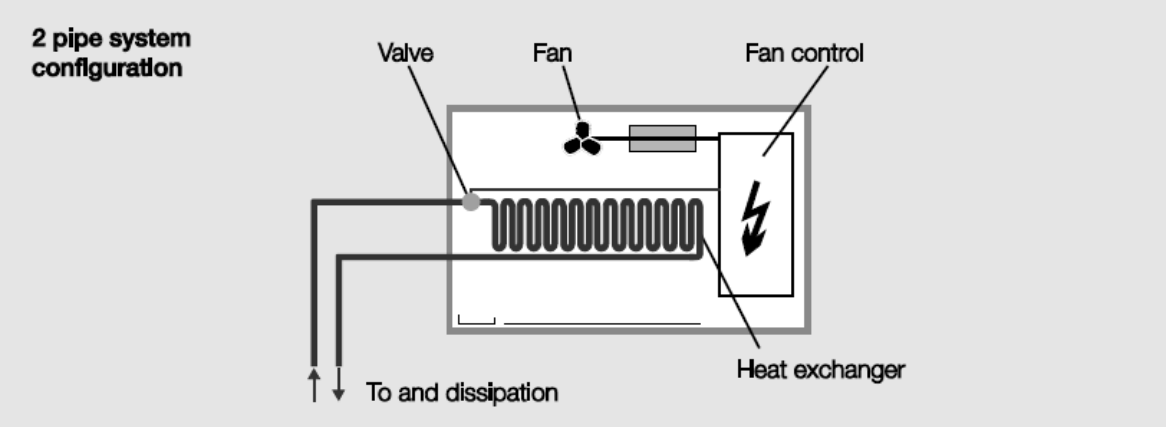
4.1.5 Pipe systems

A Fan Coil unit can be configured as a 2-, 3- or 4-pipe system.



4.1.5.1 2 pipe system, configuration

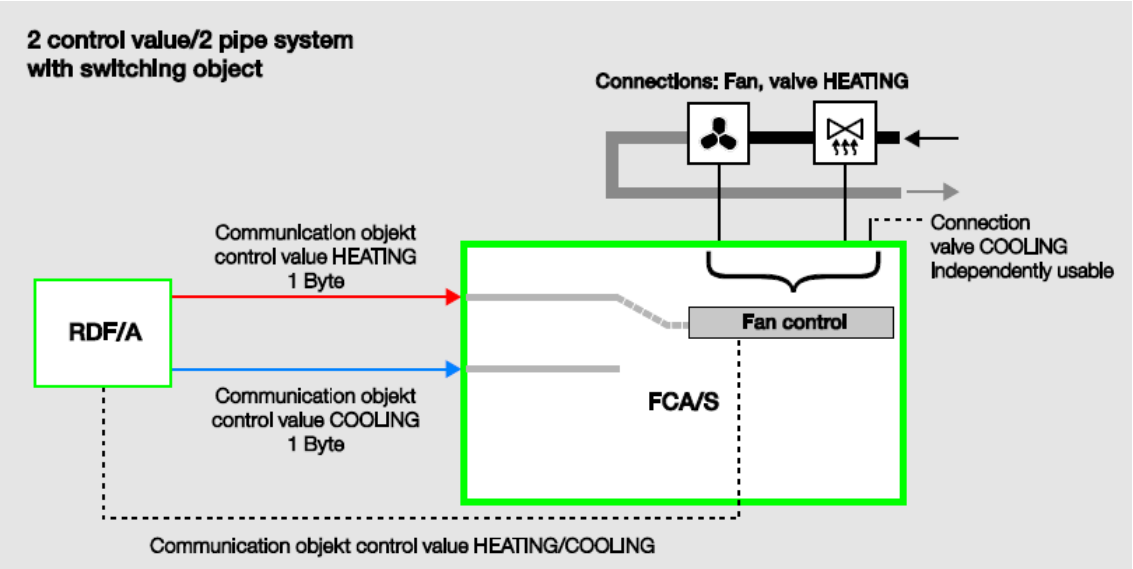
The 2 pipe system consists of just a single water circuit which is heated or cooled alternately to suit the season. In a 2 pipe Fan Coil unit there is only one heat exchanger with a valve.



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.

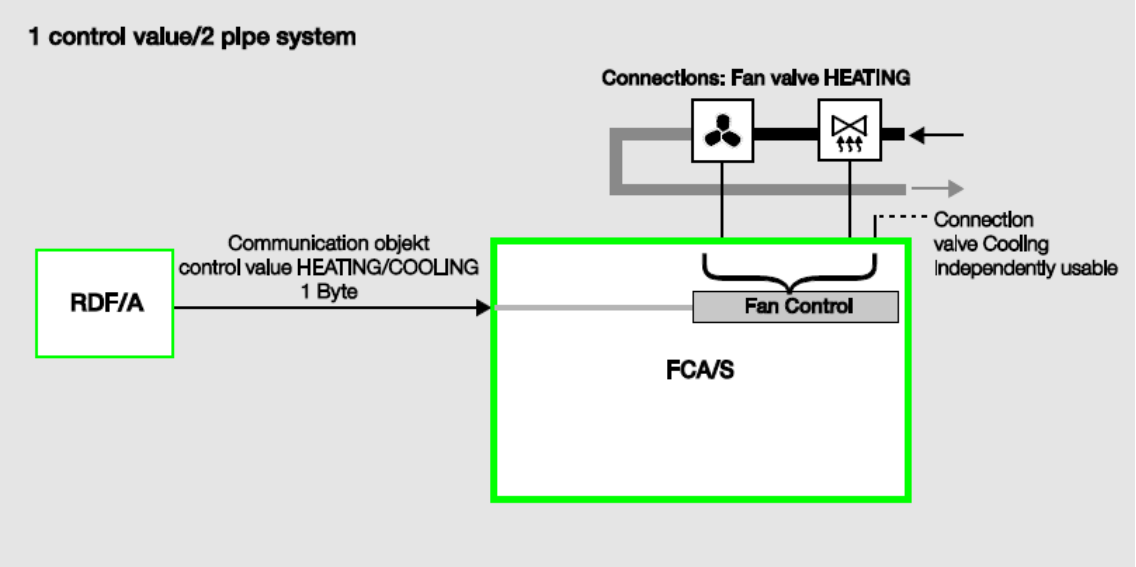
4.1.5.2 2 pipe system HEATING and COOLING

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.



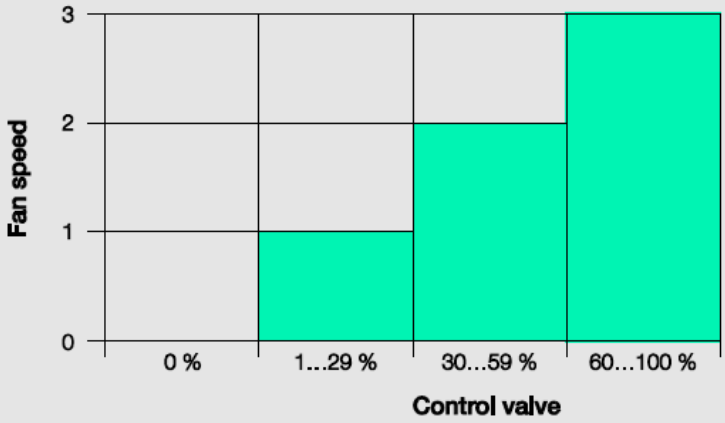
Note
Both 2-pipe systems can be established using a 3 stage fan or blower. Depending on the control value (1 byte or 1 bit), which is sent from a thermostat, the Fan Coil Actuator determines the corresponding fan stages (speeds) via programmable threshold values.

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:

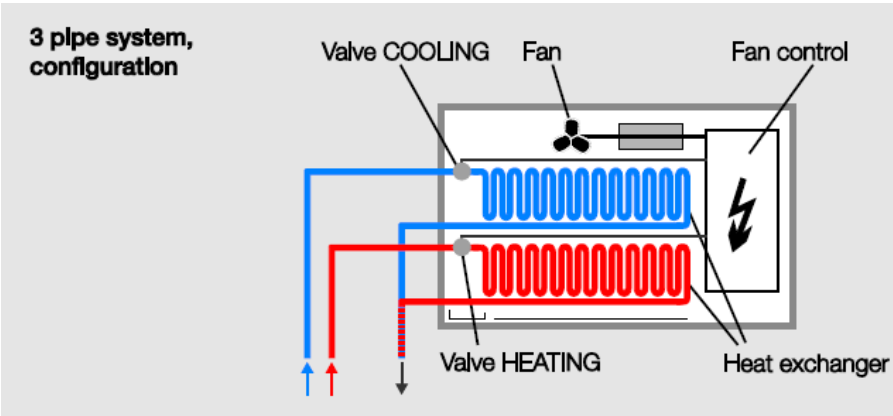
Fan speed 1: 1…29 % Off -> Fan speed 1 = 1%
Fan speed 2: 30…59% Fan speed 1 -> 2 = 30%
Fan speed 3: 60…100% Fan speed 2 -> 3 = 60%



4.1.5.4 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.

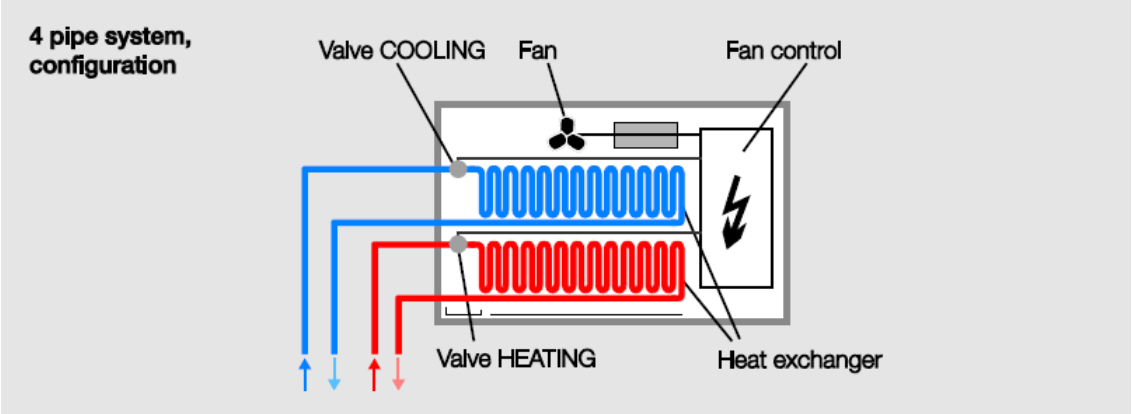


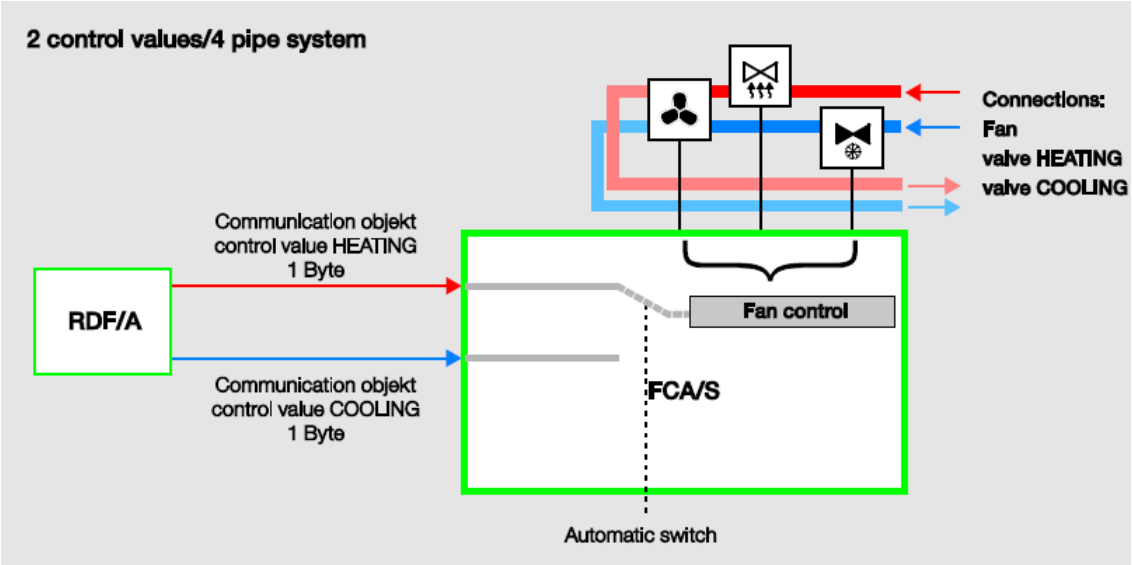
4.1.5.5 4 pipe system, configuration

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:

Controlvalue	Fanspeed
0… 9 %	0 (fan off)
10… 39 %	1
40… 69 %	2
70…100 %	3

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.

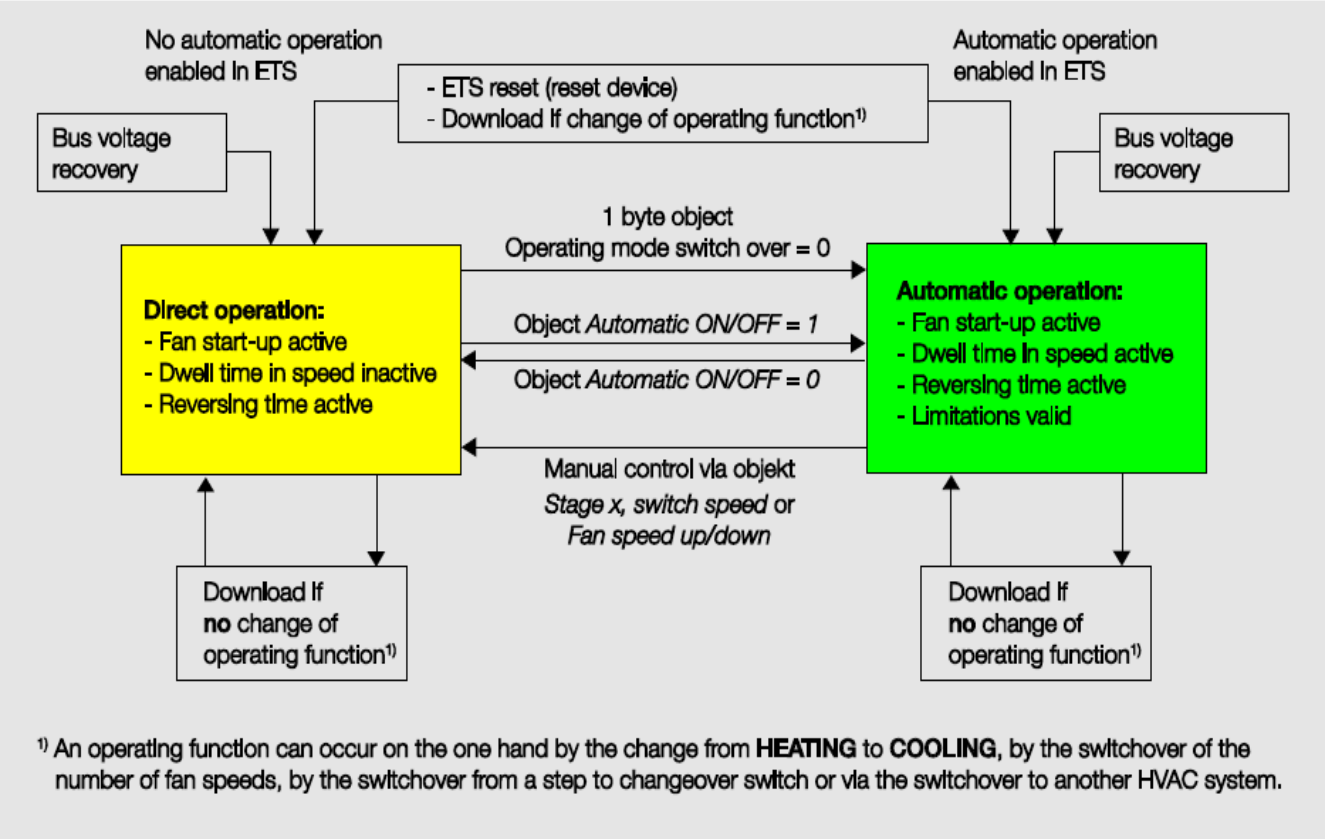
An automatic operation parameterized in the ETS only becomes active after the first download. With a subsequent download the automatic operating state (active, inactive) is retained as it was before the download. However, there is an exception when system properties such as HVAC systems, fan control (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 step to changeover switch or via the switchover to another HVAC system.

4.2.2 Direct operation

With direct fan control via the EIB/KNX, 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 EIB/KNX. 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.

1bytevalue	Fanspeed
0… 9 %	0 (fan off)
10… 39 %	1
40… 69 %	2
70…100 %	3

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.

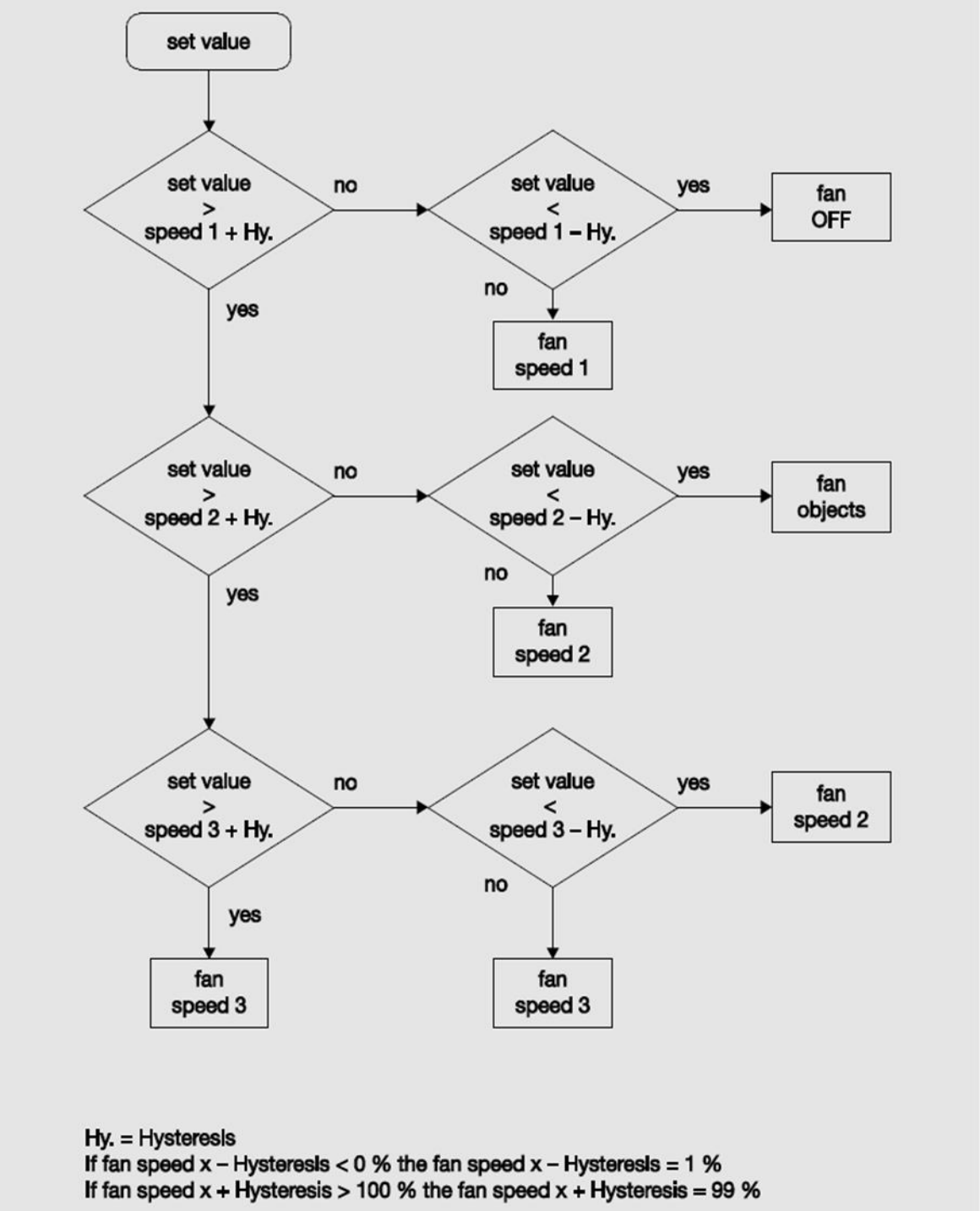
The fan control is changed back to automatic operation if a 1 is received in the respective communication object.

The current status of automatic operation is fed-back via a 1 bit value.

4.2.4 Logic of the stage switching

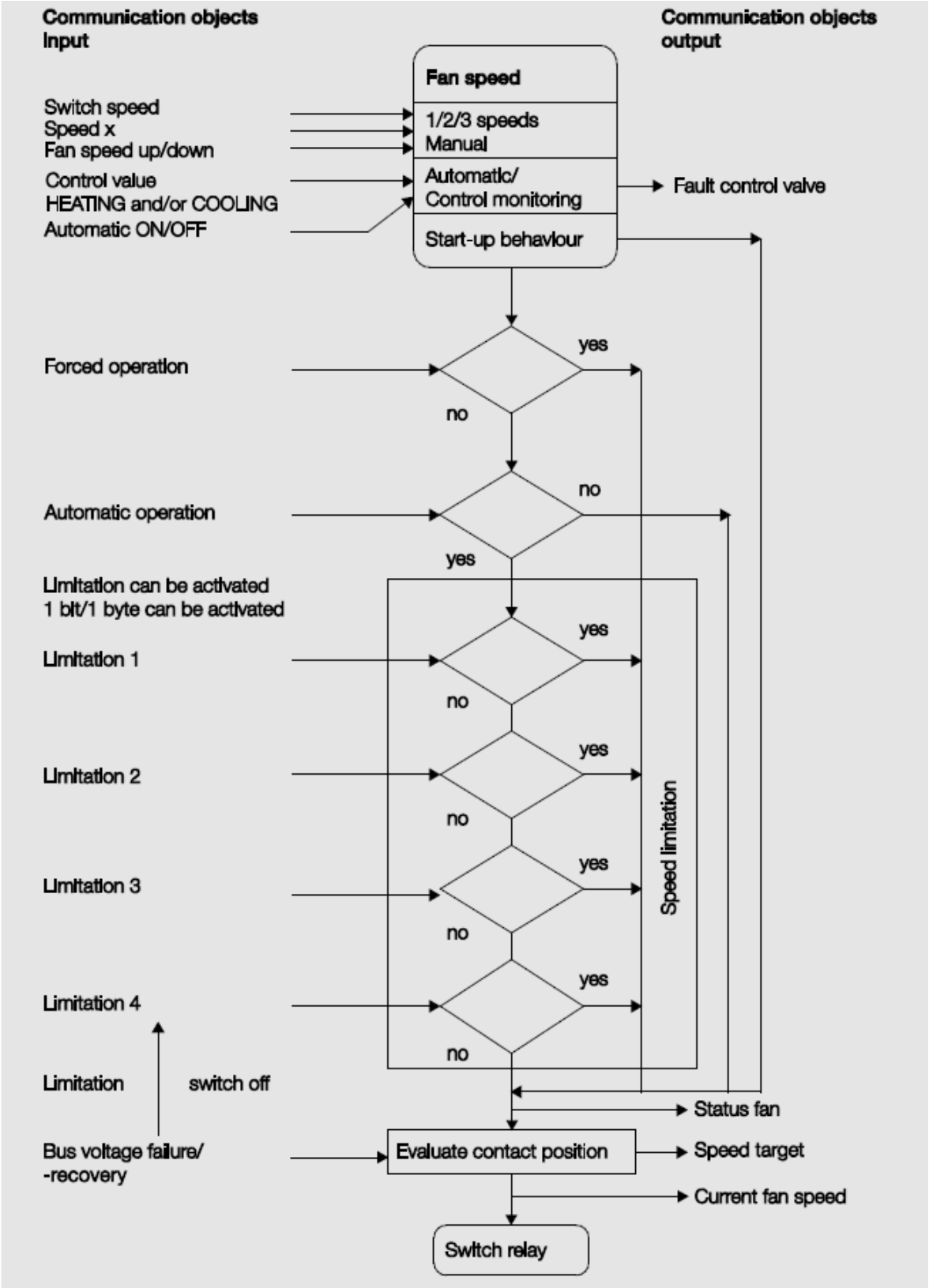
The following illustration indicates the logic of a switchover stage for a Fan Coil Actuator in dependence on the control values and the parameterized threshold values and hysteresis.

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.



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 to 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

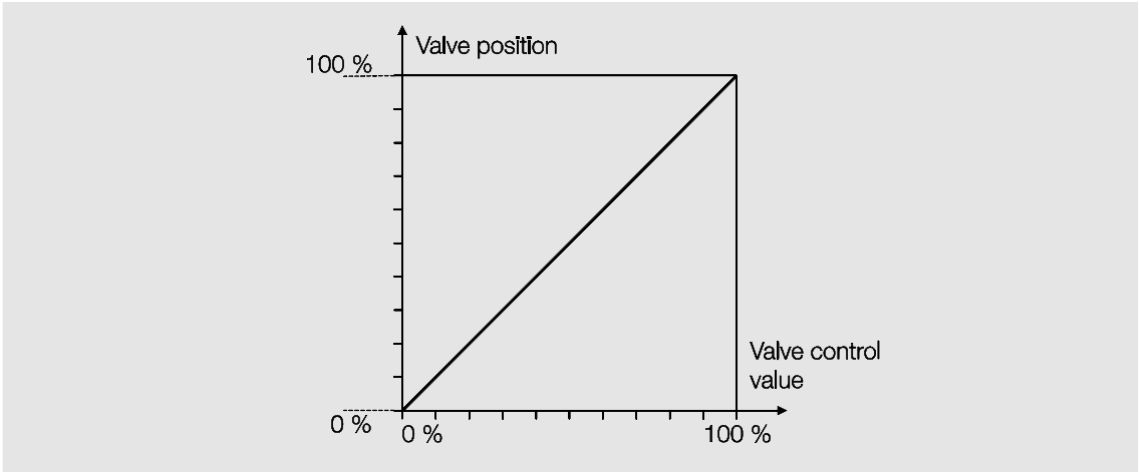
Electro-thermal drives are adjusted due to heat expansion of a material caused by a flow of electric current. Electro-thermal valve drives are controlled by pulse width modulation. The Fan Coil Actuator supports the control of electro-thermal valve drives via pulse width modulation.

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

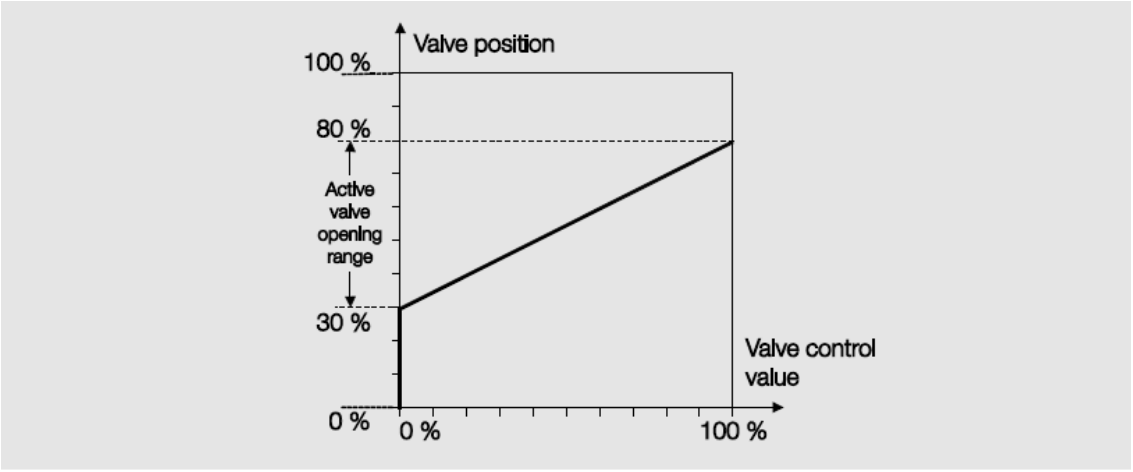
The Fan Coil Actuator controls valves with linear valve curves. The valve control is matched linearly to the control value. The valve is closed with a control value of 0 %, i.e. also 0 %. The valve is fully open with a control value of 100 %, i.e. also 100 %. The same ratio also applies for all intermediate values.



Linear valve curve

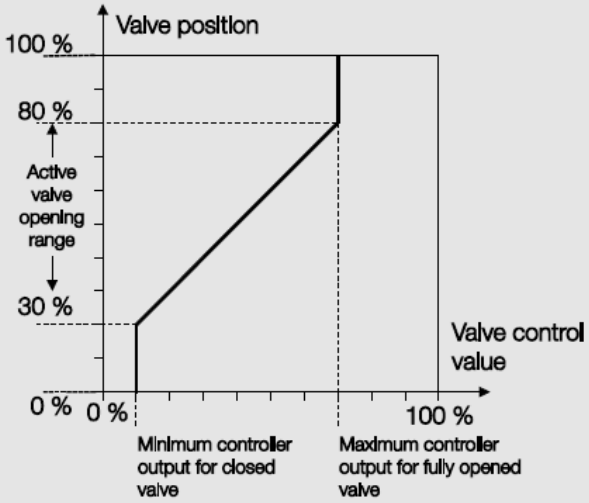
These valve curves can be matched for different valve types. Many valves, for example, have practically no flow when barely opened and achieve maximum flow at 60…80 %. Furthermore, many valves emit an annoying whistling sound at low flows.

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

A further correction of the curve can be undertaken in the Parameterwindow-Curve, 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.

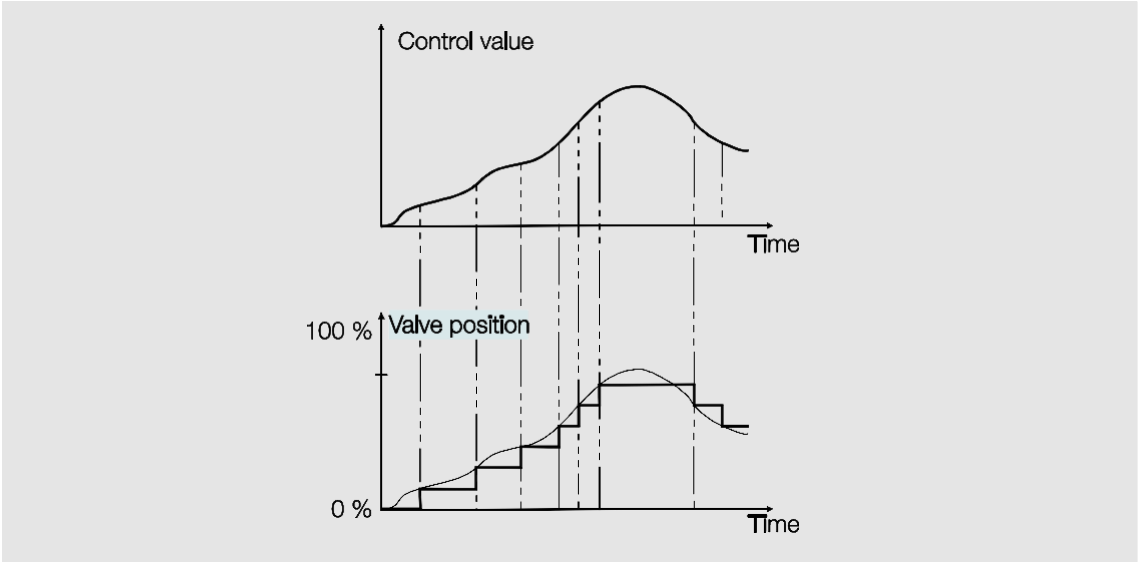
4.3.4 Control types

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.

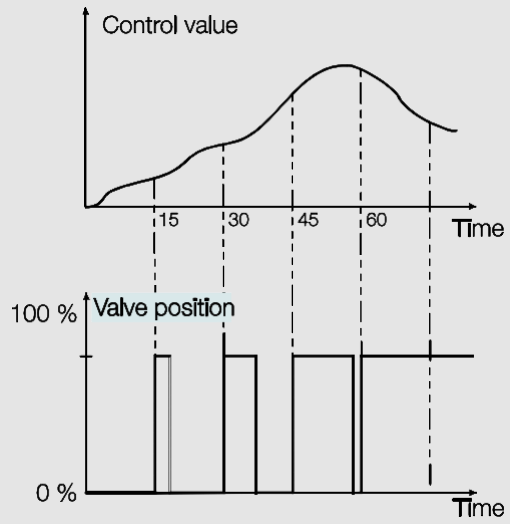
What is a 1 byte control?

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.

4.3.4.2 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.

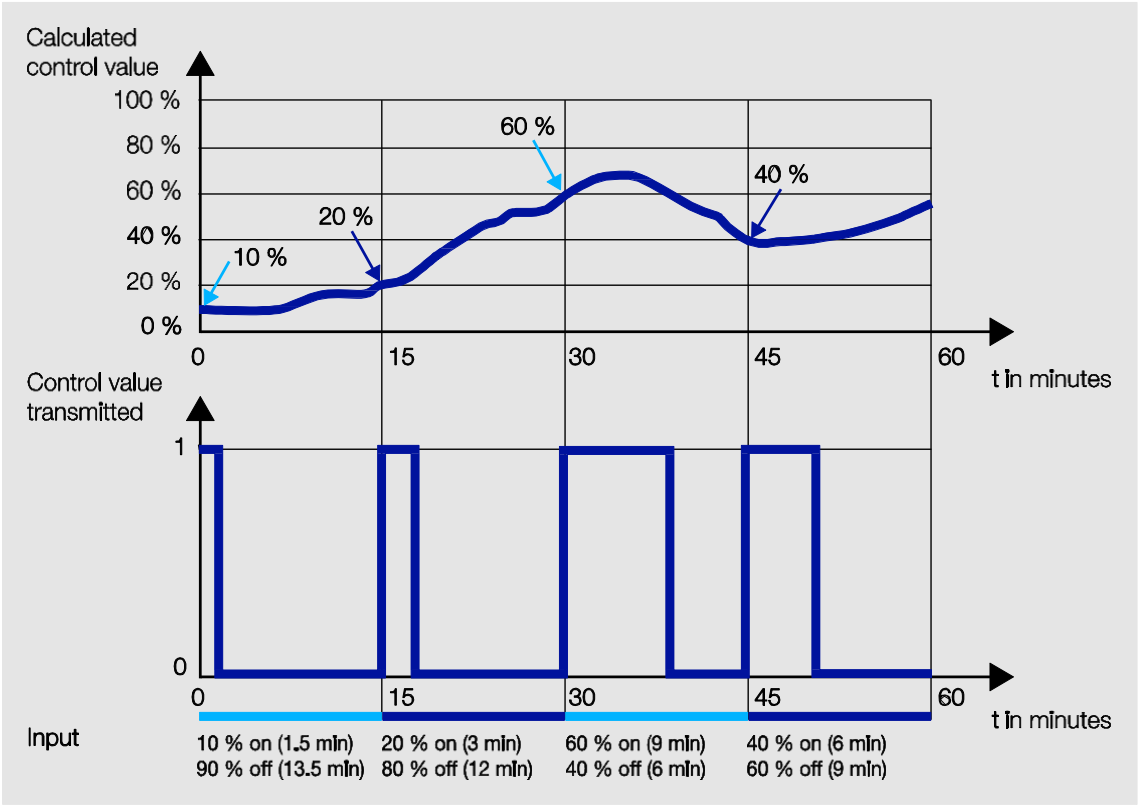


With pulse width modulation, a relatively accurate setting of the temperature can be achieved without any resulting overshoots. Simple, attractively-priced control valves can be used. The positioning frequency of the control valve is relatively high.

Pulse width modulation can be used with the Fan Coil Actuator in conjunction with electromotor or electro-thermal valve drives.

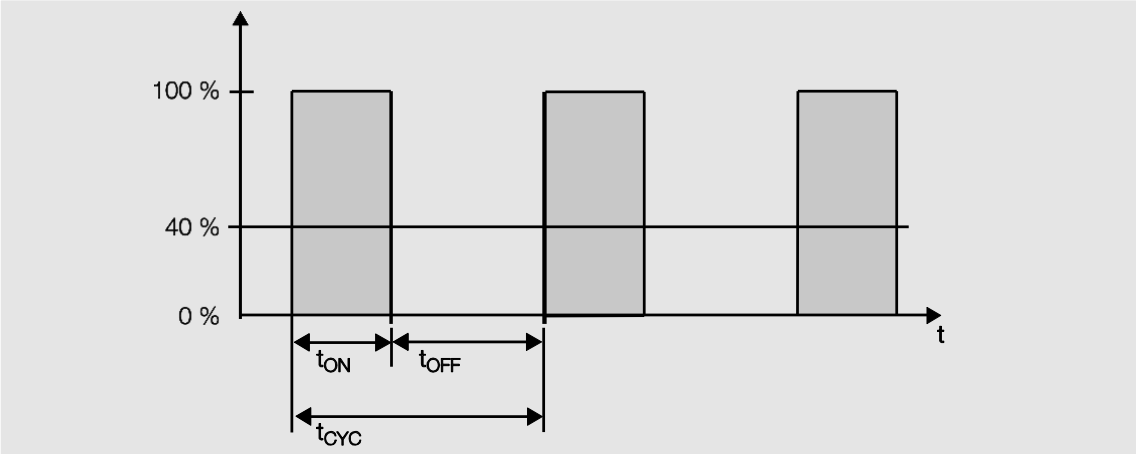
An example: When the FCA/S receives a 1 byte control value (continuous control) as an input signal, this value together with the parameterized cycle time from a PWM calculation is converted into a signal for a 2-point control (ON-OFF-ON).

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 x 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!

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.

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.

Note
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

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

Behaviour with	Bus voltage recovery	Bus voltage failure	Download, if no change of the operating function[1] occurs.	ETS bus reset and download (if a change of operating function[1]) complete - Reset
Fan				
Fan speed	Can be parameterized	Can be parameterized	Unchanged or moves from a previously selected required stage, if this has not been achieved by switchover pauses and dwell times.	OFF, contacts open
Forced operation	Inactive	No function. Fan stage as parameterized with BVF	OFF, inactive	OFF, inactive
Limitation x x = 1…4	Inactive	No function. Fan stage as parameterized with BVF	OFF, inactive	OFF, inactive
Automatic operation	Automatic mode is activated, if automatic mode is possible.	No function	Is retained if already available. Remains inactive, if already inactive.	Automatic mode is activated if automatic mode is possible, otherwise not active.
Communication object *Status automatic*	Is updated and sent in dependence on the parameterization	No function	Is updated and sent in dependence on the parameterization	Is updated and sent in dependence on the parameterization (always, after a change, not)
Communication object *Status fan ON/OFF*	Will be updated and sent	No function	Unchanged, implemented when the next telegram is received	Is updated (OFF, communication object value 0) and sent.
Communication object *Valve control*	Values are recalculated and sent after the parameterized send delay	No function	Unchanged and sent.	COOLING or COOLING/HEATING, communication object value 0
Status byte	Values are updated and sent in dependence on the parameterization.	No function	Values are updated and sent in dependence on the parameterization.	Values are updated and sent in dependence on the parameterization (always, when changed, not)

[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

Behaviour with	**Bus voltage recovery**	**Bus voltage failure**	**Download, if no change of the operating function[1] occurs.**	**ETS bus reset and download (if a change of operating function[1]) complete - Reset**
Valves			Communication object values are available	
Valve operation Contact setting	Can be parameterized	Can be parameterized	Calculation (PWM) / evaluation will be continued with the existing communication object values (input values)	Calculation / evaluation for valve control is set. Valve is closed (reference run = run time + 5 %)
Functions	Unchanged	Unchanged, however without function. Contact position is programmable.	Will be accepted, if changed	Will be accepted, if changed
Monitoring (communication object *Thermostat fault*)	Monitoring time will be restarted. Communication object value is 0	No monitoring	Monitoring time will be restarted. Communication object value unchanged.	Monitoring time will be restarted. Thermostat fault is reset
Behaviour forced operation	Inactive, must be reactivated.	Inactive	Inactive	Becomes inactive
Valve purge	Monitoring time restarts.	Time is lost. No purging.	Monitoring time restarts.	Monitoring time restarts.

[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_{up} = Valve adjustment duration from 0 to 100 %

V_{act} = Current valve position [0…255]

V_{new} = New valve position [0…255]

T_{new} = Switch on time of the PWM at the new valve position

T_{cyc} = PWM cycle time

T_{+1} = Is added on the way to V_{new} at every position

Calculation of the closing time

$$T_{new} = \frac{T_{cyc}}{255} \times V_{new}$$

$$T_{+1} = \frac{T_{up}}{255} \times \frac{V_{act}}{255}$$

Calculation of the closing time at switchover

$$T = T_{new} + \left(T_{+1}\left[atV_{act}\right]\right) + \left(T_{+1}\left[atV_{act}+1\right]\right) + \ldots + \left(T_{+1}\left[atV_{new}\right]\right)$$

This means:

For a movement from 0…99 %, the contact remains closed for about T_{up} + T_{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_{down} = Valve adjustment duration from 100 to 0 %

V_{act} = Current valve position [0…255]

V_{new} = New valve position [0…255]

T_{new} = Switch off time of the PWM at the new valve position

T_{cyc} = PWM cycle time

T_{+1} = Is added on the way to V_{new} at every position

Calculation of the opening time

$$T_{new} = \frac{T_{cyc}}{255} \times (255 - V_{new})$$

$$T_{+1} = \frac{T_{down}}{255} \times \frac{255 - V_{act}}{255}$$

Calculation of the opening time at switchover

$$T = T_{new} + (T_{+1}[atV_{act}]) + (T_{+1}[atV_{act} + 1]) + \ldots + (T_{+1}[atV_{new}])$$

This means:

For a movement from 99…0 % the contact remains opened for about T_{down} + T_{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 Fan Coil Actuator,SATION-AC0501.4002
- 1 x installation and operating instructions
- 1 x bus connection terminal (red/black)

A.2 Status byte forced/operation

Bit No.		7	6	5	4	3	2	1	0
8 bit value	Hexadecimal	Forced operation	Limitation 1	Limitation 2	Limitation 3	Limitation 4	Thermostat fault	Automatic	HEA-TING/COOLING
0	00								
1	01								■
2	02							■	
3	03							■	■
4	04						■		
5	05						■		■
6	06						■	■	
7	07						■	■	■
8	08					■			
9	09					■			■
10	0A					■		■	
11	0B					■		■	■
12	0C					■	■		
13	0D					■	■		■
14	0E					■	■	■	
15	0F					■	■	■	■
16	10				■				
17	11				■				■
18	12				■			■	
19	13				■			■	■
20	14				■		■		
21	15				■		■		■
22	16				■		■	■	
23	17				■		■	■	■
24	18				■	■			
25	19				■	■			■
26	1A				■	■		■	
27	1B				■	■		■	■
28	1C				■	■	■		
29	1D				■	■	■		■
30	1E				■	■	■	■	
31	1F				■	■	■	■	■
32	20			■					
33	21			■					■
34	22			■				■	
35	23			■				■	■
36	24			■			■		
37	25			■			■		■
38	26			■			■	■	
39	27			■			■	■	■
40	28			■		■			
41	29			■		■			■
42	2A			■		■		■	
43	2B			■		■		■	■
44	2C			■		■	■		
45	2D			■		■	■		■
46	2E			■		■	■	■	
47	2F			■		■	■	■	■
48	30			■	■				
49	31			■	■				■
50	32			■	■			■	
51	33			■	■			■	■
52	34			■	■		■		
53	35			■	■		■		■
54	36			■	■		■	■	
55	37			■	■		■	■	■
56	38			■	■	■			
57	39			■	■	■			■
58	3A			■	■	■		■	
59	3B			■	■	■		■	■
60	3C			■	■	■	■		
61	3D			■	■	■	■		■
62	3E			■	■	■	■	■	
63	3F			■	■	■	■	■	■
64	40		■						
65	41		■						■
66	42		■					■	
67	43		■					■	■
68	44		■				■		
69	45		■				■		■
70	46		■				■	■	
71	47		■				■	■	■
72	48		■			■			
73	49		■			■			■
74	4A		■			■		■	
75	4B		■			■		■	■
76	4C		■			■	■		
77	4D		■			■	■		■
78	4E		■			■	■	■	
79	4F		■			■	■	■	■
80	50		■		■				
81	51		■		■				■
82	52		■		■			■	
83	53		■		■			■	■
84	54		■		■		■		
85	55		■■		■		■		■

Bit No.		7	6	5	4	3	2	1	0
8 bit value	Hexadecimal	Forced operation	Limitation 1	Limitation 2	Limitation 3	Limitation 4	Thermostat fault	Automatic	HEA-TING/COOLING
86	56		■		■		■	■	
87	57		■		■		■	■	■
88	58		■		■	■			
89	59		■		■	■			■
90	5A		■		■	■		■	
91	5B		■		■	■		■	■
92	5C		■		■	■	■		
93	5D		■		■	■	■		■
94	5E		■		■	■	■	■	
95	5F		■		■	■	■	■	■
96	60		■	■					
97	61		■	■					■
98	62		■	■				■	
99	63		■	■				■	■
100	64		■	■			■		
101	65		■	■			■		■
102	66		■	■			■	■	
103	67		■	■			■	■	■
104	68		■	■		■			
105	69		■	■		■			■
106	6A		■	■		■		■	
107	6B		■	■		■		■	■
108	6C		■	■		■	■		
109	6D		■	■		■	■		■
110	6E		■	■		■	■	■	
111	6F		■	■		■	■	■	■
112	70		■	■	■				
113	71		■	■	■				■
114	72		■	■	■			■	
115	73		■	■	■			■	■
116	74		■	■	■		■		
117	75		■	■	■		■		■
118	76		■	■	■		■	■	
119	77		■	■	■		■	■	■
120	78		■	■	■	■			
121	79		■	■	■	■			■
122	7A		■	■	■	■		■	
123	7B		■	■	■	■		■	■
124	7C		■	■	■	■	■		
125	7D		■	■	■	■	■		■
126	7E		■	■	■	■	■	■	
127	7F		■	■	■	■	■	■	■
128	80	■							
129	81	■							■
130	82	■						■	
131	83	■						■	■
132	84	■					■		
133	85	■					■		■
134	86	■					■	■	
135	87	■					■	■	■
136	88	■				■			
137	89	■				■			■
138	8A	■				■		■	
139	8B	■				■		■	■
140	8C	■				■	■		
141	8D	■				■	■		■
142	8E	■				■	■	■	
143	8F	■				■	■	■	■
144	90	■			■				
145	91	■			■				■
146	92	■			■			■	
147	93	■			■			■	■
148	94	■			■		■		
149	95	■			■		■		■
150	96	■			■		■	■	
151	97	■			■		■	■	■
152	98	■			■	■			
153	99	■			■	■			■
154	9A	■			■	■		■	
155	9B	■			■	■		■	■
156	9C	■			■	■	■		
157	9D	■			■	■	■		■
158	9E	■			■	■	■	■	
159	9F	■			■	■	■	■	■
160	A0	■		■					
161	A1	■		■					■
162	A2	■		■				■	
163	A3	■		■				■	■
164	A4	■		■			■		
165	A5	■		■			■		■
166	A6	■		■			■	■	
167	A7	■		■			■	■	■
168	A8	■		■		■			
169	A9	■		■		■			■
170	AA	■		■		■		■	
171	AB	■		■		■		■	■

Bit No.		7	6	5	4	3	2	1	0
8 bit value	Hexadecimal	Forced operation	Limitation 1	Limitation 2	Limitation 3	Limitation 4	Thermostat fault	Automatic	HEA-TING/COOLING
172	AC	■		■		■	■		
173	AD	■			■		■		■
									■
174	AE	■		■		■	■	■	
175	AF	■		■		■	■	■	■
176	B0	■		■	■				
177	B1	■		■	■				■
178	B2	■		■	■			■	
179	B3	■		■	■			■	■
180	B4	■		■	■		■		
181	B5	■		■	■		■		■
182	B6	■		■	■		■	■	
183	B7	■		■	■		■	■	■
184	B8	■		■	■	■			
185	B9	■		■	■	■			■
186	BA	■		■	■	■		■	
187	BB	■		■	■	■		■	■
188	BC	■		■	■	■	■		
189	BD	■		■	■	■	■		■
190	BE	■		■	■	■	■	■	
191	BF	■		■	■	■	■	■	■
192	C0	■	■						
		193	C1	■			■		■
194	C2	■	■					■	
195	C3	■	■					■	■
196	C4	■	■				■		
197	C5	■	■				■		■
198	C6	■	■				■	■	
199	C7	■	■				■	■	■
200	C8	■	■			■			
201	C9	■	■			■			■
202	CA	■	■			■		■	
203	CB	■			■		■		■
									■
204	CC	■	■			■	■		
205	CD	■			■		■		■
									■
206	CE	■	■			■	■	■	
207	CF	■	■			■	■	■	■
208	D0	■	■						
209	D1	■	■						■
210	D2	■	■					■	
211	D3	■	■					■	■
212	D4	■	■				■		
213	D5	■	■				■		■
214	D6	■	■				■	■	
215	D7	■	■				■	■	■
216	D8	■	■			■			
217	D9	■	■			■			■
218	DA	■	■			■		■	
219	DB	■	■			■		■	■
220	DC	■	■			■	■		
221	DD	■	■			■	■		■
222	DE	■	■			■	■	■	
223	DF	■	■			■	■	■	■
224	E0	■	■	■					
225	E1	■	■	■					■
226	E2	■	■	■				■	
227	E3	■	■	■				■	■
228	E4	■	■	■			■		
229	E5	■	■	■			■		■
230	E6	■	■	■			■	■	
231	E7	■	■	■			■	■	■
232	E8	■	■	■		■			
233	E9	■	■	■		■			■
234	EA	■	■	■		■		■	
235	EB	■	■	■		■		■	■
236	EC	■	■	■		■	■		
237	ED	■	■	■		■	■		■
238	EE	■	■	■		■	■	■	
239	EF	■	■	■		■	■	■	■
240	F0	■	■	■	■				
241	F1	■	■	■	■				■
242	F2	■	■	■	■			■	
243	F3	■	■	■	■			■	■
244	F4	■	■	■	■		■		
245	F5	■	■	■	■		■		■
246	F6	■	■	■	■		■	■	
247	F7	■	■	■	■		■	■	■
248	F8	■	■	■	■	■			
249	F9	■	■	■	■	■			■
250	FA	■	■	■	■	■		■	
251	FB	■	■	■	■	■		■	■
252	FC	■	■	■	■	■	■		
253	FD	■	■	■	■	■	■		■
254	FE	■	■	■	■	■	■	■	
255	FF	■	■	■	■	■	■	■	■

■ = applicable

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