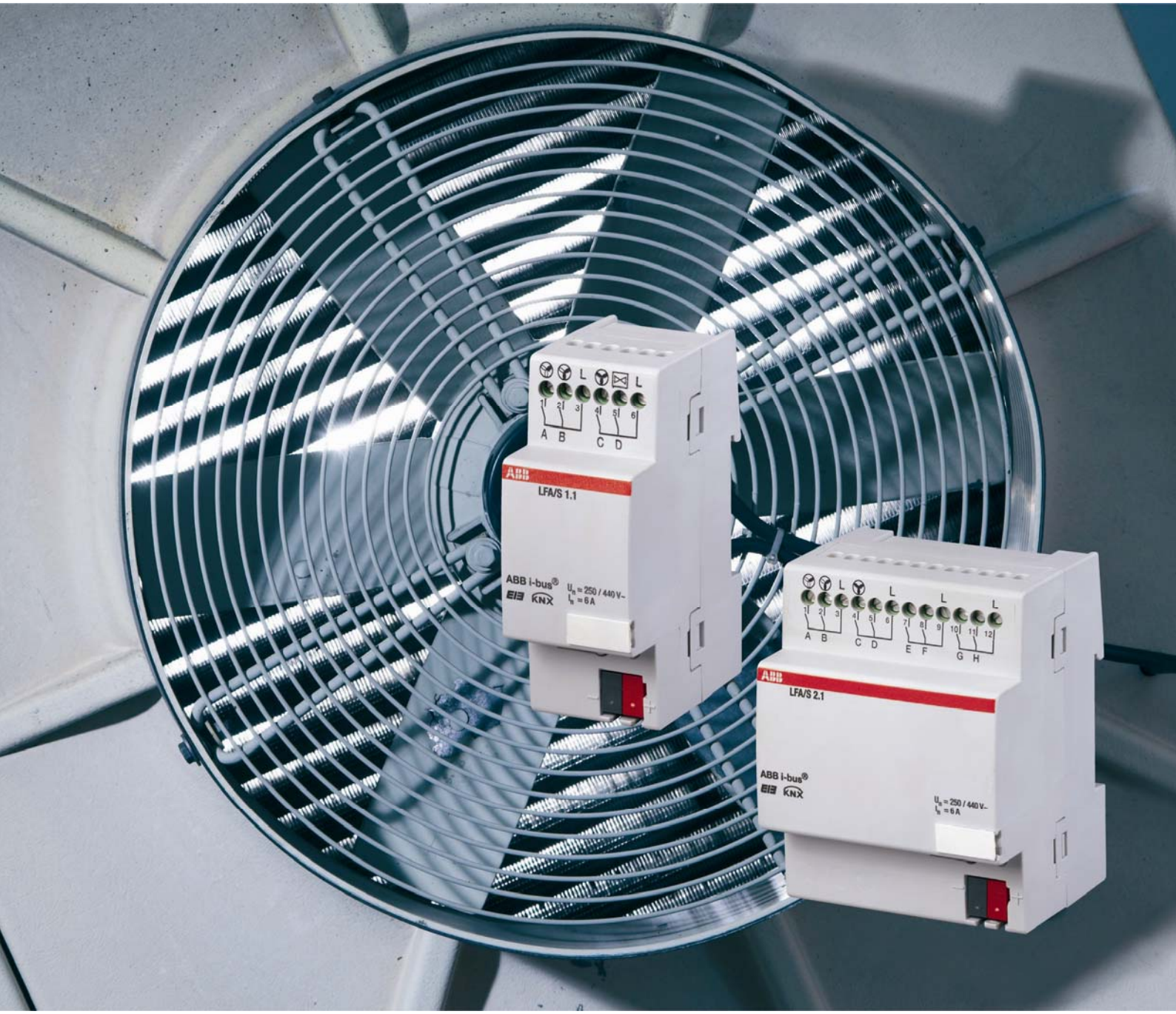
Product Manual

ABB i-bus® KNX Blower/Fan Coil-Actuator LFA/S 1.1, LFA/S 2.1

Intelligent Installation Systems



This manual describes the application of the function of the Blower/Fan Coil Actuator LFA/S x.1 with the application programs *FanCoil xf 6A/1.1* (x = 1 and 2).
Subject to changes and errors excepted.

Exclusion of liability:
Despite checking that the contents of this document match the hardware and software, deviations cannot be completely excluded. We therefore cannot accept any liability for this. Any necessary corrections will be inserted in new versions of the manual.

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1 General

This manual provides you with detailed information relating to the ABB i-bus® KNX Blower/Fan Coil Actuators LFA/S 1.1 and LFA/S 2.1 which can be used for blower, fan and fan coil applications. The manual describes the installation and programming and explains the use of the actuators based on examples.

The actuators are modular installation devices in pro*M* Design for installation in the distribution board on 35 mm mounting rails to DIN EN 60 715.

The applications described in the following enable the control of

- Fans
- Blowers
- Fan coil units
- Valves for heating circuits
- Electrical loads

The outputs which are not required for the fans, blowers and fan coil functions can be used as switch actuators for switching electrical loads or as heating actuators for controlling valves.

Please note that a comprehensive range of switch actuator functions are available in the ABB i-bus® KNX SA/S switch actuator range. It may also be prudent when the lifespan of electromechanical relays is considered to control the valves with an electronic switch actuator from the ABB i-bus® range.

For further information see: product manual Switch Actuator SA/S, Download on www.abb.de/knx

The power supply to the actuators is implemented via the KNX bus voltage, an additional external supply is not required.

The comprehensive functionality is defined by the programming with the Engineering Tool Software ETS 2 or ETS 3.

Ability to use and operate the ETS is assumed.

1.1 Product and functional overview

LFA/S 1.1

LFA/S 2.1

In this section, you will be provided with a brief overview of the ABB i-bus® KNX Blower/Fan Coil Actuators LFA/S 1.1 and LFA/S 2.1. The actuators are modular installation devices with 4 and 8 outputs and a width of 2 and 4 modules in pro*M* design for installation in a distribution board. The connection to the ABB i-bus® is established using the bus connection terminal at the front. The LFA/S Actuators do not require an additional voltage supply. The assignment of the physical addresses as well as the parameterisation is carried out with Engineering Tool Software ETS (from Version ETS2 V1.3) with a *.VD2 file. If ETS3 is used, a *.VD3 type file must be imported.

The 1-fold LFA/S 1.1 controls a single-phase, 3-speed fan. The 2-fold LFA/S 2.1 controls two 3- or 5-speed, single-phase fans via step or changeover control. This ensures that no two fan speeds can be switched on simultaneously. An additional programmable switchover delay is provided for this purpose. Three-phase drives are not supported.

The outputs not used in fan control can be used to control valves or for switching an electrical load.

The following controls can be implemented:

With the LFA/S 1.1:

- 3-speed fan plus 1 switch output
- 2-pipe fan coil systems with 3-speed fan and a valve

With the LFA/S 2.1:

- 3-speed fan plus 5 switch outputs
- 5-speed fan plus 3 switch outputs
- Two 3-speed fans plus 2 switch outputs
- 2-pipe fan coil systems with 3- or 5-speed fans
- 3-pipe fan coil systems with 3- or 5-speed fans
- 4-pipe fan coil systems with 3- or 5-speed fans

Separate objects are available for the valve control so that control is possible via an electronic switch actuator or a higher capacity switch actuator depending on the requirements.

Note
A manual operating feature on the Blower/Fan Coil Actuator has not been provided in order to prevent destruction of the fan due to incorrect manual switching operations.

2 Device technology

2.1 Technical data LFA/S 1.1

Fig. 2 LFA/S 1.1

The Blower/Fan Coil Actuator LFA/S 1.1 is a modular installation device in proM design for installation in the distribution board on 35 mm mounting rails. The actuator can control fans, blowers and fan coil units (2-pipe systems) with the application program *FanCoil 1f 6A/1.1*. The connection to the ABB i-bus® KNX is implemented via a bus connection terminal.

The Blower/Fan Coil Actuator controls a 3-speed, single-phase fan as a changeover or step switch via 3 relay outputs interconnected by software. The fourth relay output can be utilised for control of a valve or for switching an electrical load.

The outputs are connected using screw terminals in groups of 2 contacts. Each output is controlled separately via the KNX and features a rated current of 6A.

The actuator does not require an additional power supply.

Power supply	- Operating voltage	21...30 V DC, made available by the bus
	- Current KNX consumption	< 12 mA
	- Power consumption via KNX	Max. 250 mW
Nominal values of output	- Number	4 (floating contacts 2 per group)
	- U_n rated voltage	250/440 V AC (50/60 Hz)
	- I_n rated current (per output)	6 A
	- Leakage loss per device at max. load	1.5 W
Switching currents of output	- AC3 operation ($\cos\varphi = 0.45$) DIN EN 60 947-4-1	6 A/230 V
	- AC1 operation ($\cos\varphi = 0.8$) DIN EN 60 947-4-1	6 A/230 V
	- Fluorescent lighting load to DIN EN 60 669-1	6 A/250 V (35 µF)[2)]
	- Minimum switching capacity	20 mA/5 V 10 mA/12 V 7 mA/24 V
	- DC current switching capacity (resistive load)	6A/24 V =
Life expectancy of output	- Mechanical endurance	> 10^7
	- Electrical endurance to DIN IEC 60 947-4-1	
	- AC1 (240 V/$\cos\varphi = 0.8$)	> 10^5
	- AC3 (240 V/ $\cos\varphi = 0.45$)	> 1.5 x 10^4
	- AC5a (240 V/ $\cos\varphi = 0.45$)	> 1.5 x 10^4
Switching times of output [1)]	- Max. relay position change per output and minute if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	60
	- Max. relay position change per output and minute if only one relay is switched.	240
Connections	- KNX	Bus connection terminal, 0.8 mm Ø, single core
	- Load circuits (1 terminal per contact)	Screw terminal
	- Phase (1 terminal for 2 contacts)	0.2... 2.mm^2 finely stranded
	-Ferrules without / with plastic sleeves	0.2... 4 mm^2 single-core 0.25-2.5/0.25-1.5 mm^2
	-TWIN ferrules with plastic sleeves	0.5-1.5 mm^2
	- Tightening torque	Max. 0.6 Nm
KNX operating and display elements	- Red LED and KNX push button	For assignment of the physical address

[1)] The specifications apply only after the bus voltage has been applied to the device for at least 10 seconds. The typical elementary delay of the relay is approx. 20 ms.
[2)] The maximum inrush current peak (see table 3) may not be exceeded

Table 1-Part 1: Blower/Fan Coil Actuator LFA/S 1.1, Technical data

KNX safety extra-low voltage	- SELV 24 V DC	
Enclosure	- IP 20	to DIN EN 60 529
Safety class	- II	to DIN EN 61 140
Insulation category	- Overvoltage category - Pollution degree	III to DIN EN 60 664-1 2 to DIN EN 60 664-1
Temperature range	- Operation	-5 °C ... + 45 °C
	- Storage	-25 °C...+ 55 °C
	- Transport	-25 °C...+ 70 °C
Environmental conditions	- Humidity	Max. 93 %, moisture condensation should be excluded
Design	- Modular installation device (MDRC)	Modular installation device, pro*M*
	- Dimensions (H x W x D) in mm	90 x W x 64
	- Width W in mm	36
	- Mounting width (modules at 18 mm)	2
	- Mounting depth in mm	64
Weight	- in kg	0.13
Installation	- On 35 mm mounting rail	DIN EN 60 715
Mounting position	- as required	
Housing, colour	- Plastic housing, grey	
Approvals	- KNX to EN 50 090-2-2	Certification
CE mark	- in accordance with the EMC guideline and low voltage guideline	

Table 2-Part 2: Blower/Fan Coil Actuator LFA/S 1.1, Technical data

Lamp loads

Lamps	- Incandescent lamp load	1200 W
Fluorescent lamp T5 / T8	- Uncorrected luminaire - Parallel compensated - Twin-lamp circuit	800 W 300 W 350 W
Low-voltage halogen lamps	- Inductive transformer - Electronic transformer	800 W 1000 W
	- Halogen lamp 230 V	1000 W
Dulux lamp	- Uncorrected luminaire - Parallel compensated	800 W 800 W
Mercury-vapour lamp	- Uncorrected luminaire - Parallel compensated	1000 W 800 W
Switching capacity (switching contact)	- Max. peak inrush current I_p (150 µs)	200 A
	- Max. peak inrush current I_p (250 µs)	160 A
	- Max. peak inrush current I_p (600 µs)	100 A
Number of electronic ballasts (T5/T8, single element)[1)]	- 18 W (ABB ballast 1 x 58 CF)	10
	- 24 W (ABB ballast T5 1 x 24 CY)	10
	- 36 W (ABB ballast 1 x 36 CF)	7
	- 58 W (ABB ballast 1 x 58 CF)	5
	- 80 W (Helvar EL 1 x 80 SC)	3

[1)] For multiple element lamps or other types, the number of electronic ballasts must be determined using the peak inrush current of the electronic ballasts. See section 2.7 for example

Table 3 Lamp loads for Blower/Fan Coil Actuators LFA/S 1.1

User programs

Device designation	Application program	Max. number of communication objects	Max. number of group addresses	Max. number of associations
LFA/S 1.1	FanCoil 1f 6A/1.1	32	254	254
Notice: A conversion of the application program FanCoil 1f6A/1 is possible. In Annex A2 is a description of the conversion.				

Table 4 User programs LFA/S 1.1

Note
• The programming requires ETS2 V1.3 or higher. If ETS3 is used, a **.VD3* type file must be imported. The user program can be found in ETS2/ETS3 under ABB/Heizen, Klima, Lüftung/Klimaaktor/*FanCoil, 1f 6A/1.1*. • The devices do not support the closing function of a project or the KNX devices in the ETS. If you inhibit access to all devices of the project with a “BA password” (ETS2) or “BCU code” (ETS3), it has no effect on this device. Data can still be read and programmed.

2.1.1 Circuit diagram LFA/S 1.1

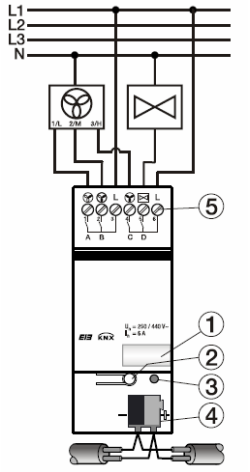


Fig. 3: Circuit diagram of the 1-fold 6A Blower/Fan Coil Actuator LFA/S 1.1

1 Label carriers
2 Programming button
3 Programming LED
4 Bus connection terminal
5 Load circuit: a common power supply for two outputs

Note
All-pole disconnection must be observed in order to avoid dangerous touch voltages which originate from feedback from differing phase conductors.

2.1.2 Dimension drawing LFA/S 1.1

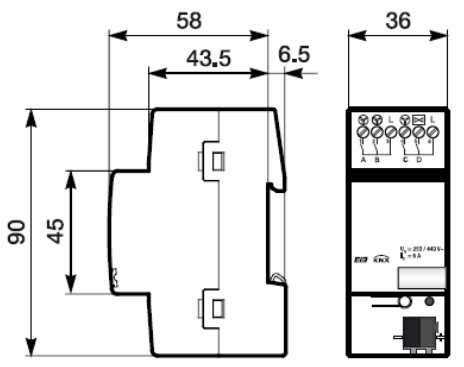


Fig. 4: Dimension drawing LFA/S 1.1

2.2 Technical data LFA/S 2.1

The Blower/Fan Coil Actuator LFA/S 2.1 is a modular installation device in pro*M* design for installation in the distribution board on 35 mm mounting rails. The actuator can control ventilation, fan and fan coil units (2-, 3- or 4-pipe systems) with the application program *FanCoil 2f 6A/1.1*. The connection to the ABB i-bus® KNX is implemented via a bus connection terminal.

The Blower/Fan Coil Actuator controls two 3-speed fans or a 5-speed fan as a changeover or step switch via relay outputs interconnected by software. The relay outputs not used by the fan can be used to control valves or for switching any electrical loads.

The outputs are connected using screw terminals in groups of 2 contacts. Each output is controlled separately via the KNX and features a rated current of 6A.

The actuator does not require an additional power supply.

Power supply	- Operating voltage	21...30 V DC, made available by the bus
	- Current KNX consumption	< 12 mA
	- Power consumption via KNX	Max. 250 mW
Nominal values of output	- Number (floating contacts 2 per group)	8
	- U_n rated voltage	250/440 V AC (50/60 Hz)
	- I_n rated current (per output)	6 A
	- Leakage loss per device at max. load	2 W
Switching currents of output	- AC3 operation ($\cos\varphi = 0.45$) DIN EN 60 947-4-1	6 A/230 V
	- AC1 operation ($\cos\varphi = 0.8$) DIN EN 60 947-4-1	6 A/230 V
	- Fluorescent lighting load to DIN EN 60 669-1	6 A/250 V (35 µF)[2)]
	- Minimum switching capacity	20 mA/5 V 10 mA/12 V 7 mA/24 V
	- DC current switching capacity (resistive load)	6A/24 V =
Life expectancy of output	- Mechanical endurance	> 10^7
	- Electrical endurance to DIN IEC 60 947-4-1	
	- AC1 (240 V/$\cos\varphi = 0.8$)	> 10^5
	- AC3 (240 V/ $\cos\varphi = 0.45$)	> 1.5 x 10^4
	- AC5a (240 V/ $\cos\varphi = 0.45$)	> 1.5 x 10^4
Switching times of output [1)]	- Max. relay position change per output and minute if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	30
	- Max. relay position change per output and minute if only one relay is switched.	240
Connections	- KNX	Bus connection terminal, 0.8 mm Ø, single core
	- Load circuits (1 terminal per contact)	Screw terminal
	- Phase (1 terminal for 2 contacts)	0.2... 2.mm^2 finely stranded 0.2... 4 mm^2 single-core
	- Ferrules without/with plastic sleeves -TWIN ferrules with plastic sleeves	0.25-2.5/0.25-1.5 mm^2 0.5-1.5 mm^2
	- Tightening torque	Max. 0.6 Nm
KNX operating and display elements	- Red LED and KNX push button	For assignment of the physical address

[1)] The specifications apply only after the bus voltage has been applied to the device for at least 10 seconds. The typical elementary delay of the relay is approx. 20 ms.
[2)] The maximum inrush current peak (see table 3) may not be exceeded

Table 5 -Part 1: Blower/Fan Coil Actuator LFA/S 2.1, Technical data

KNX safety extra-low voltage	- SELV 24 V DC	
Enclosure	- IP 20	to DIN EN 60 529
Safety class	- II	to DIN EN 61 140
Insulation category	- Overvoltage category - Pollution degree	III to DIN EN 60 664-1 2 to DIN EN 60 664-1
Temperature range	- Operation	-5 °C ... + 45 °C
	- Storage	-25 °C...+ 55 °C
	- Transport	-25 °C...+ 70 °C
Environmental conditions	- Humidity	Max. 93%, moisture condensation should be excluded
Design	- Modular installation device (MDRC)	Modular installation device, pro*M*
	- Dimensions (H x W x D) in mm	90 x W x 64
	- Width W in mm	72
	- Mounting width (modules at 18 mm)	2
	- Mounting depth in mm	64
Weight	- in kg	0.24
Installation	- On 35 mm mounting rail	DIN EN 60 715
Mounting position	- as required	
Housing, colour	- Plastic housing, grey	
Approvals	- KNX to EN 50 090-2-2	Certification
CE mark	- in accordance with the EMC guideline and low voltage guideline	

Table 6 -Part 2: Blower/Fan Coil Actuator LFA/S 2.1, Technical data

Lamp loads

Lamps	- Incandescent lamp load	1200 W
Fluorescent lamp T5/T8	- Uncorrected luminaire - Parallel compensated - Twin-lamp circuit	800 W 300 W 350 W
Low-voltage halogen lamps	- Inductive transformer - Electronic transformer	800 W 1000 W
	- Halogen lamp 230V	1000 W
Dulux lamp	- Uncorrected luminaire - Parallel compensated	800 W 800 W
Mercury-vapour lamp	- Uncorrected luminaire - Parallel compensated	1000 W 800 W
Switching capacity (switching contact)	- Max. peak inrush current I_p (150 µs)	200 A
	- Max. peak inrush current I_p (250 µs)	160 A
	- Max. peak inrush current I_p (600 µs)	100 A
Number of electronic ballasts (T5/T8, single element)[1)]	- 18 W (ABB ballast 1 x 58 CF)	10
	- 24 W (ABB ballast T5 1 x 24 CY)	10
	- 36 W (ABB ballast 1 x 36 CF)	7
	- 58 W (ABB ballast 1 x 58 CF)	5
	- 80 W (Helvar EL 1 x 80 SC)	3

[1)] For multiple element lamps or other types the number of electronic ballasts must be determined using the peak inrush current of the electronic ballasts. See section 2.7 for example

Table 7 Lamp loads for Blower/Fan Coil Actuators LFA/S 2.1

User programs

Device designation	Application program	Max. number of communication objects	Max. number of group addresses	Max. number of associations
LFA/S 2.1	FanCoil, 2f 6A/1.1	63	254	254
Notice: A conversion of the application program FanCoil 2f6A/1 is possible. In Annex A2 is a description of the conversion.				

Table 8 User programs LFA/S 2.1

Note
• The programming requires ETS2 V1.3 or higher. If ETS3 is used, a **.VD3* type file must be imported. The user program can be found in ETS2/ETS3 under ABB/Heizen, Klima, Lüftung/Klimaaktor/*FanCoil, 1f 6A/1.1*. • The devices do not support the closing function of a project or the KNX devices in the ETS. If you inhibit access to all devices of the project with a “BA password” (ETS2) or “BCU code” (ETS3), it has no effect on this device. Data can still be read and programmed.

2.2.1 Circuit diagram LFA/S 2.1

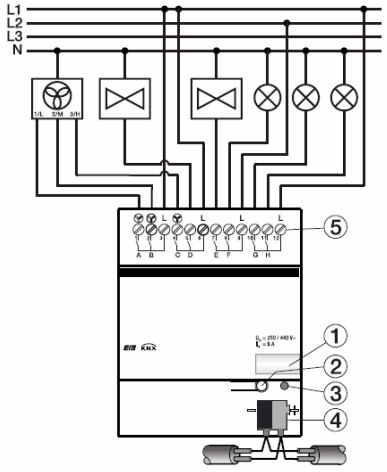


Fig. 6: Circuit diagram of the 2-fold 6A Blower/Fan Coil Actuator LFA/S 2.1

1 Label carriers
2 Programming button
3 Programming LED
4 Bus connection terminal
5 Load circuit: a common power supply for two outputs

Note
All-pole disconnection must be observed in order to avoid dangerous touch voltages which originate from feedback from differing phase conductors.

2.2.2 Dimension drawing LFA/S 2.1

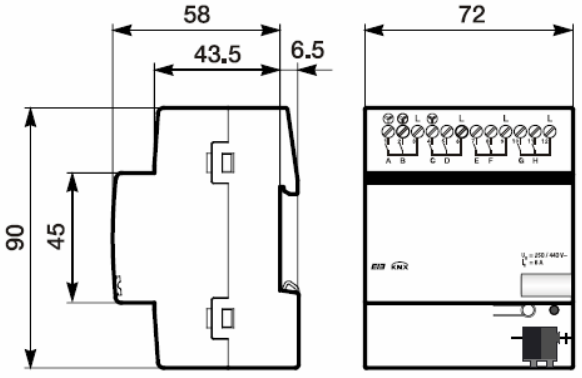


Fig. 7: Dimension drawing LFA/S 2.1

2.3 Assembly and installation

The ABB i-bus® Blower/Fan Coil Actuators are suitable for installation in the distribution board or in small enclosures for rapid installation on 35 mm mounting rails to DIN EN 60 715.

The mounting position can be selected as required.

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

The electrical connection is implemented using screw terminals. The connection to the KNX is established using a bus connection terminal. The terminal designation is located on the housing.

The devices should be protected against damp, dirt and damage during transport, storage and operation.

- The device should only be operated in an enclosed housing (e.g. distribution board)!
- The devices should not be operated outside the specified technical data.

2.4 Commissioning

The parameterisation of the Blower/Fan Coil Actuators is implemented using the application programs *FanCoil xf 6A/1* (x = 1 or 2) and the ETS (from Version ETS2 V1.3). If ETS3 is used, a ".VD3" type file must be imported. The following work must be carried out:

- Assignment of the physical KNX device addresses
- Parameterisation of the general output device functions
- Parameterisation of the output behaviour
- Assignment of the communication objects to KNX groups

The LFA/S Blower/Fan Coil Actuators do not require an additional power supply. The connection to the ABB i-bus® KNX is sufficient to enable the actuator functions. You will require a PC or laptop for parameterisation with the ETS (from ETS2 V1.3) and a connection to the ABB i-bus® e.g. via RS232 or USB interface.

Note
The installation and commissioning may only be carried out by electrical specialists. The appropriate norms, guidelines, regulations and specifications should be observed when planning and setting up electrical installations.

2.5 Manual operation

The LFA/S x.1 Blower/Fan Coil Actuators (x = 1 or 2) have not been provided with a manual operating feature in order to prevent destruction of the fan due to incorrect manual switching operations.

2.6 Supplied state

The LFA/S Blower/Fan Coil Actuators are supplied with the physical address 15.15.255. The connection terminals and the relay are opened and the bus terminal is fitted.

Note that vibration during transport can change the positions of the relays so that some or all of the contacts may be closed. Only after a defined OFF command on the KNX or an ETS bus reset is it possible to ensure that all the contacts are still open.

The user program *FanCoil xf 6A/1.1 (x = 1 or 2)* is pre-installed.

2.7 Assignment of the physical KNX address

The assignment of the physical KNX address of the LFA/S Blower/Fan Coil Actuators is carried out via the ETS and the programming button on the device.

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

2.8 Maintenance and cleaning

The LFA/S Blower/Fan Coil Actuators are maintenance-free. No repairs should be carried out by unauthorised personnel if damage occurs, e.g. during transport or storage. The warranty expires if the device is opened.

If devices become dirty, they can be cleaned using a dry cloth. Should a dry cloth not remove the dirt, they can be cleaned using a slightly damp cloth and soap solution. Corrosive materials or solutions should never be used.

3 Commissioning

The LFA/S Blower/Fan Coil Actuators feature 4 or 8 outputs with independent controllable relays, which can be compiled in groups of up to 2 relays for one common power input. Each output has a rated current of 6A.

With the user program *FanCoil xf 6A/1.1 (x = 1 or 2),* the Blower/Fan Coil Actuators LFA/S 1.1 and LFA/S 2.1 offer the option of controlling a single-phase fan or blower with 3 or 5 speeds. The actuator outputs used for the fans are mutually linked to one another so that only one output can be switched on at a time (changeover switch) or a further output can only be enabled (step switch) consecutively. This prevents two fans or blower speeds being switched on unintentionally. A short circuit and the associated destruction of the fan or blower motor is thus avoided. The remaining outputs can be used if desired as heating actuators for valve control or for control of an electrical load.

The following table provides an overview of the applications which are possible with the Blower/Fan Coil Actuators and their user program:

	LFA/S 1.1	LFA/S 2.1
Installation type	MDRC	MDRC
Number of outputs (relay)	4	8
Group of outputs	2 with 2 outputs each	4 with 2 outputs each
Module width	2	4
Manual operation, contact position display	none	none
I_n rated current per output / A	6 A	6 A
Fan / Fan coil controller [2]		
- one 3-speed fan controller	■	■
- two 3-speed fan controllers	-	■
- one 5-speed fan controller	-	■
- 2-pipe systems	■	■
- 3-pipe systems	■[1]	■
- 4-pipe systems	■[1]	■
- controller as changeover or step switch	■	■
- fan with central switch/ master switch	■	■
- forced positioning	■	■
- 4 limitations, e.g. for frost/heat protection, comfort, night shut down and standby modes	■	■
- fan limitation	■	■
- behaviour on bus voltage failure/recovery	■	■
Heating actuator		
- switch on-off (2-step control)	■	■
- forced positioning	■	■
- cyclic thermostat monitoring	■	■
- automatic purge	■	■
- behaviour on bus voltage failure/recovery	■	■
Switch function		
- normally open/normally closed can be set	■	■
- behaviour on bus voltage failure/recovery	■	■
- staircase lighting function	■	■
- staircase lighting time modified via the bus	■	■
- permanent ON function	■	■
Special functions		
- Preference on bus voltage failure	■	■
- Feedback status	■	■

[1] One or both valves are controlled with an additional switch actuator (SA/S or ES/S)

Table 9 Functional overview with Blower/Fan Coil actuators LFA/S x.1

3.1 Overview

The application programs ***FanCoil xf 6A/1.1*** *(x = 1 or 2)* are to be used for the Blower/Fan Coil Actuators LFA/S x.1. Programming requires ETS2 V 1.3 or higher. If ETS3 is used, a *.VD3 type file must be imported.

Device designation	Application program	Max. number of communication objects	Max. number of group addresses	Max. number of associations
LFA/S 1.1	*FanCoil 1f 6A/1.1*	31	254	254
LFA/S 2.1	*FanCoil 2f 6A/1.1*	62	254	254

Notice: A conversion of the application program FanCoil xf6A/1 is possible. In Annex A2 is a description of the conversion.

Table 10 Overview of the user programs and the number of communication objects

For the fan, blower and fan coil applications, both the ABB i-bus® KNX devices LFA/S 1.1 and LFA/S 2.1 are available with 6 A outputs. Both of the devices do not have manual actuation in order to exclude undefined manual switching of the devices. This eliminates the danger of destruction of the fan motors due to improper switching operations. The Blower/Fan Coil Actuators feature relays in each output which are mechanically independent of the other outputs. Switching noises cannot be avoided due to the mechanical nature of the design.

The installation location of the actuator can either be centrally in the distribution board or decentrally in a fan coil unit. Normally the Blower/Fan Coil Actuator is used in conjunction with a room temperature controller for an individual room temperature control system. The room temperature controller sends a setting value for the fan speed via the Blower/Fan Coil Actuator. The valve settings of the cooling and heating circuits are defined. Control of the valves is implemented using communication objects. In this way, the valve control can be implemented in the Blower/Fan Coil Actuator or with a mechanical or electronic switch actuator (SA/S or ES/S) selected for switching capacity or endurance.

These combination options result in very flexible applications for blowers, fans or fan coil units:

Fan and blower control

Fan with 3 fan speeds

Fan with 5 fan speeds

With changeover or step control

Fan coil control

2-pipe system with heating and cooling

2-pipe system with heating or cooling

3-pipe system

4-pipe system

For further information see: Pipe systems

Pipe system

The outputs which are not used in the fan, blower or fan coil application can be used as heating actuators or as simple switching actuators for switching and control of electronic loads, valve(s) in fan coil units or other heating controls.

In order to guarantee simple project design, the user programs have been dynamically structured, i.e. in the basic setting only a few communication objects are visible per output and only a few parameter pages are released. Parameter pages and functions are enabled by activation of the respective functions and the full functionality of the user program becomes visible.

Both the Blower/Fan Coil Actuators are supplied with pre-installed user programs (*FanCoil xf 6A/1.1*). Hence, only group addresses and parameters must be loaded during commissioning. The entire application can be reloaded if required.

3.2 Applications

In the following chapter, the functions of the user program *FanCoil xf 6A/1.1* for the Blower/Fan Coil Actuators LFA/S x.1 (x=1 and 2) are described together with their parameter windows and communication objects.

It is possible to operate the outputs of the fan, heating actuator or switch actuator with the user program. The main focus of the application is centred on the fan or blower control and the associated control of valves in order to implement various fan coil applications.

If a comprehensive range of switch actuator functions is needed, an ABB i-bus® KNX switch actuator of the SA/S range is required.

For further information see: Planning and application

3.3 *Fan* mode

Up to two fans (A-C Fan 1 and D-F Fan 2) can be programmed in the Blower/Fan Coil Actuator LFA/S 2.1 with the application program *FanCoil 2f 6A/1*. These fans are each controlled and parameterised using a group of switch actuator outputs. The corresponding parameter window is identified by *A-C: Fan* or *D-F: Fan*. If the parameter window for *A-C: Fan* and *D-F: Fan* has the same appearance, this documentation will only describe one parameter window.

3.3.1 Parameter window *Fan*

The functions of the outputs and their properties are determined in these individual parameter windows.
The parameter window features a dynamic structure so that further parameter windows may be enabled depending on the parameterisation and the function of the outputs.
In the following section, the parameter windows of the 2-fold Blower/Fan Coil Actuator LFA/S 2.1 are shown, as these are the parameters and functions of the 1-fold actuator LFA/S 1.1.

In the following description, *Output X* or *Output X-Y* or simply *X* or *X-Y* represents an individual output or a group of outputs of the actuator. The letters *X* and *Y* represent an output of the actuator.

By combining the individual outputs into a group, 3- or 5-speed, single-phase fans and blower motors can be controlled. The fan group ensures that two relays cannot be switched on simultaneously.

At the same time, the fan groups form the basis for a fan coil unit. The objects for control of the valves or for the heating and/or cooling circuits can be freely parameterised and can be assigned via the usual group assignment in the ETS of any KNX actuator output.

The best actuator can thus be selected at any time according to its properties. This can for example be an electronic switch actuator with wear-free and silent electronic switching components.

3.3.1.1 Parameter window *General*

In the *General* parameter window, the basic settings for the Blower/Fan Coil Actuators which affect the device and all its outputs can be defined.

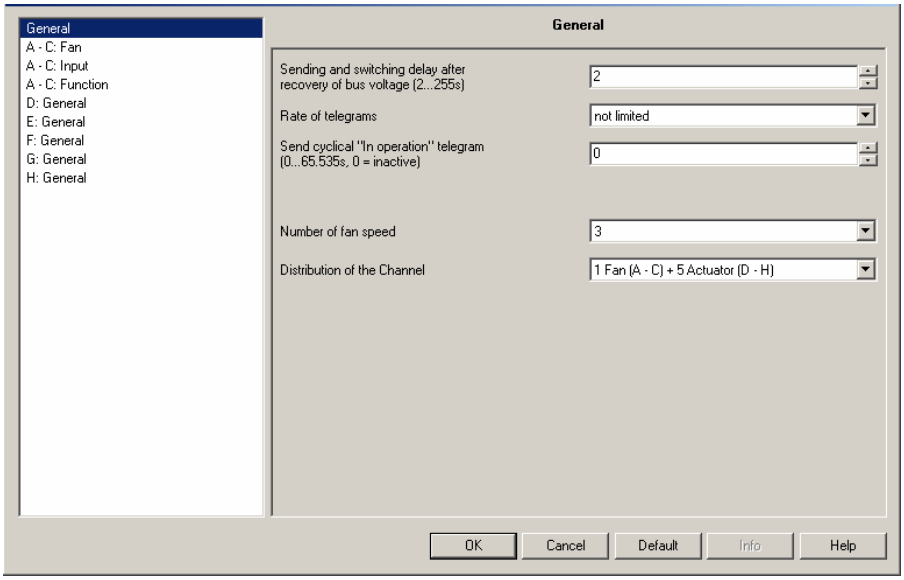


Fig. 8: Parameter window: *General*

The functions of the outputs are also defined as well as the outputs which are combined into a fan group. The last two parameters *Number of fan speeds* and *Distribution of the channel* are only visible in the 2-fold Actuator LFA/S 2.1. On the LFA/S 1.1 these parameters are fixed and cannot be changed.

Transmission and switching delay after recovery of bus voltage (2...255 s)

Options: 2…255

The delay determines the time between the *bus voltage recovery* and the earliest time at which telegrams can be sent and the earliest time at which the relays can switch. An initialisation time – reaction time of approx. 2 seconds until the processor is fully functional – is included in the delay time.

If objects are read out via the bus during the delay time (e.g. from the visualisations), these requests are stored and if necessary answered after the time delay has elapsed.

If the delay time is long enough (all contacts can switch simultaneously, see the switching times in the technical data.

Note
The first switching action will only be initiated when enough energy is available to bring all outputs to the required position in the event of a renewed bus voltage failure. This can mean that the initial switching action will occur at a later time than intended by the parameterised switching delay. The sending delay is not influenced by this measure.

Rate of telegrams

The telegram rate is defined with this parameter. The loading on the bus can be directly affected here.

Options: not limited
1 Telegram/Second
2 Telegrams/Second
….
20 Telegrams/Second

The setting *1 Telegram/Second* means that a maximum of 1 telegram per second can be sent by the switch actuator on the KNX. A maximum of 20 telegrams per second can be sent if the option *20 Telegrams/Second* is selected.

The telegrams are sent as fast as possible at the start of the second. If the telegram count is reached, no further telegrams are sent until the following second.

Send cyclical *In operation* telegram (0...65.535 s, 0 = inactive):

Options: 0...65.535, 0 = cyclical send inactive

- *0*: The Blower/Fan Coil Actuator does not send a monitoring telegram on the bus.
- *value not equal to 0*: A telegram with the value 1 is sent cyclically on the bus with the send interval via the communication object *In operation*.

The period selected for the send interval must be as long as possible depending on the application, in order to keep the bus load as low as possible.

Number of fan speeds

Options: 3
5

Note
This and the following parameter are only available on the LFA/S 2.1. These parameters are not required for the LFA/S 1.1 as with the 1-fold device, the first 3 outputs are always intended for the control of a 3-speed fan and no further 2-speed or 5-speed fans can be controlled.

With the first parameter *Number of fan speeds*, you define if the LFA/S 2.1 controls a fan with 3 or 5 fan speeds.

Distribution of the channel

If 3 fan speeds have been selected in the previous parameters, the following results

Options: 1 Fan (A-C) + 5 Actuator (D-H)
2 Fan (A-C, D-F) + 2 Actuators (G, H)

If 5 fan speeds have been selected, there is only one fixed parameterisation option:

Option: 1 Fan (A--E) + 3 Actuator (F-H)

- *1 Fan (A-C) + 5 Actuator (D-H)*: The actuator controls the first three outputs A to C of a 3-speed fan. The remaining 5 outputs can be used independently for the control of electrical loads. The valve control (heating actuator) or switch actuator function is available. If the output is to be used to control a valve, the electrical endurance of the relay must

be considered. Refer to the technical data. Normally an electronic switch actuator, e.g. ES/S, has better properties for valve control applications.

- 2 *Fan (A-C, D-F) + 2 Actuators (G,H)*: Two 3-speed fans can be controlled with the LFA/S 2.1. The free channels are available as independent switch outputs.
  If a 5-speed fan is to be actuated, this is implemented via the first 5 outputs of the actuator. The remaining 3 outputs can be used to independently switch electronic loads.

The parameterisation of the free outputs is implemented in the corresponding parameter window *D: General* to *H: General*.

Note
If comprehensive switch actuator functions are required, a corresponding switch actuator from the ABB i-bus® SA/S range must be used.

The 2-fold Blower/Fan Coil Actuator LFA/S 2.1 can be used to implement the following controls:

Typical applications	Outputs Fans	Outputs D…H [1)] D = LFA/S 1.1, D…H = LFA/S 2.1
A 3-speed fan + 5 actuator outputs	A-C	D…H = freely available
A 5-speed fan + 3 actuator outputs	A-E	F…H = freely available
Two 3-speed fans + 2 actuator outputs	A-C u. D-F	G…H = freely available switch outputs
Fan coil, 2-pipe system (3-speed fan) with heating or cooling	A-C	D = *Valve, Heating/Cooling* E…H = freely available switch outputs
Fan coil, 2-pipe system (3-speed fan) with heating and cooling	A-C	D = *Valve, Heating* E = *Valve, Cooling* F…H = freely available switch outputs
Fan coil, 2-pipe system (3-speed fan) with heating and cooling, with master switch	A-C	D = *Valve, Heating* E = *Valve, Cooling* F = *Fan status*, for master switch G…H = freely available switch outputs
Fan coil, 4-pipe system (3-speed fan with 2 valves)	A-C	D = *Valve, Heating* E = *Valve, Cooling* F…H = freely available switch outputs

1) This is only a suggestion; the valve control can be implemented with any actuator output. This can also be another KNX actuator (LFA/S, SA/S, ES/S). For valve control, an electronic switch actuator (e.g. ES/S) may be used because of its better suitability for high numbers of switching operations associated with temperature control.

Table 11 Typical applications for Blower/Fan Coil Actuator

For further information see: Pipe systems

3.3.1.2 Parameter window *A-C: Fan*

This parameter window applies for a 3-speed or 5-speed fan control. The behaviour of the fan is defined in this window.

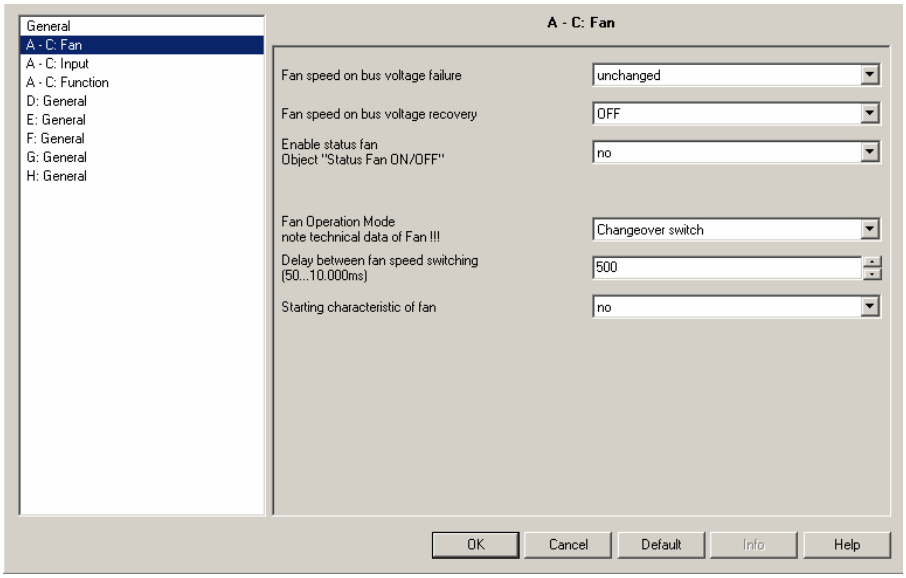


Fig. 9: Parameter window: *A-C: Fan*

For a second fan *D-F*, the parameter window *D-F: Fan* is enabled, which contains the same parameters for the second fan.

For a 5-speed fan *A-E*, the corresponding parameter window *A-E: Fan* is enabled.

Fan speed on bus voltage failure

Option: unchanged
OFF

The behaviour of the fan with a bus voltage failure is defined here.

- *unchanged*: The Blower/Fan Coil Actuator outputs of the fan remain unchanged and the fan speed is retained on bus voltage failure.
- *OFF*: The fan off via the actuator.

The behaviour on bus voltage failure can be set independently for each fan or every free output.

Fan speed on bus voltage recovery

Option: unchanged
OFF
1
2
3
4[1)]
5[1)]

[1)] applies only with the selection of a 5-speed fan

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

With the default setting (factory setting), you can ensure that the relay for the fan position is switched off when the bus voltage is applied for the first time, even if it is switched on due to vibrations during transport.

Note
It is advisable to apply a bus voltage before connecting the fan in order to achieve a defined switching state and to eliminate the possibility of damaging the fan due to an incorrect contact setting.

Enable fan status, Object: *Status Fan ON/OFF*

Option: no
yes

The object *Fan status* can be enabled with this parameter.

Some fans initially require an ON command before they are set to a fan speed from the OFF state. This ON command influences a master switch which has to be switched on.
This request can be implemented with any switch output which is controlled via the *Fan status* object. The corresponding switching object of the switch actuator should be connected with the *Fan status* object.

The value of the object *Fan status* is set to 1 if a fan speed is set that is not equal to 0 (OFF). If no fan speed is set, the object value is set to 0.
This object value is sent on the bus if the fan switches from the OFF state to a fan speed or switches off again.

Note
Fan Operation Mode, note technical data of fan!

Option: Changeover switch
Step switch

The control of the fan is set with this parameter. The mode of fan control should be taken from the technical data of the fan. Usually the fans are controlled with a changeover switch.

Only one output is switched on when the changeover switch is parameterised, i.e. the second fan speed is set so that only the second input of the fan is switched on. The LFA/S switches on the second relay of the fan group.
It is possible to program the delay time between changing speeds as well as a minimum dwell time in a fan speed. The minimum dwell time in a fan speed setting is only active in automatic mode.

On a step switch, all the previous outputs are switched on, i.e. the second fan speed is set so that the first and second input of the fan are switched on. The LFA/S switches on the first and second relay of the fan group. With step switch control, no erratic and sudden switching on of the fan is possible. The lower speeds are activated consecutively (outputs switched on) until the required speed is achieved. The parameterised delay time between two fan speeds has the effect that the current fan speed must be switched on for at least this period before the next fan speed is switched on. The parameterised minimum dwell time in a speed setting has the same effect as a changeover switch i.e. it is only active in automatic mode and is added to the switchover delay.

For further information see: description of the fan control

Delay between fan speed switching (50…10,000 ms)

Option: 50…500…10,000

Some ventilation equipment requires a switchover delay between speed changes (contact change). This delay corresponds to the period in which the current fan speed is switched off and the next speed is not yet switched on. The necessary delay is a fan-specific factor and can be taken from the technical data of the fan.

A switchover delay can be programmed with this parameter. As this time is a fan-specific factor, it is always considered in automatic mode as well as with manual switching or during the start-up phase.

On a fan with a changeover switch, this delay defines the time delay in which the current fan speed (contact) has been switched off, and the next speed has not yet been switched on. The delay time is entered in ms.

With a step switch, only one contact is ever enabled or switched off, i.e. apart from the OFF state, there is no state in which no relay is switched on. Here too the time delay is the time duration between two speeds (a contact change).

The minimum switching time of the relay based on the switching frequency must also be considered.

For further information see: Technical data

Starting characteristic of fan

Option: no
yes

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, in order to develop a higher torque for the start-up phase of the fan.

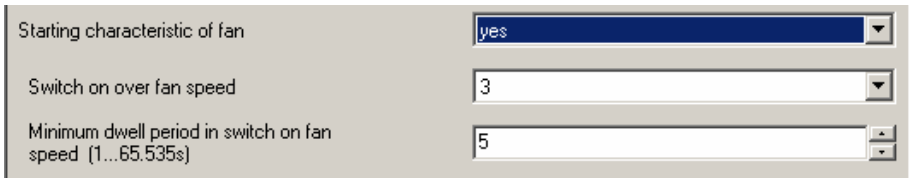
This parameter offers the opportunity to start the fan from the OFF position with a defined fan speed. This speed is immediately applied. A step switch normally means however that the previous speeds are usually switched on consecutively. With the changeover switch, the speed is immediately switched on.

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

The dwell times in a speed setting 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.

- *yes*: The parameters Switch on via fan speed and Minimum dwell time at starting speed are enabled.



Switch on via fan speed

Option: 1
2
3
4[1)]
5[1)]

[1)] applies only with the selection of a 5-speed fan

This parameter is enabled if the parameter *Starting characteristic of fan* has been set to *yes*.

With this parameter, the fan speed is set with which the fan starts from the OFF state.

Minimum dwell time at starting speed (1...65.535 s)

Option: 1…5…65.535

This parameter is enabled if the parameter *Starting characteristic of fan* has been set to *yes*.

This parameter defines the minimum dwell time in one of the starting speeds.

The following figure describes the behaviour during the automatic mode. The fan starts in the off position and should switch on over the third speed. For example the fan will get the switch on demand over the object *speed 1*. With the manual switching, the automatic mode is deactivating. The fan switched on with the start speed 3 and stays there for the dwell time. After this time the fan switched to the wished first speed, by noticing the switchover time between switching. For minimum the dwell time the fan stays in this speed.

The following illustration indicates the behaviour with the option *Switch on via fan speed 3* if the fan receives the *Fan speed 2* control variable from the OFF state.

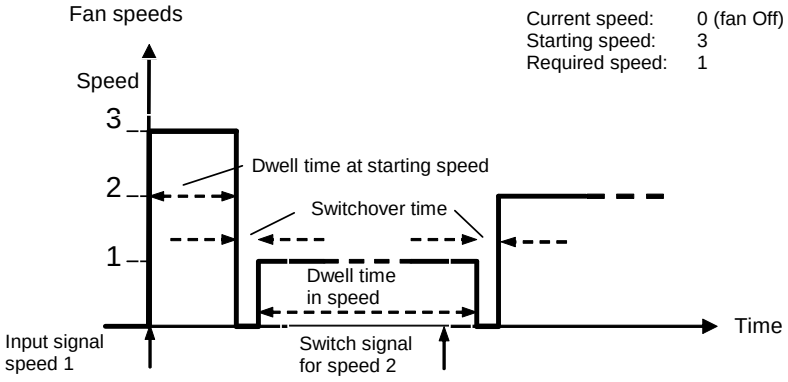


Fig. 10: Starting behaviour of a fan

3.3.1.3 Parameter window *A-C: Input*

The input and setting variables for the Blower/Fan Coil Actuator can be defined in this parameter window. The corresponding objects are released.

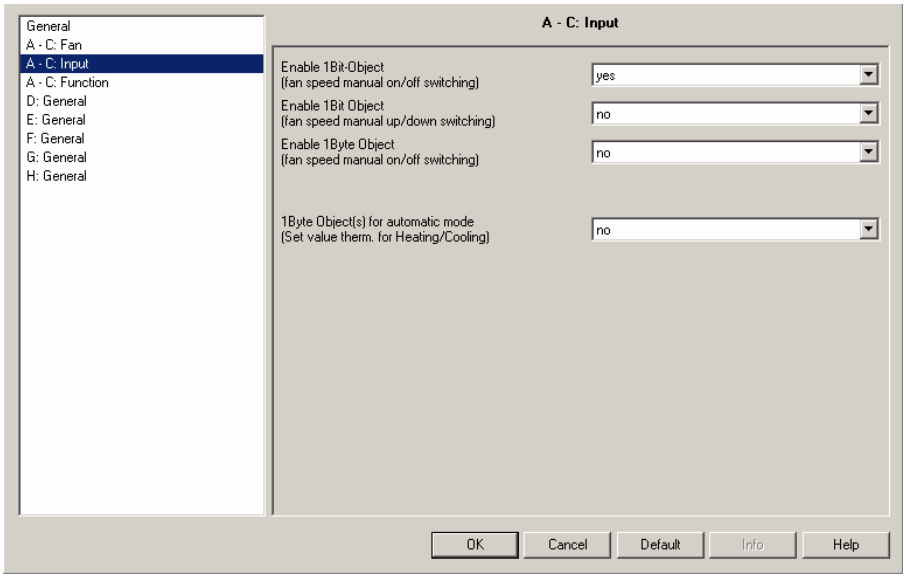


Fig. 11: Parameter window: *A-C: Input*

The setting variables for the fan and object values for a valve control are calculated with the input values. When the LFA/S receives a manual command, the automatic mode is switched off and the manual command is executed. The automatic mode can be reactivated by the 1-bit objects *Automatic ON/OFF*. In manual mode, the programmed dwell time in a speed is ignored in order to detect an immediate reaction in manual operation. The transition time between two speeds remains active in order to protect the fan.
The 5-speed fans or the possible two 3-speed fans of the LFA/S 2.1 have the same parameter window.

Enable 1-bit object (manual switching of fan speed)

Option: yes
no

- *yes*: The three 1-bit objects *Speed 1* to *Speed 3* are enabled. The Blower/Fan Coil Actuator receives a control command via these objects. The LFA/S calculates the fan control and switches the corresponding outputs based on these limitations.

There are five corresponding 1-bit objects for the 5-speed fan.

A telegram with the value 1 at the object *Speed x* causes fan speed x to switch on. The value 0 to any speed switches off speed x.

If several ON commands are received consecutively in a short period of time at various *Speed x* objects, the value last received by the fan control is the decisive value. This also applies for the OFF command. If a speed which has been switched off receives an OFF command again, this command is carried out, i.e. another speed that is currently switched on will be switched off and the command that was last received – in this case an OFF command – will be implemented.

Note
Forced operations, limitations 1-4 and the switchover delays are still valid and must be considered. The parameterised dwell time for automatic mode is ignored during manual operation.

Enable 1-bit object (manual switching up/down)

Option: yes
no

- *yes*: The 1-bit object *Fan speed up/down* is enabled. A speed is switched up a step if a Blower/Fan Coil Actuator receives a telegram with the value 1. If a telegram with the value 0 is received, the fan is switched down one speed. If the maximum speed is achieved and a further telegram with the value 1 is received, the fan's speed will remain as it is.

Note
Forced operations, the four limitations and the switchover delays are still valid and must be considered. The parameterised dwell time for automatic mode is ignored during manual operation.

With multiple manual *up* or *down* switching operations, the target speed will be increased or reduced by a speed. This is possible until the maximum or minimum possible speed is achieved. Further *up* or *down* commands are ignored and not executed. Each new switching command initiates a new calculation of the target speed. This means that a target speed changes by a switching command until this is achieved.

Enable 1-byte object (manual switching of fan speed)

Option: yes
no

- *yes*: The 1-byte object *Switch fan speed* is enabled. The Blower/Fan Coil Actuator receives its setting variables as 1-byte counter values via this object. The relay positions for the fan control are calculated and set dependent on the limitations and forced operation.

The following value assignment is applied:

1-byte values	Hexadecimal	Binary value	Speed
0	00	00000000	0 (Off)
1	01	00000001	Speed 1
2	02	00000010	Speed 2
3	03	00000011	Speed 3
4	04	00000100	Speed 4
5	05	00000101	Speed 5
> 5	> 05	> 00000101	No change

Table 12 Object value assignment for *Switch fan speed*

Telegrams, with a value greater as the maximum fan speed (3 or 5), send to the object *Status spee*d, will ignored and not longer transform to the maximum speed (3 or 5).

Hinweis
The forced operation, the four limitations (e.g. frost/heat protection) and the switchover delays continue to apply and should be considered. The parameterised dwell time for automatic mode is ignored during manual operation.

1-byte object(s) for automatic mode (Set value therm. for Heating/Cooling)

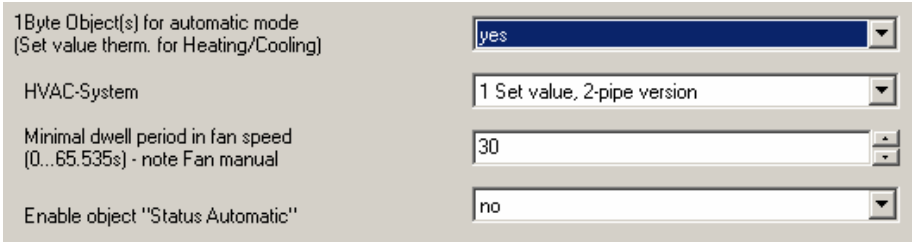
Option: no
yes

- *yes*: The Blower/Fan Coil Actuator is enabled. In automatic mode, the LFA/S x.1 evaluates its object(s) for automatic mode for the fan via 1-byte object (Heating and/or Cooling). The variables are provided for example by a thermostat.

  Automatic mode is activated after reset of the LFA/S via the ETS or by a telegram with the value 1 to the object *Automatic ON/OFF*. Automatic mode is switched off either by a telegram with the value 0 to the object *Automatic ON/OFF*, a manual action via the objects *Speed x*, *Fan speed up/down* or *Switch fan speed*.

  After a download or a bus voltage recovery, the automatic mode is not changed, i.e. if an automatic mode was active before a download or a bus voltage recovery, this is again reactivated. If automatic mode is not active, this is also the case after a download or bus voltage recovery.

  The HVAC system parameter is also enabled with the blower/fan coil pipe system. The required setting variables are enabled to suit the parameterisation.



HVAC system

Option: 1 set value, 2-pipe version
1 set value, 4-pipe version
2 set values, 2-pipe version
2 set values, 4-pipe version

This parameter is enabled if the parameter 1-*byte object(s) for automatic mode (Set value therm. for Heating/Cooling)* has been selected with *yes*. The following HVAC systems result:

Option	System	Input objects	Output objects
1	1 set value, 2-pipe version	Control Value, Heating/Cooling Automatic ON/OFF	Valve, Heating/Cooling
2	1 set value, 4-pipe version	Control Value, Heating/Cooling Toggle, Heating/Cooling Automatic ON/OFF	Valve, Heating Valve, Cooling
3	2 set values, 2-pipe version	Control Value, Heating Control Value, Cooling Toggle, Heating/Cooling Automatic ON/OFF	Valve, Heating/Cooling
4	2 set values, 4-pipe version	Control Value, Heating Control Value, Cooling Automatic ON/OFF	Valve, Heating Valve, Cooling

- *1 set value, 2-pipe version*: The Blower/Fan Coil Actuator for example receives only one input variable as a set value from a thermostat. This can be a cooling or a heating signal. Depending on the parameterised threshold values, the actuator sets a fan speed and generates a set value (output variable *Valve, Heating/Cooling*) for a valve which controls a heating or cooling circuit.
- *1 set value, 4-pipe version*: The Blower/Fan Coil Actuator for example only receives one input variable as a set value from a thermostat. Furthermore, the object *Toggle, Heating/Cooling* appears. The Blower/Fan Coil Actuator is in cooling or heating mode depending on the value of the object (1 = heating, 0 = cooling). If a fan speed is not equal to 0, the LFA/S in *cooling mode* sends a telegram with the value 1 via the object *Valve, Cooling*. At the same time, a telegram with the value 0 is sent to the *Valve, Cooling* object. A telegram to the valve objects is always initiated if a new set variable is received.

  This is the exact opposite in *heating mode*. A telegram with the value 1 is sent to the object *Valve, Heating* and a telegram with the value 0 is sent to the object *Valve, Cooling*.
- *2 set values, 2-pipe version*: A Blower/Fan Coil Actuator has two input objects, *Control Value, Heating* and *Control Value, Cooling*, and an output object, *Valve, Heating/Cooling*. A heating or cooling valve can be controlled with this object.

  In automatic mode, the LFA/S operates in heating mode if a telegram which is not equal to 0 is received via the object *Control Value, Heating*. The received value is used for the evaluation of the fan speed. At the same time, a 1 is sent to the object *Valve, Heating/Cooling*.

  If a telegram with a value not equal to 0 is received at the object *Control Value, Cooling*, the LFA/S switches to cooling mode. The received value is used for the evaluation of the fan speed. A telegram with the value 1 is again sent via the object *Valve, Heating/Cooling*. A 0 is only sent to the object *Valve, Heating/Cooling* if the fan is OFF.

This evaluation can only be influenced manually. The heating or cooling operation can be defined for this purpose via the object *Toggle, Heating/Cooling*. This object is enabled via the parameter object *Toggle, Heating/Cooling*. If a 0 is received at the object *Toggle, Heating/Cooling*, the LFA/S is in cooling mode. Only telegrams from the object *Control Value, Cooling* are evaluated. In heating mode, only the object *Control Value, Heating* is evaluated.

- *2 set values, 4-pipe version:* A Blower/Fan Coil-Actuator has two input objects, *Control Value, Heating* and *Control Value, Cooling*, and two output objects, *Valve, Heating* and *Valve, Cooling*; which can be used to control a separate heating and cooling valve.

  In automatic mode, the LFA/S operates in heating mode if a telegram not equal to 0 is received via the object *Control Value, Heating*. The received value is used for the evaluation of the fan speed. At the same time, a 1 is sent to the *Valve, Heating* object and a 0 is sent to the *Valve, Cooling* object.

  If a telegram with a value not equal to 0 is received at the object *Control Value, Cooling*, the LFA/S switches to cooling mode. The received value is used for the evaluation of the fan speed. At the same time, a 1 is sent to the *Valve, Cooling* object and a 0 is sent to the *Valve, Heating* object.

  This evaluation can only be influenced manually. The heating or cooling operation can be defined for this purpose via the object *Toggle, Heating/Cooling*. This object is enabled via the parameter object *Toggle, Heating/Cooling*. If a 0 is received at the object *Toggle, Heating Cooling*, the LFA/S is in cooling mode. The LFA/S evaluates the object *Control Value, Cooling* and sends a cooling signal 1 via the object *Valve, Cooling* and a 0 via the object *Valve, Heating*. Incoming telegrams at the object *Control Value, Heating/Cooling* are ignored.

  If on the other hand a telegram with the value 1 is received at the object *Toggle, Heating/Cooling*, the LFA/S switches over to heating mode and only reacts to control values which are received via the object *Control Value, Heating*. The valve objects are controlled in the opposite case for cooling operation.

  The object *Automatic ON/OFF* has the same function for all 4 options. Automatic mode of the Blower/Fan Coil Actuator is activated with the object value 1. This means that the actuator calculates the fan speeds using the input control value(s) with the parameterised threshold values and generates a corresponding signal for the valves. Automatic mode is either deactivated by a telegram with the value 0 at the object *Automatic ON/OFF* or through a manual action via the objects *Speed x*, *Fan speed up/down* or *Switch fan speed*.

Enabling object *Toggle, Heating/Cooling*

Option: no
yes

This parameter is visible if 2 control values and 1 valve or 1 control value and 2 valves are selected for the Blower/Fan Coil Actuator. The object *Toggle, Heating/Cooling* is enabled with this parameter. It is possible to define if the actuator is in heating or cooling mode with this object. In heating mode, only the setting signals of the object *Control Value, Heating* are selected. In cooling mode, the *Control Value, Cooling* object is decisive. Accordingly valve control is implemented in heating mode via the object *Valve, Heating* and in cooling mode via the object *Valve, Cooling*.

Minimal dwell period in fan speed (0...65.535 s)

Option: 0…30…65.535

This parameter defines the dwell time for a fan in the fan speed until it switches to the next higher or lower speed. The input is made in seconds.

- *0:* This means a non-delayed switching. The minimum switching time of the relay should be taken from the technical data.

The dwell time in a fan speed is only considered in automatic mode. The time is set to 0 with manual switching.

Enable object *Status Automatic*

Option: no
yes

The object *Status Automatic* is enabled with this parameter. This object indicates if the Blower/Fan Coil Actuator is in automatic mode. In this case, the object value is 1. If automatic mode is switched off, the object value is 0.

Send object value (Object *Status Automatic*)

Option: no, update only
only after changing
always

- *no, update only*: The status byte is always updated but never sent.
- *only after changing*: This has the effect that status changes are sent to the status byte on the KNX.
- *always*: The status byte is always sent regardless whether the status changes.

3.3.1.4 Parameter window *A-C: Automatic*

This parameter window is enabled if an automatic mode *1-byte object(s) for automatic mode (Set value therm. for Heating/Cooling)* has been activated in the parameter window *A-C: Input*.

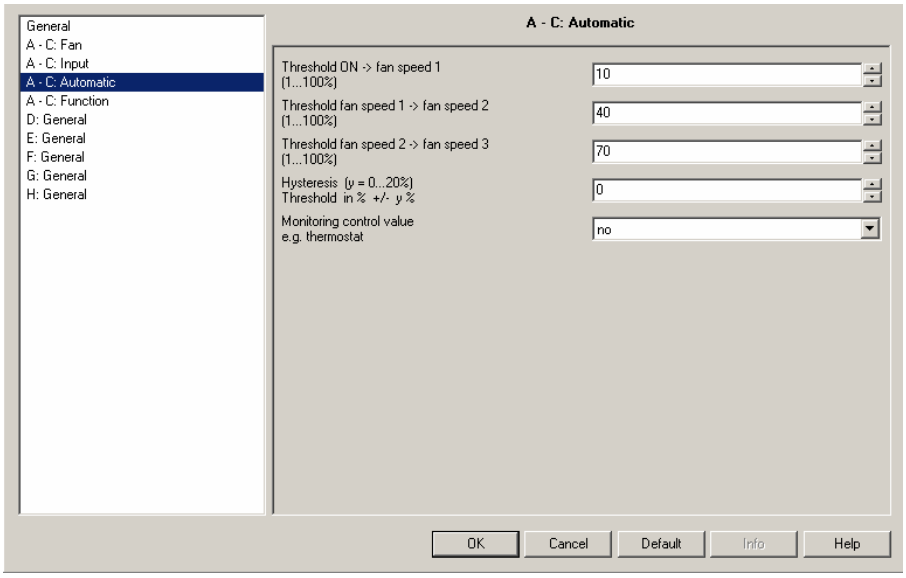


Fig. 12: Parameter window: *A-C: Automatic*

In this parameter window, the threshold values for switching over the fan speed are defined. Monitoring of the thermostat can also be activated.

The 5-speed fan or the possible two 3-speed fans of LFA/S 2.1 have the same parameter window where 5 threshold values can be adjusted if necessary.

The corresponding valve control objects receive the value 1 if a fan position is set. If a fan speed is not selected, the object will receive the value 0. Through forced operation for example, a recirculation (valve off) fan can be implemented.

Note
The Blower/Fan Coil Actuator evaluates the threshold values in ascending order, i.e. first of all the threshold value for *OFF -> Speed 1* is checked followed by *Speed 1 -> Speed 2* etc. The correct function is only ensured if the threshold for *OFF -> Speed 1* is less than the threshold for *Speed 1 -> Speed 2* and if this threshold is less than the threshold for *Speed 2 -> Speed 3* etc.

Threshold OFF -> fan speed 1 (1...100 %)

Option: 1, 2...<u>10</u>…100 (for 3-speed fan)

1, 2...<u>10</u>…100 (for 5-speed fan)

Here the threshold value is set from which switching over to fan speed 1 occurs. If the value in the control value object is greater than the parameterised threshold value, speed 1 is switched on.

Threshold fan speed 1 -> fan speed 2 (1...100 %)

Option: 1, 2…40...100 (for 3-speed fan)
1, 2…30…100 (for 5-speed fan)

Here the threshold value is set from which switching over to fan speed 2 occurs. If the value in the control value object is greater than the parameterised threshold value, switching over to speed 2 occurs.

Threshold fan speed 2 -> fan speed 3 (1...100 %)

Option: 1, 2…70…100 (for 3-speed fan)
1, 2…70…100 (for 5-speed fan)

Here the threshold value is set from which switching over to fan speed 3 occurs. If the value in the object *Control Value, Heating* or *Control Value, Cooling* is greater than the parameterised value, switching over to speed 3 occurs.

Threshold fan speed 3 -> fan speed 4 (1...100 %)

Option: 1, 2…80…100 (for 5-speed fan)

This parameter is only enabled with 5-speed fans.

Here the threshold value is set from which switching over to fan speed 4 occurs. If the value in the control value object is greater than the parameterised threshold value, switching over to fan speed 4 occurs.

Threshold fan speed 4 -> fan speed 5 (1...100 %)

Option: 1, 2…90…100 (for 5-speed fan)

This parameter is only enabled with 5-speed fans.

Here the threshold value is set from which switching over to fan speed 5 occurs. If the value in the control value object is greater than the parameterised threshold value, switching over to fan speed 5 occurs.

Hysteresis (y = 0...20 %) Threshold in % +/- y %

Option: 0, 1…5…20

Here a hysteresis is set from which switching over to the next fan speed occurs. This hysteresis applies for all three or five threshold values.

- *0*: This causes immediate switching without a hysteresis.
  The entered percentage value is added to or subtracted directly from the % value of *Threshold fan speed*. The result is a new upper or lower threshold value.

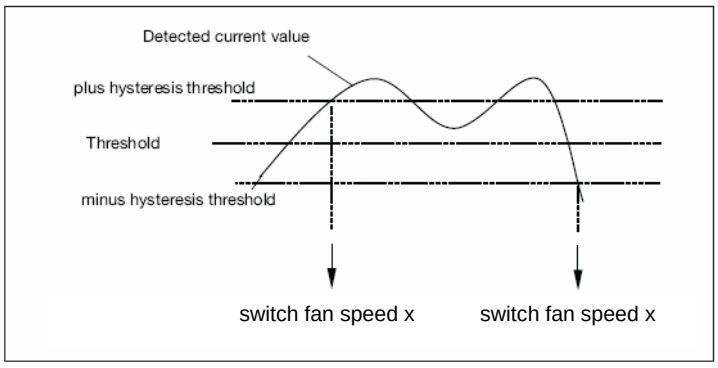


Fig. 13: Hysteresis with fan control

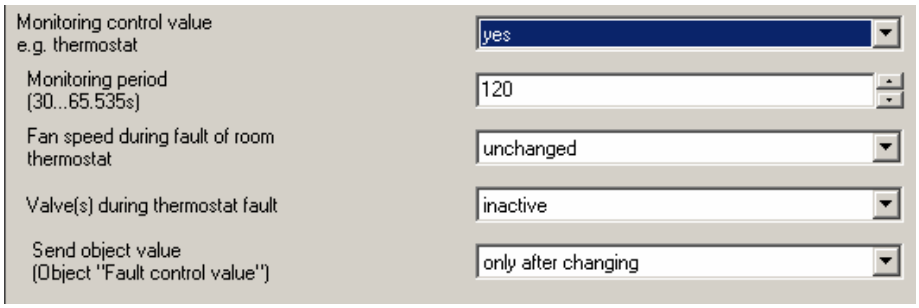
Using a hysteresis, continuous switching between the speeds around the threshold value with deviating input signals can be avoided.

Monitoring control value e.g. thermostat

Option: no
yes

- *yes*: The monitoring of the input/setting value(s) of the Blower/Fan Coil Actuator is enabled. Hereby the function of the thermostat can be monitored.

The following further parameters appear:



Monitoring period 30...65.535 s

Option: 1, 2…120…65.535

This parameter is enabled if the parameter *Monitoring control value e.g. thermostat* has been set to yes.

With this parameter, the time is set with which the telegrams at the input/setting values, objects *Control Value, Heating*, *Control Value, Cooling* or *Control Value, Heating/Cooling*, of the LFA/S are monitored. If a setting variable is not received within the parameterised time, a communication malfunction or a defective thermostat can be assumed.

The reaction of the LFA/S to a setting value that has not been received can be defined in the following parameters.

Fan speed during fault of room thermostat

Option: unchanged
OFF
1
2
3
4[1)]
5[1)]

[1)] applies only with the selection of the 5-speed fan

With this parameter, the fan speed (safety setting) is defined which the Blower/Fan Coil Actuator sets with an operational malfunction. This fan speed is only set in automatic mode. In manual mode, this setting has no effect.

A set fan limit continues to be active and has a higher priority than a thermostat fault. If a setpoint value with a thermostat fault is out of the activated limitation range, the next nearest limit value of the limitation is set.

Valve(s) during thermostat fault

Option: inactive
Heating-ON
Cooling or Cooling/Heating-ON
OFF

With this parameter, you can determine how the valve(s) is/are controlled if a thermostat fault has been detected. This valve setting is only set in automatic mode. In manual mode this setting has no effect.

Send object value (Object *Fault control value*)

Option: no, update only
after a change
always

- *no, update only*: The status fault control value is always updated but never sent.
- *after a change*: A telegram is sent to the KNX with a change in a fault.
- *always*: The status of the fault control value is always sent even if the status has not changed.

3.3.1.5 Parameter window *A-C: Function*

This parameter window is used to enable the individual functions.

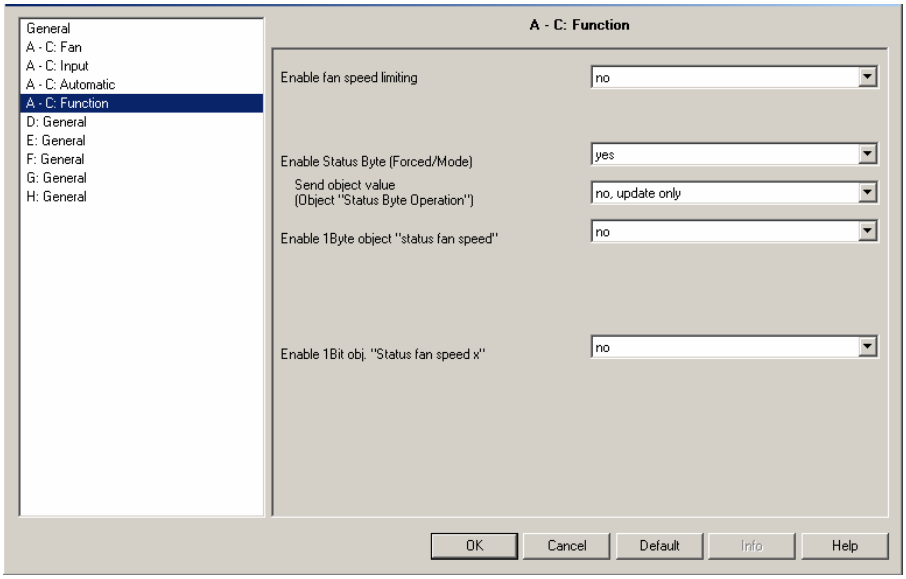


Fig. 14: Parameter window: *A-C: Function*

.

Enable fan speed limitation

Option: no
yes

yes: The parameter window *A-C: Limitation* or *A-E: Limitation* is enabled for a 5-speed fan. At the same time, the objects for activation of the forced positions and 4 limitations of the fan are enabled. For example for fan A-C they are:

Fan A-C: *Limitation 1*, e.g. for standby mode
Fan A-C: *Limitation 2* e.g. for night shut down
Fan A-C: *Limitation 3* e.g. for comfort operation
Fan A-C: *Limitation 4* e.g. for frost/heat protection
Fan A-C: *Forced operation*

Speed ranges (limits) are defined for the fan with the speed limitation function which may not be exceeded or undershot.

At the same time the valve position can be defined for this case.

Forced operation and 4 further limitations are available. This 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.

Note
With a defined forced operation (fan speed = inactive) which is purely limited to the valve, a valve purge for example can be implemented via the Blower/Fan Coil Actuator.

Note
The parameterised 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 speed 2 and a start-up behaviour is parameterised via speed 3, the following behaviour will result: The fan is in the OFF state and receives a control signal for speed 1. Initially the fan moves to speed 3 (starting speed) and then proceeds to speed 2 which is defined by the limitation. The speed that is actually required-speed 1-is not set.

Enable Status Byte (Forced/Mode)

Option: no
<u>yes</u>

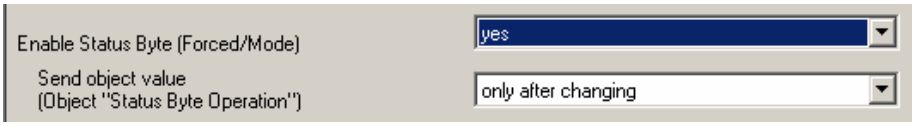
yes: A status byte object *Status Byte Operation* is enabled, from which the states heating, cooling, automatic, forced operation and the four limitations are indicated directly via a 1-bit coding (inactive / active). The value 1 means active, the value 0 means inactive.

Telegram code: 1st byte: 76543210

Bit no.
0: Heating (active = 1, inactive = cooling = 0)
1: Automatic
2: Thermostat fault
3: Limitation 1
4: Limitation 2
5: Limitation 3
6: Limitation 4
7: Forced operation

For further information see :Status byte code table

Different send options for the status byte are available via the *Send object value…* parameters enabled with *yes*.



Send object value (Object *Status Byte Operation*)

Option: <u>no, update only</u>
after a change
always

- *no, update only*: The status byte is always updated but never sent.
- *after a change*: The LFA/S sends the status byte on the KNX when the status changes.
- *always*: The status byte is always sent regardless whether the status changes.

Enable 1-byte object *Status fan speed*

Option: no
yes

yes: The object *Status fan speed* is enabled. This status byte defines the numerical value of the fan speed. This can be the actual or target speed depending on the parameterisation. The following value assignment is applied:

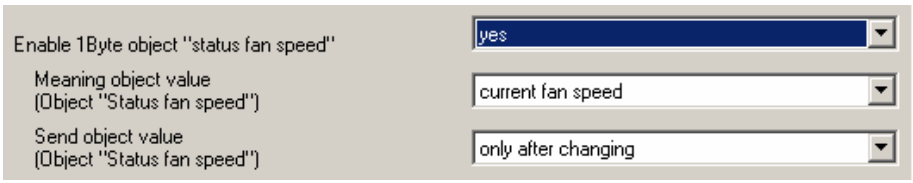
1-byte values	Hexadecimal	Binary value	Speed
0	00	00000000	0 (Off)
1	01	00000001	Speed 1
2	02	00000010	Speed 2
3	03	00000011	Speed 3
4	04	00000100	Speed 4
5	05	00000101	Speed 5
> 5	> 05	> 00000101	No change

Table 13 Value assignment for object *Status fan speed*

Telegrams, with a value greater as the maximum fan speed (3 or 5), send to the object *Status spee*d, will ignored and not longer transform to the maximum speed (3 or 5).

This display can be differentiated from the required fan speed with the selection of *current fan speed*, as initially the switchover times, dwell times and start-up phase must be completed before the required fan speed is achieved.

With the enabling of the 1-byte status display *Status fan speed*, two further parameters appear:



Meaning (object *Status fan speed*)

Option: current fan speed
required fan speed

With this parameter, it is possible to determine if the status of the current fan speed or required fan speed is displayed. The current fan speed is the speed at which the fan is currently operating. The required fan speed is the speed which has to be achieved, e.g. when the transition and dwell times are completed. The limitations are taken into consideration in the observation, i.e. if a limitation only allows speed 2, the fan is operating at speed 2 and e.g. a telegram is received to increase the speed, the required fan speed remains at speed 2 as speed 3 cannot be achieved due to the limitation.

Send object value (object *Status fan speed*)

Option: no, update only
<u>after a change</u>
always

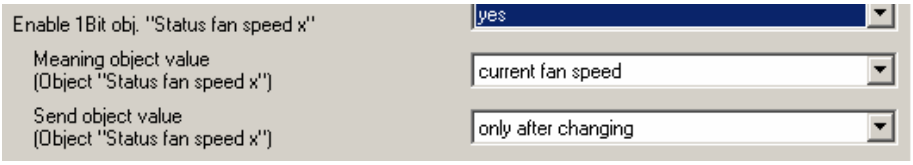
- *no, update only:* The status byte is always updated but never sent.
- *after a change*: Status changes are sent to the status byte on the KNX.
- *always*: The status byte is always sent regardless whether the status changes.

Enable 1-bit obj. *Status fan speed x*

Option: <u>no</u>
yes

- *yes*: Three or five 1-bit objects *(Status fan speed x*, x = 1 to 3 or 5 for a 5-speed fan are enabled. The setting of a fan speed is displayed via these objects. It can be parameterised whether the status of the current fan speed or the required fan speed is displayed.

With the enabling of the 1-bit status display *Status fan speed x*, two further parameters appear:



Meaning (object *Status fan stage x*)

Option: <u>current fan speed</u>
required fan speed

With this parameter, it is possible to determine if the status of the current fan speed or required fan speed is displayed. The current fan speed is the speed at which the fan is currently operating. The required fan speed is the speed which has to be achieved, e.g. when the transition and dwell times are completed. The limitations are taken into consideration in the observation, i.e. if a limitation only allows speed 2, the fan is operating at speed 2 and e.g. a telegram is received to increase the speed, the required fan speed remains at speed 2 as speed 3 cannot be achieved due to the limitation.

Send object value (object *Status fan speed x*)

Option: no, update only
<u>after a change</u>
always

- *no, update only*: The status byte is always updated but never sent.
- *after a change*: Status changes are sent to the status bit on the KNX.
- a*lways*: The status byte is always sent regardless whether the status changes.

3.3.1.6 Parameter window *A-C: Limitation*

This parameter window is enabled if the parameter *Enable fan speed limitation* is enabled in the parameter window *X-Y: Function*.

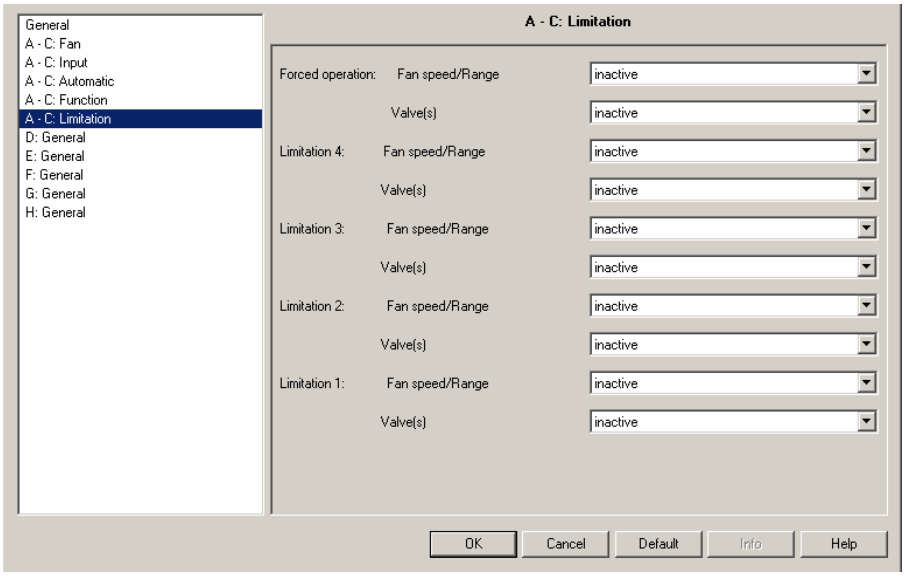


Fig. 15: Parameter window: *A-C: Limitation*

The sequence of the displayed forced operations or limitations corresponds with the priorities, i.e. the highest priority is the forced operation of limitation 4, followed by limitations 3, 2 and 1.

For further information see: function diagram

Note
The fault operation, such as a malfunction of the thermostat, has a lower priority than the fan limitation through forced operation and limitations 1 to 4, i.e. only the upper limit or at a minimum the lower limit of the fan limitation can be set by limiting the fan speed during a thermostat malfunction.

When automatic mode is exited, e.g. by a manual action, limits 1 to 4 remain. If a forced operation has been activated, it remains so.

The following points apply for all limitations:

- Fan speed and valve position can be parameterised independently.
- The limitation need not necessarily apply to just one fan speed. It can also encompass another range of the fan speed, i.e. only certain fan speeds can be set if the limitation is active. Hereby a limited control is still possible.
- The limitation is activated if a telegram with the value 1 is received at the limitation object. The limitation is deactivated if a telegram with the value 0 is received at the limitation object. A manual action ends the automatic mode.
- If a limitation is activated, the Blower/Fan Coil Actuator switches to the parameterised fan speed regardless of the control value(s). If during the activation of the limitation, another fan speed or a fan speed outside the range of the *limitation range* is set, the required fan speed or the limiting fan speed of the range is set.

- After switching off a limitation, the fan speed and the objects for valve control are recalculated and executed, i.e. during limitation, the actuator operates normally in the background, the outputs are not changed and implementation only occurs after the end of the limitation.

Forced operation: Fan speed/Range

Option: inactive
unchanged
OFF
1
1, off
2
2, 1
2, 1, off
3
3, 2
3, 2, 1
3, 2, 1, off[1)]
4[1)]
…
4, 3, 2, 1, off[1)]
5[1)]
…
5, 4, 3, 2, 1[1)]

[1)] this option appears only with the selection of a 5-speed fan

Forced operation is set with this parameter. The corresponding object *Forced operation* has already been enabled through activating the parameter window *X-Y: Limitation* with the parameter *Enable fan speed* in the parameter window *X-Y: Automatic*. The valve position is defined with a further parameter (see next), which is set during forced operation.

- *inactive*: No forced operation can be considered for the fan. Forced operation is still possible for the valve.
- *unchanged*: The fan speed is retained during activation of forced operation and continues in this state until the forced operation is cancelled.

Valve(s)

Option: inactive
Heating-ON
Cooling or Cooling/Heating-ON
OFF

With this parameter, the output objects for valve control are defined during forced operation.

- *inactive*:The valve position is not considered during forced operation. The valve continues to be controlled even though the fan is subject to forced operation.
- *Heating-ON*: The heating valve receives an ON command (telegram value 1) during forced operation via the object *Valve, Heating* or a value 1 at the object *Valve, Heating/Cooling*. If a cooling valve is available, this object is switched off via the *Valve, Cooling* object.
- *Cooling or Cooling or Cooling/Heating-ON*: The cooling valve receives an ON command (telegram value 1) during forced operation via the object *Valve, Cooling* or *Valve, Heating Cooling*. The heating valve is switched off via the object *Valve, Heating*.
- *OFF*: The forced operation of both valves is switched off.

Limitation x: Fan speed/Range (x = 1…4)

The parameters are identical for each of the four limitations and are used to limit a fan speed and to define the valve position during the corresponding limitation. The priority follows the listed sequence. The highest priority is assigned to limitation 4 (e.g. frost/heat protection) while the lowest priority is assigned to limitation 1 (e.g. standby operation). The following options are available:

Option: inactive
unchanged
Off
1
…
5, 4, 3, 2, 1[1)]

for a listing of all options see fan speed forced operation.

[1)] the option appears only with the selection of a 5-speed fan

With this parameter you set which fan speed is set with active limitation or which speed is not exceeded or undershot.
The corresponding object has already been enabled through activating the parameter window *X-Y: Limitation* with the parameter *Enable fan speed* in the parameter window *X-Y: Automatic*. The valve position is defined with a further parameter (see next), which is set when the limitation is active.

Limitation 4 can for example be used for frost/heat protection in order to prevent the room from overheating or freezing. A defined cooling or heating performance is ensured by the minimum possible fan speeds. However, the valve position and temperature of the heating/cooling medium in the pipe system must be guaranteed.

The other limitations can be activated or switched off via a time switch.

Valve(s)

Option: ***inactive***
Heating-ON
Cooling or Cooling/Heating-ON
OFF

With this parameter, the output objects for valve control are defined during the limitation.

A detailed description of the options can be found in the *Valve(s)* parameter of forced operation.

3.3.1.7 Parameter window *D-F: Fan*

For the 2-fold Blower/Fan Coil Actuator LFA/S 2.1, there is an option to control two 3-speed fans.

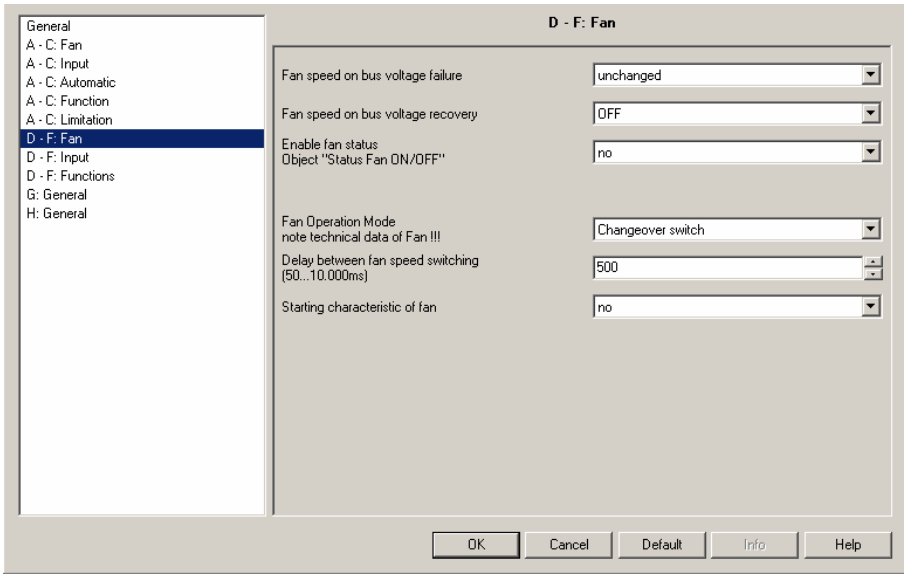


Fig. 16: Parameter window: *D-F: Fan*

The two fans D-F have the same parameters and communication objects available as for the first fan A-C. The parameters are only differentiated through the designation D-F. They are enabled when a second fan *(2 Fan (A-C, D-F) + 2 Actuators (G,H)*) is selected in the *General* parameter window.

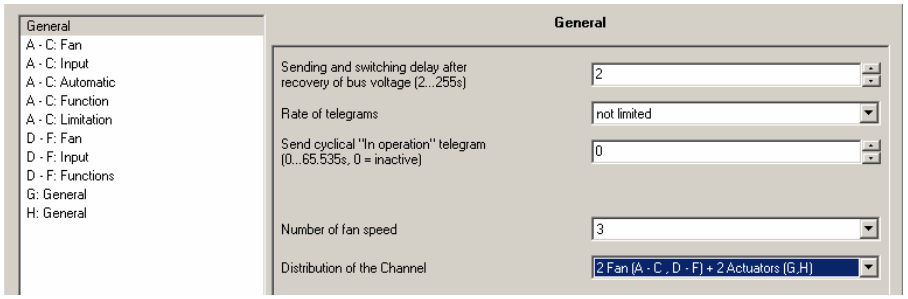


Fig. 17: Parameter window: *General*, two fans

The following assignment of the outputs of the 2-fold Blower/Fan Coil Actuator LFA/S 2.1 is produced for both 3-speed fans:

- Fan 1 (Fan A-C):
  Speed 1 = output A, speed 2 = output B, speed 3 = output C
- Fan 2 (Fan D-F):
  Speed 1 = D, speed 2 = E, speed 3 = F

The outputs G and H can be used as required. For these outputs, the *Switch Actuator* and *Control Valve (Heating)* modes are available.

The parameterisation possibilities of these modes are described in the corresponding chapters of this manual.

Note
A 3-speed fan and a 5-speed fan cannot be controlled together with the LFA/S 2.1.

3.3.1.8 Parameter window *G: General*

The free outputs of the Blower/Fan Coil Actuator which are not required for a fan application can be used as required as switch or heating actuators.

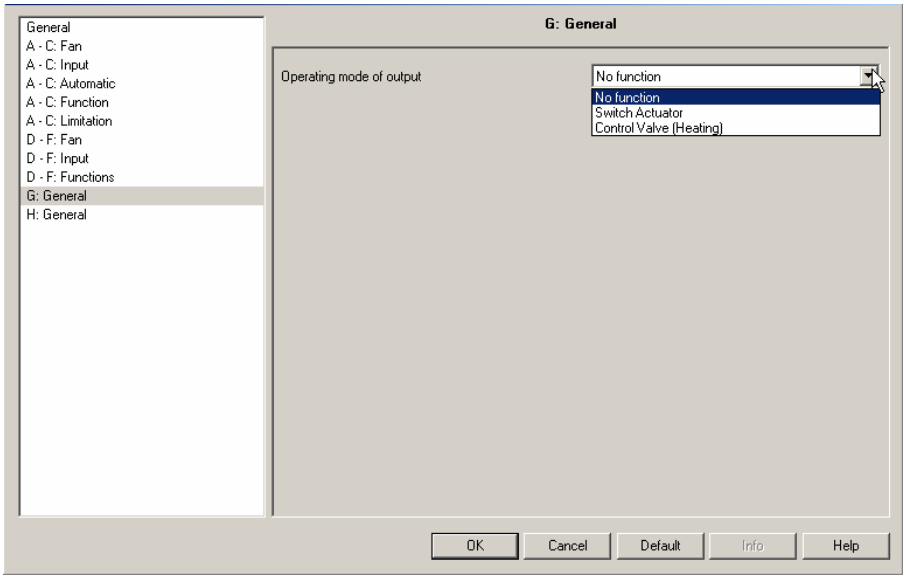


Fig. 18: Parameter window: *G: General*

On the 1-fold Blower/Fan Coil Actuator LFA/S 1.1, this is output D.

On the 2-fold Blower/Fan Coil Actuator LFA/S 2.1, these are the outputs

- D to H, if only one 3-speed fan is connected
- F to H, if only one 5-speed fan is connected
- G and H, if two 3-speed fans are connected.

The following additional functions are available for each of these outputs:

Switch actuator - see chapter 3.4

Control valve (Heating) - see chapter 3.5

Comprehensive switch actuator functions are possible with the ABB i-bus® SA/S switch actuators.

3.3.2 Communication objects *Fan*

General device communication objects

Number	Object Function	Name	Length	C	R	W	T	U
0	In Operation	General	1 bit	C	-	-	T	-

No.	Function	Object name	Data type	Flags
0	**In operation**	**General**	**1 bit (EIS 1) DPT 1.002**	**C, T**
Object *In operation*: 1 bit (EIS 1): In order to regularly monitor the presence of the Blower/Fan Coil Actuator on the KNX, a monitoring telegram can be sent cyclically on the bus. The communication object is only enabled if the parameter *Send cyclical In operation telegram (0...65.535s, 0 = inactive)* in the *General* parameter window has been activated (*yes*). Telegram value 1: Status				
1...9	**Free**	**not assigned**		

Table 14 Communication objects: Fan-General

Communication objects: Fan – manual switching/1 byte

Number	Object Function	Name	Length	C	R	W	T	U
10	Fan speed switch	Fancoil A - C	1 Byte	C	-	W	-	-

No.	Function	Object name	Data type	Flags
10 **40**[1)]	**Switch fan speed**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1-Byte Non EIS DPT 5.010**	**C, W**

Object *Switch fan speed*: 1 byte (Non EIS): The object is enabled if the parameter *Enable 1-byte object (manual switching of fan speed)* has been selected (*yes*) in parameter window *X-Y: Input*.

With this object, the fan can be switched on via a 1-byte 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.

Telegrams, with a value greater as the maximum fan speed (3 or 5), send to the object Status speed, will ignored and not longer transform to the maximum speed (3 or 5).

Limitations through forced operation or one of the four limitations 1…4 are retained. Automatic mode is switched off. A renewed activation of automatic mode occurs via the objects *Automatic ON/OFF* (no. 29 or 59[1)]) or one of the limitation objects (no. 23…28 or 53…58[1)]).

The following telegram values are produced:

1-byte values	Hexadecimal	Binary value	Speed
0	00	00000000	0 (Off)
1	01	00000001	Speed 1
2	02	00000010	Speed 2
3	03	00000011	Speed 3
4	04	00000100	Speed 4
5	05	00000101	Speed 5
> 5	> 05	> 00000101	No Change

[1)] Communication object for the second fan (D-F)

Table 15 Communication objects: Fan – manual switching (1 byte)

Communication objects: Fan – manual switching/1 bit

Number	Object Function	Name	Length	C	R	W	T	U
11	Fan speed 1	Fancoil A - E	1 bit	C	-	W	-	-
12	Fan speed 2	Fancoil A - E	1 bit	C	-	W	-	-
13	Fan speed 3	Fancoil A - E	1 bit	C	-	W	-	-
14	Fan speed 4	Fancoil A - E	1 bit	C	-	W	-	-
15	Fan speed 5	Fancoil A - E	1 bit	C	-	W	-	-

No.	Function	Object name	Data type	Flags
11…15 **41…45**[1)]	**Speed x** (x= 1…3, or 1…5)	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.001**	**C, W**

Object *Speed x*: 1 bit (EIS 1): This object is enabled if three or five 1-bit input objects *Fan speed x* (x = 1…5) have been selected in the parameter window *X-Y: Input*.

The actuator receives a setting value for fan speed x via this 1- object.

Limitations through forced operation or one of the four limitations 1…4 are retained. Automatic mode becomes inactive. A renewed activation occurs via the objects *Automatic ON/OFF* (no. 29 or 59[1)]) or one of the limitation objects (no. 23…28 or 53…58[1)]).

Telegram value	0	Fan OFF
	1	Fan speed x ON

If several ON commands 1 are received by the various fan speed objects, the value that was last received for the fan control is decisive. This also applies for the OFF command 0. If the actuator for a speed that has been switched off receives another OFF command, it is carried out, i.e. a speed that is currently switched on is switched off, even though the corresponding fan speed object does not act directly on the speed. The last command – in this case the OFF command of another speed – is always executed.

[1)] Communication object for the second fan (D-F)

Table 16 Communication objects: Fan – manual switching (1 bit)

Communication objects: Fan-automatic control value

Fan operation with 2 control values

Number	Object Function	Name	Length	C	R	W	T	U
16	Control Value, Heating	Fancoil A - C	1 Byte	C	-	W	-	-
17	Control Value, Cooling	Fancoil A - C	1 Byte	C	-	W	-	-

No.	Function	Object name	Data type	Flags
16 **46**[1)]	**Control Value, Heating**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 byte (EIS 6)** **DPT 5.001**	**C, W**

Object *Control Value, Heating*: 1 Byte (EIS 6): This object is enabled if the option *2 set values, …* has been selected for the operation mode in the parameter window *X-Y: Input*.

Using this object, the heat output is defined as a 1-byte % value, e.g. via a thermostat.

Telegram value	0 %	no heat output
	…	
	100 %	maximum heat output

17 **47**[1)]	**Control Value, Cooling**	**Fan X--Y** (z = A-C, A-E, D-F)	**1 byte (EIS 6)** **DPT 5.001**	**C, W**

Object *Control Value, Cooling*: 1 byte (EIS 6): This object is enabled if the option *2 set values, …* has been selected for the operation mode in the parameter window *X-Y: Input*.

Using this object, the cooling capacity is defined as a 1-byte-% value, e.g. via a thermostat.

Telegram value	0 %	no cooling capacity
	…	
	100 %	maximum cooling capacity

[1)] Communication object for the second fan (D-F)

Table 17 Communication objects: Fan-automatic, mode with 2 control values

Communication objects: Fan-automatic control value

Fan operation with 1 control value

Number	Object Function	Name	Length	C	R	W	T	U
17	Control Value, Heating/Cooling	Fancoil A - C	1 Byte	C	-	W	-	-

No.	Function	Object name	Data type	Flags
16 **46**[1)]	**Free**	**not assigned**		
17 **47**[1)]	**Control Value, Heating/Cooling**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 byte (EIS 6)** **DPT 5.001**	**C, W**

Object *Control Value, Heating/Cooling* 1 byte (EIS 6): This object is enabled if the option *1 set value, …* has been selected for the operation mode in the parameter window *X-Y: Input*.

Using this object, the heat output/cooling capacity is defined as a 1-byte-% value, e.g. via a thermostat.

Telegram value	0 %	no heat output/cooling capacity
	…	
	100 %	maximum heat output/cooling capacity

With two valve objects and a 2-conductor system, it is possible to decide which valve object is switched on via the object *Toggle, Heating/Cooling*.

[1)] Communication object for the second fan (D-F)

Table 18 Communication objects: Fan-automatic, mode with 1 control value

Communication objects: Fan – manual switching

Number	Object Function	Name	Length	C	R	W	T	U
18	Fan speed up/down	Fancoil A - C	1 bit	C	-	W	-	-

No.	Function	Object name	Data type	Flags
18 **48**[1)]	**Fan speed up/down**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.007**	**C, W**

Object *Fan speed up/down*: 1 bit (EIS 1): This object is enabled if the parameter *Enable 1-bit object (manual switching up/down)* has been selected in the parameter window *X-Y: Input*.

Using this object, the fan can be switched up or down a speed via a 1-bit object. Switching (up/down) is determined by the telegram value and can be parameterised.

Telegram value 0 switch down a speed
1 switch up a speed

With multiple manual up or down switching operations, the target speed will be increased or reduced by a speed. This is possible until the maximum or minimum possible speed is achieved. The parameterised limitations are considered here. Further up or down commands are ignored and not executed. Each new switching command initiates a new calculation of the target speed. This means that a target speed changes by a switching command until this is achieved.

[1)] Communication object for the second fan (D-F)

Table 19 Communication objects: Fan – manual switching

Communication objects: Fan-automatic, control value

Number	Object Function	Name	Length	C	R	W	T	U
19	Toggle, Heating / Cooling	Fancoil A - C	1 bit	C	-	W	-	-

19 **49**[1)]	**Toggle, Heating / Cooling**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, W**

Object *Toggle, Heating/Cooling* 1 bit (EIS 1): This object is enabled if an HVAC system with 2 valves *1 set value, 4-pipe version* or two control values *2 set values, 2-pipe version* has been selected in the parameter window *X-Y: Input*. The object has the following meaning:

In 4-pipe systems, there are two separate circuits for heating and cooling. Each circuit has its own valve. If a control value (*Control Value, Heating/Cooling*) is available, the *Toggle, Heating/Cooling* object described here can be used to define if the input variable is a heating signal which controls the heating circuit (Object *Valve, Heating*) or a cooling signal which controls the cooling circuit (Object *Valve, Cooling*).

In 2-pipe systems with 2 control values, 2 input variables are available for evaluation. With the object *Toggle, Heating/Cooling* it is possible to define the object to be evaluated. Telegrams to the other object are ignored. If the object *Toggle, Heating/Cooling* is not used, the LFA/S always evaluates the control signals that are not equal to 0.

The corresponding non-actuated valve is switched off.

Telegram value: 1 = heat
0 = cool

[1)] Communication object for the second fan (D-F)

Table 20 Communication objects: Fan-automatic control value

Communication objects: Fan control value – fan status

Number	Object Function	Name	Length	C	R	W	T	U
20	Status Fan ON/OFF	Fancoil A - C	1 bit	C	-	-	T	-

No.	Function	Object name	Data type	Flags
20 **40**[1)]	**Status Fan ON/OFF**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.001**	**C, T**

Object *Status Fan ON/OFF*: 1 bit (EIS 1): This object is enabled if the parameter *Enable status fan Status Fan ON/OFF* has been selected with option *yes* in the parameter window *X-Y: Fan*.

The object receives the object value 1 (ON), if a fan speed is not equal to OFF. The value of the object is updated if the fan speed changes.

This object thus reflects the status of the fan. If it is switched on or off, it can be used to control a master switch for the fan.

Telegram value: 0 = OFF
1 = ON

Some fans require an ON command before you set a fan speed. With the object *Status Fan ON/OFF* the fan can for example, be switched on centrally via a normal KNX switch actuator.

[1)] Communication object for the second fan (D-F)

Table 21 Communication objects: Fan control value – fan status (central switch)

Communication objects: Fan – Valve control

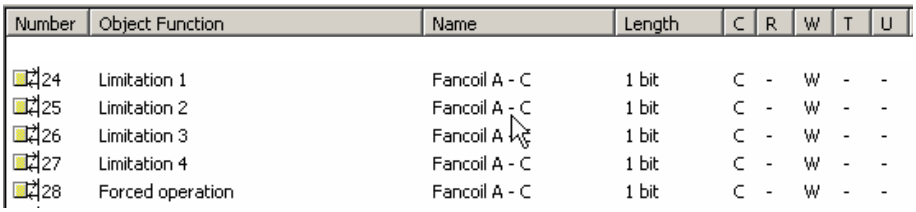
Number	Object Function	Name	Length	C	R	W	T	U
21	Valve, Heating	Fancoil A - C	1 bit	C	-	-	T	-
22	Valve, Cooling	Fancoil A - C	1 bit	C	-	-	T	-

No.	Function	Object name	Data type	Flags
21 **51**[1)]	**Valve, Heating**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, T**
Object *Value, Heating*: 1 Bit (EIS 1): This object is enabled if a 4-pipe system has been selected as an HVAC system in the parameter window *X-Y: Input*. In this case, two valves are available. The valve of the heating circuit is controlled via the *Valve, Heating* object. As soon as a heating signal is available as a control value and the ventilation fan is running with at least 1 speed, the object value is set to 1 (valve closed). If no fan speed is on, the *Valve, Heating* object value is set to 0. Overheating of the blower/fan coil unit is hereby avoided. The valve can be closed via forced operation and the fan can remain operational, resulting in recirculation. Telegram value: 1 = valve, actuator relays closed 0 = valve, actuator relays opened				
22 **52**[1)]	**Valve, Heating/Cooling**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, T**
Object *Valve, Heating/Cooling*: 1 bit (EIS 1): This object is enabled if a 2-pipe system has been selected as an HVAC system in the parameter window *X-Y: Input*. In this case, only one common valve *Valve, Heating/Cooling* is available for heating or cooling. The medium in the HVAC pipe system dictates if heating or cooling is implemented. As soon as a control signal is received and the fan is running with at least 1 speed, the object value is set to 1 (valve closed). If no fan speed is on, the *Valve, Heating/Cooling* object value is set to 0. Overheating of the blower/fan coil unit is hereby also avoided. The valve can be closed and the fan can remain operational with forced control. In this manner a recirculation is generated. Telegram value: 1 = valve closed (active heating or cooling) 0 = valve open				
22 **52**[1)]	**Valve, Cooling**	**Fan X--Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, T**
Object *Valve, Cooling*: 1 bit (EIS 1): This object is enabled if a 4-pipe system has been selected as an HVAC system in the parameter window *X-Y: Input*. In this case, two valves are available. The valve of the heating circuit is controlled via this object. If no fan speed is on, the *Valve, Cooling* object value is set to 0. It is possible to switch off the fan and to open the valve via a forced operation. Icing up may be prevented by this measure. As soon as a cooling signal is available as a control value and the ventilation fan is running with at least speed 1, the object *Valve, Cooling* has the value 1 whereby a normally opened valve opens. Telegram value: 1 = valve, actuator relays closed 0 = valve, actuator relays opened				

[1)] Communication object for the second fan (D-F)

Table 22 Communication objects: Fan – Valve control

Communication objects: Fan – Limitation



Number	Object Function	Name	Length	C	R	W	T	U
24	Limitation 1	Fancoil A - C	1 bit	C	-	W	-	-
25	Limitation 2	Fancoil A - C	1 bit	C	-	W	-	-
26	Limitation 3	Fancoil A - C	1 bit	C	-	W	-	-
27	Limitation 4	Fancoil A - C	1 bit	C	-	W	-	-
28	Forced operation	Fancoil A - C	1 bit	C	-	W	-	-

No.	Function	Object name	Data type	Flags
23 **53**[1)]	**Not used**			
24…27 **54…57**[1)]	**Limitation x** (x = 1…4)	**Fan X--Y** **(X-Y = A-C, A-E, D-F)**	**1 bit (EIS 1)** **DPT 1.003**	**C, W**

Object *Limitation x*: 1 bit (EIS 1): This object is enabled if the parameter *Enable fan speed* is enabled in the parameter window *X-Y: Function*.

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

When limitation x is activated, the fan can only assume the set fan speed or speed range in the parameter window *Limitation*. The valve position is independently programmable from the fan limitation, see function chart.

Telegram value 0 = Limitation x inactive
1 = Limitation x active

[1)] Communication object for the second fan (D-F)

Table 23 Communication objects: Fan – Limitation

Communication objects: Fan – Forced operation

No.	Function	Object name	Data type	Flags
28 **58**[1)]	**Forced operation**	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, W**

Object *Forced operation*: 1 bit (EIS 1): This object is enabled if the parameter *Enable fan speed* is enabled in the parameter window *X-Y: Function*.

The forced operation is active if a telegram with the value 1 is received at the object *Forced operation*. The forced operation is deactivated if a telegram with the value 0 is received at the object *Forced operation*.

If forced operation is activated, the switch actuator assumes forced operation independently of the *control value* and the parameterised limitation x (x = 1…4).

The fan speed and valve position(s) during forced operation can be parameterised.

Telegram value 0 = no forced operation
1 = forced operation

[1)] Communication object for the second fan (D-F)

Table 24 Communication objects: Fan – Forced operation

Communication objects: Fan – Automatic activate

Number	Object Function	Name	Length	C	R	W	T	U
29	Automatic ON/OFF	Fancoil A - C	1 bit	C	-	W	-	-

No.	Function	Object name	Data type	Flags
29 **59**[1)]	**Automatic ON/OFF**	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, W**

Object *Automatic ON/OFF*: 1 bit (EIS 1): This object is enabled if the automatic mode is enabled with the parameter *1-byte object(s) for automatic mode: (Set value therm. for Heating/Cooling)* in the parameter window *X-Y: Input*.

If automatic mode is enabled, it will be activated at this object with the value 1 after a download, bus reset or via a telegram. Automatic mode is switched off if a signal is received at a manual object (no. 10 to 15 and 18, or 50 to 55 and 58). During one of the four limitations or forced operation, the automatic mode remains active, but it is only operated in the allowed limits however.

It is possible to parameterise if an object value is only updated and not sent, always sent or only sent when changed.

Telegram value: 0 = inactive
1 = activated

[1)] Communication object for the second fan (D-F)

Table 25 Communication objects: Fan – Automatic activate

Communication objects: Fan – Status

Number	Object Function	Name	Length	C	R	W	T	U
30	Status fan speed	Fancoil A - E	1 Byte	C	R	-	T	-
31	Status fan speed 1	Fancoil A - E	1 bit	C	R	-	T	-
32	Status fan speed 2	Fancoil A - E	1 bit	C	R	-	T	-
33	Status fan speed 3	Fancoil A - E	1 bit	C	R	-	T	-
34	Status fan speed 4	Fancoil A - E	1 bit	C	R	-	T	-
35	Status fan speed 5	Fancoil A - E	1 bit	C	R	-	T	-
36	Fault control Value	Fancoil A - E	1 bit	C	R	-	T	-
37	Status Byte Mode	Fancoil A - E	1 Byte	C	R	-	T	-
38	Status Automatic	Fancoil A - C	1 bit	C	R	-	T	-

No.	Function	Object name	Data type	Flags
30 **60**[1)]	**Status fan speed**	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 byte non EIS** **DPT 5.010**	**C, R, T**

Object *Status fan speed*: 1 byte (non EIS): This object is enabled if the object *Enable 1-byte object Status fan speed* is enabled in the parameter window *X-Y: Function*.

It can be parameterised (see parameter window *Functions*) whether the object value is only updated, always sent on the KNX or only sent after a change.

It is possible to parameterise if the actual or required speed are displayed with the status object.

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

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

Numerical value	Hexadecimal	Binary value	Speed
0	00	00000000	0 (Off)
1	01	00000001	Speed 1
2	02	00000010	Speed 2
3	03	00000011	Speed 3
4	04	00000100	Speed 4
5	05	00000101	Speed 5

31-35 **61-65**[1)]	**Status fan speed x** (x = 1…5)	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.001**	**C, R, T**

Object *Status fan speed x*: 1 bit (EIS 1): These objects are enabled if the object *Enable 1-bit object Status fan speed x* is enabled in the parameter window *X-Y: Function*.

It can be parameterised (see parameter window *Functions*) whether the object value is only updated, always sent on the KNX or only sent after a change.

It can be parameterised for the status to indicate a current fan speed or a required fan speed.

With this object, is possible to display the fan speed in a visualisation program or to indicate it using a diode.

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

[1)] Communication object for the second fan (D-F)

Table 26 Communication objects: Fan – Status

Communication objects: Fan – Status

No.	Function	Object name	Data type	Flags
36 **66**[1)]	**Fault control Value**	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.005**	**C, R, T**

Object *Fault control Value*: 1 bit (EIS 1): This object is enabled if the parameter *Monitoring control value e.g. thermostat* is enabled in the parameter window *X-Y: Automatic*.

This object indicates a malfunction of the control value, normally the thermostat. If the object value *Control Value, Heating*, *Control Value, Cooling* or *Control Value, Heating/Cooling* remains off for a parameterised time (see parameter window *Automatic*), a fault is assumed. The fan coil control reports a fault and assumes the safety position with the object *Fault control Value*. This safety position affects the fan speed and the valves and can be set in the parameter window *X-Y: Automatic*.

Telegram value: 0 = no fault
1 = fault

No.	Function	Object name	Data type	Flags
37 **67**[1)]	**Status Byte Mode**	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 byte non EIS** **DPT non**	**C, R, T**

Object *Status Byte Mode*: 1 byte (non EIS): This object is enabled if the status byte is enabled with the parameter *Enable Status Byte (Forced/Mode)* in the parameter window *X-Y: Function*.

The operating state of the fan can be displayed or sent on the KNX via this communication object.

It is possible to parameterise (see parameter page *Function*) if the status is only updated, always sent or only sent when changed.

Telegram code: 1st byte: 76543210

Telegram value: 0 = inactive
1 = activated

Bit No.
0: Heating 1, Cooling 0
1: Automatic
2: Thermostat fault
3: Limitation 1
4: Limitation 2
5: Limitation 3
6: Limitation 4
7: Forced positioning

A status byte code table with the possible combinations is printed in the appendix.

No.	Function	Object name	Data type	Flags
38 **68**[1)]	**Status Automatic**	**Fan X-Y** (X-Y = A-C, A-E, D-F)	**1 bit (EIS 1)** **DPT 1.003**	**C, W**

Object *Status Automatic*: 1 bit (EIS 1): This object is enabled if the object *Status Automatic* is enabled in the parameter window *X-Y: Input*.

It is possible to parameterise if an object value is only updated and not sent, always sent or only sent when changed.

The object indicates the status of the automatic mode.

Telegram value: 0 = inactive
1 = activated

[1)] Communication object for the second fan (D-F)

Table 27 Communication objects: Fan – Status

3.4 Operating mode *Switch Actuator*

The free outputs of the Blower/Fan Coil Actuator which are not required for a fan application can be used as required.

On the 1-fold Blower/Fan Coil Actuator LFA/S 1.1 this is output D.

On the 2-fold Blower/Fan Coil Actuator LFA/S 2.1 these are the outputs

- D to H, with a 3-speed fan
- F to H, with a 5-speed fan
- G and H, with two 3-speed fans

A rudimentary switch actuator function is available, which can be used to switch electrical loads on and off without a time delay on the KNX. The behaviour on bus voltage failure and recovery can be parameterised. Furthermore, a staircase lighting function is available where the staircase lighting time can be adjusted via the bus and a continuous ON function is possible.

If a comprehensive range of switch actuator functions are required, an ABB-i-bus® KNX switch actuator of the SA/S range is required.

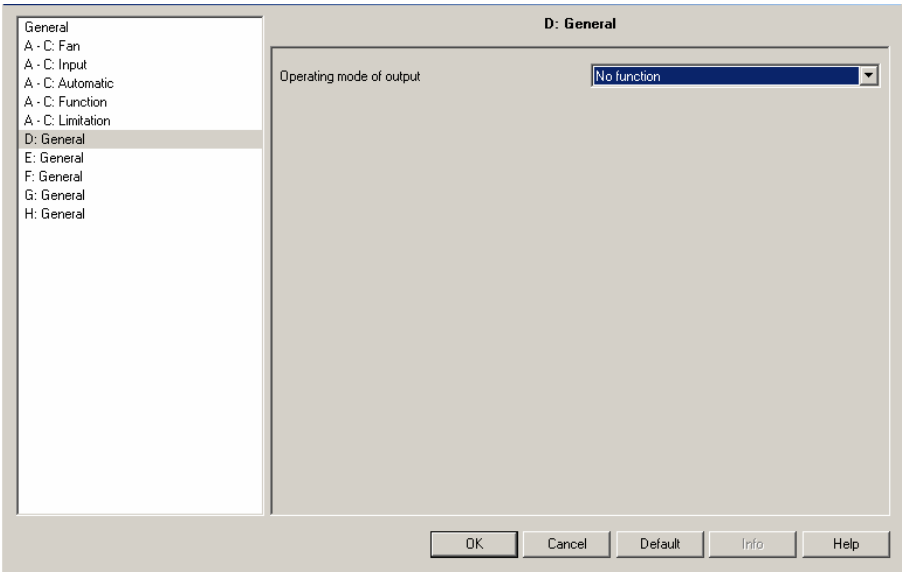


Fig. 19: Parameter window: *D: General*

3.4.1 Parameter window *Switch Actuator*

In the following, parameterisation as a switch actuator is described. Output D is used for the example. The same parameter window and objects result for other outputs.

The functions of the outputs and their properties are determined in these individual parameter windows.

The parameter window features a dynamic structure so that further parameter windows may be enabled depending on the parameterisation and the function of the outputs.

3.4.1.1 Parameter window *D: General*

In the *General* parameter window, the basic settings for the Blower/Fan Coil Actuators which affect the device and all its outputs can be defined.

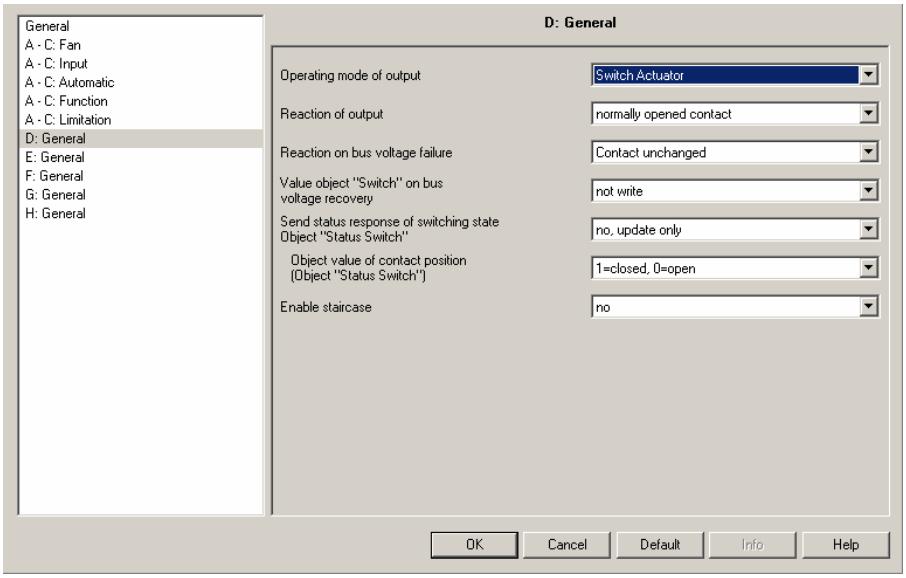


Fig. 20: Parameter window: *D: General* – Switch Actuator

Operating mode of output

Options: no function
Switch Actuator
Control Valve (Heating)

With these parameters, the operating mode of the free, unused outputs in fan control can be defined.

The option *Switch Actuator* enables easy switching of electronic loads, which will be described in the following section. If the *Switch Actuator* option is selected, the objects *Switch* and *Switch Status* are enabled.

The option *Control Valve (Heating)* defines the output as a heating actuator. The parameterisation possibilities are described in section 3.5.

Reaction of output

Options: Normally open contact
Normally closed contact

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

- *Normally open contact*: An ON command leads to the closing of a contact while an OFF contact causes the contact to be opened.
- *Normally closed contact*: The reverse process is carried out. An ON command (1) opens the contact and an OFF command (0) closes the contact.

Reaction on bus voltage failure

Options: Contact unchanged
Contact open
Contact closed

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

- *Contact unchanged*: Does not lead to a change in the contact position on bus voltage failure.
- *Contact open*: The contact is opened on bus voltage failure.
- *Contact closed*: The contact is closed.

For further information see: Behavior on bus voltage failure

Value object *Switch* on bus voltage recovery

Options: not described
describe with 0
describe with 1

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

The *Switch* object can be written with either a 0 or 1 when the bus voltage recovers. The contact position is re-determined and set dependent on the set device parameterisation, see function chart. If *not described* is selected, the value 0 is written into the *Switch object* and remains so until the object is changed via the bus. The contact position is only re-evaluated at this time.

The Blower/Fan Coil Actuator draws the energy for switching the contact from the bus. After bus voltage is applied, sufficient energy is only available after about 10 seconds in order to switch all contacts simultaneously. Depending on the set *Transmission and switching delay after recovery of bus voltage* set in the *General* parameter window, the individual outputs will only assume the desired contact position after this time. If a shorter time is set, the LFA/S will only switch the first contact when sufficient energy is stored in the actuator, in order to ensure that enough energy is available to immediately bring all outputs safely to the required position with a renewed bus voltage failure

Send status response of switching state Object *Status Switch*

Option: no, update only
after a change
always

- *no, update only*: The switch status is always updated but not sent via the object *Status Switch*.
- *after a change*: The switch status is sent via the *Status Switch* object after a change in the contact position.
- *always*: The switch status is sent via the object *Status Switch* not only when it changes, but also when the switching status could change.

The status can be defined with the following parameter.

The contact position, and thus the switching status can result from a series of priorities and links; see function chart.

Object value of contact position (Object *Status Switch*)

Options: 1 = closed, 0 = open
0 = closed, 1 = open

With this parameter the object value of the switching status (*Status Switch*) is defined.

As standard, a closed contact is represented by the object value 1 and an open contact is represented by the value 0.
With the option *0 = closed, 1 = open* an inversion can be parameterised.

Enable staircase

Options: no
yes

With the option *yes*, the staircase function is enabled for the output and the parameter window *D: Time Function* in which the staircase lighting time is programmed.

At the same time, the object *Disable Time Function* is enabled. With this object (value 1), the time function (staircase) can be inhibited, i.e. the time function (staircase) is not activated with a switching command but rather it is switched on and off. With the value 0, the time function is enabled again.

After a bus voltage recovery, the value of the object *Disable Time Function* can be parameterised in the parameter window *X: Time Function*.

3.4.1.2 Parameter window *D: Time Function*

This parameter is visible if the *staircase lighting time* in the parameter window *D: General* is avtivated with *yes*.

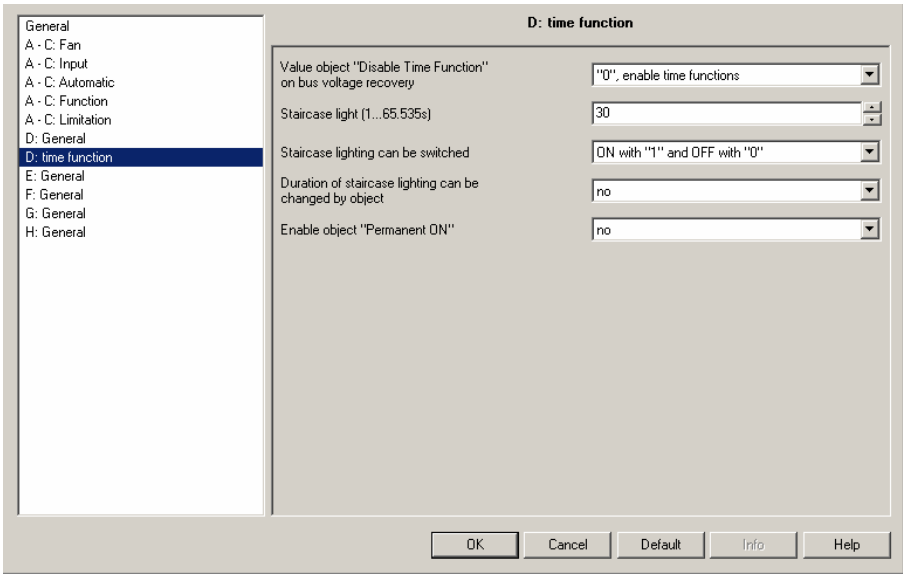


Fig. 21: Parameter window: *D: Time Function* – Switch Actuator

Value object *Disable Time Function* on bus voltage recovery

This parameter is visible if a time function is activated. You can use the

Options: 0, i.e. Enable time function
1, i.e. Disable time function

1, i.e. Disable time function: The staircase function is disabled. It can only be enabled via the object *Disable Time Function*.

0, i.e. Disable time function: The time function is enabled and active after a bus voltage recovery. If the time function is disabled when a staircase function is operational, the lighting will stay on until it is switched off manually.

Staircase light (1...65.535 s)

The staircase lighting time defines how long the staircase lighting is switched on after an ON command. The input is made in seconds.

Options: 1…30…65.535

Staircase lighting can be switched

Options: ON with 1 and OFF with 0
ON with 1 no action with 0
ON with 0 or 1, switch OFF not possible

Here you can set which telegram value is used to switch on and prematurely switch off the staircase lighting.

- *ON with 0 or 1*, *switch OFF not possible*: The staircase lighting function is switched on independently of the value of the incoming telegram. It is not possible to switch the light off prematurely.

Duration of staircase lighting can be changed by object

Options: no
yes

- *yes:* A 2-Byte communication object *Duration of staircase lighting* is enabled with which the staircase lighting time is modified via the bus.
- *no:* No modification of the staircase lighting time is possible via the bus.

The value defines the staircase lighting time in seconds.

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

The behaviour of the staircase lighting function on bus voltage failure is determined by the parameter *Reaction on bus voltage failure* on the parameter page *X: General*.

The behaviour on bus voltage recovery is defined by two parameters.

1. By the object *Disable Time Function*. If the time function is blocked after bus voltage recovery, the staircase lighting can only be switched ON and OFF normally via the *Switch* object.
2. Whether the light is switched ON or OFF on bus voltage recovery depends on the programming of the *Switch* object on the parameter page *X: General*.

Note
With a bus voltage failure, the staircase lighting time that has been changed via the bus is lost and must be reset. Until a new value is set, the staircase lighting time programmed via the ETS applies.

Enable object *Permanent ON*

Options: no
yes

The *Permanent ON* object is enabled with the option *yes*.

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

Example
This object can be used for example to allow the caretaker or maintenance and cleaning personnel to initiate a permanent ON.

Restart of staircase time after end of permanent ON

Options: no
yes

This parameter is visible when the *permanent ON* object is enabled.

- *no*: The lighting switches off when the permanent lighting has ended.
- *yes*: The lighting remains switched on and the staircase lighting time restarts.

The function of continuously ON is controlled via the *Permanent ON* object value. If the object *Permanent ON* receives a telegram with the value 1, the output is switched on irrespective of the value of the object *Switch* and remains switched on until the object *Permanent ON* has the value 0.

3.4.2 Communication objects *Switch Actuator*

Communication objects: Switch actuator

Number	Object Function	Name	Length	C	R	W	T	U
40	Switch	Output D	1 bit	C	-	W	-	-
41	Permanent ON	Output D	1 bit	C	-	W	-	-
42	Disable Time Function	Output D	1 bit	C	-	W	-	-
43	Duration of staircase lighting	Output D	2 Byte	C	R	W	-	-
49	Status switch	Output D	1 bit	C	R	-	T	-

No.	Function	Object name	Data type	Flags
40, 50… 80[1)]	**Switch**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.001**	**C, W**

Object *Switch*: 1 bit (EIS 1): Depending on whether the free outputs (D to H) of the Blower/Fan Coil Actuator are parameterised as a switch actuator, the objects 40, 50…80 are enabled if the switch actuator mode is selected in the parameter window *X: General*.

The outputs are used to switch output X ON/OFF.

The device receives a switching command via the switch object. If the output is programmed as a *normally open contact*, the relay is closed with telegram value 1 and opened with telegram value 1 (and the inverse is true when programmed as a *normally closed contact*).

Telegram value 1 = switch ON, if a *normally opened contact* is parameterised
0 = switch OFF, if a *normally opened contact* is parameterised

No.	Function	Object name	Data type	Flags
41, 51… 81[1)]	**Permanent ON**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.001**	**C, W**

Object *Permanent ON*: 1 bit (EIS 1): After enabling the time function in the parameter window *D: General*, the objects no. 41, 51…81 can be enabled in the parameter window *X: Time Function* with the parameter *Enable object Permanent ON*.

With this object, output X of the LFA/S can be forcibly switched on.

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

Permanent ON only switches ON and “masks” the other functions. This means that the other functions (e.g. staircase lighting) continue to run in the background but do not initiate a reaction. After the end of permanent ON, the switching state which would result without the permanent ON function becomes active. The behaviour for the staircase lighting function after permanent ON is programmed in the parameter window *X: Time Function*.

This object can be used for example to allow the caretaker or maintenance and cleaning personnel to initiate a permanent ON. The device receives a switching command via the switch object.

Permanent ON becomes inactive after a download or bus voltage recovery.

Telegram value 1 = activates permanent ON mode
0 = ends permanent ON mode

[1)] LFA/S 1.1 output D = 40, LFA/S 2.1 outputs D, E, F, G, H = 80…89

Table 28 Communication objects Switch actuator

No.	Function	Object name	Data type	Flags
42, 52… 82[1)]	**Disable Time Function**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.003**	**C, W**

Object *Disable Time Function*: 1 bit (EIS 1): This object is visible if the time function with the parameter *Staircase light* has been selected with the option *yes* in the parameter window *X: General*. Via this object, the time function (staircase lighting) can be disabled or enabled.

After bus voltage recovery, the object value can be defined via the parameter *Value object Disable Time Function after bus voltage recovery* in the parameter window *X: Time Function*.

With a disabled time function 1, the output can only be switched on or off, the staircase lighting function will not be initiated.

Telegram value 1 = time function disabled
0 = time function enabled

The contact position at the time of disabling and enabling is retained and will only be changed with the next switching command to the *Switch* object.

No.	Function	Object name	Data type	Flags
43, 53… 83[1)]	**Duration of staircase lighting**	**Output X** (x = D, E, F, G, H)	**2 byte (EIS 10) DPT 7.001**	**C, R, W**

Object *Duration of staircase lighting*: 2 byte (EIS 10): This object is visible if the parameter *Duration of staircase lighting can be changed by object* is selected with *yes* in the parameter window *X: Time Function*.

The staircase lighting time can be set via this object. The time is defined in seconds. On bus voltage failure, the time set via the bus is lost. After bus voltage recovery, the object value is set by the programmed value and the value set via the bus is overwritten.

49, 59… 89[1)]	**Status Switch**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.003**	**C, R, T**

Object *Status Switch*: 1 bit (EIS 1): Depending on whether the free outputs (D to H) of the Blower/Fan Coil Actuator are parameterised as a switch actuator, the objects 49, 59…89 are enabled if the switch actuator mode is selected in the parameter window *X: General*.

In Parameter window *X: General*, you can parameterise if the object value is only updated, sent after a change or always sent on the KNX.

The object value directly indicates the current contact position of the switching relay. The status value can be inverted.

Telegram value 1 = Relay ON or OFF depending on the parameterisation
0 = Relay OFF or ON depending on the parameterisation

[1)] LFA/S 1.1 output D = 40, LFA/S 2.1 outputs D, E, F, G, H = 80…89

Table 29 Communication objects Switch actuator

3.5 Operating mode *Control Valve (Heating)*

The free outputs of the Blower/Fan Coil Actuator which are not required for a fan application can be used as required.

On the 1-fold Blower/Fan Coil Actuator LFA/S 1.1 this is output D.

On the 2-fold Blower/Fan Coil Actuator LFA/S 2.1 these are the outputs

- D to H, with a 3-speed fan
- F to H, with a 5-speed fan
- G and H, with two 3-speed fans

Note
If an output of the Blower/Fan Coil Actuator has been selected as a heating actuator, it is particularly important to consider the endurance of the relay, see technical data. This is essential if the output is used for a continuous controller.

Electromechanical actuators – the LFA/S actuators included – feature a mechanical relay as a contact mechanism. On the one hand, safe electrical isolation is thus achieved and on the other hand a very high switching capacity. Furthermore this is associated with switching noises and mechanical wear, which means that the switching relay reaches the end of its life after a certain number of switching operations. Considering these aspects, it may be useful to use an ABB i-bus® KNX electronic switch actuator (e.g. ES/S) for a heating controller. These actuators do not feature a galvanic isolation and have a considerably smaller switching capacity, but are not subject to mechanical wear.

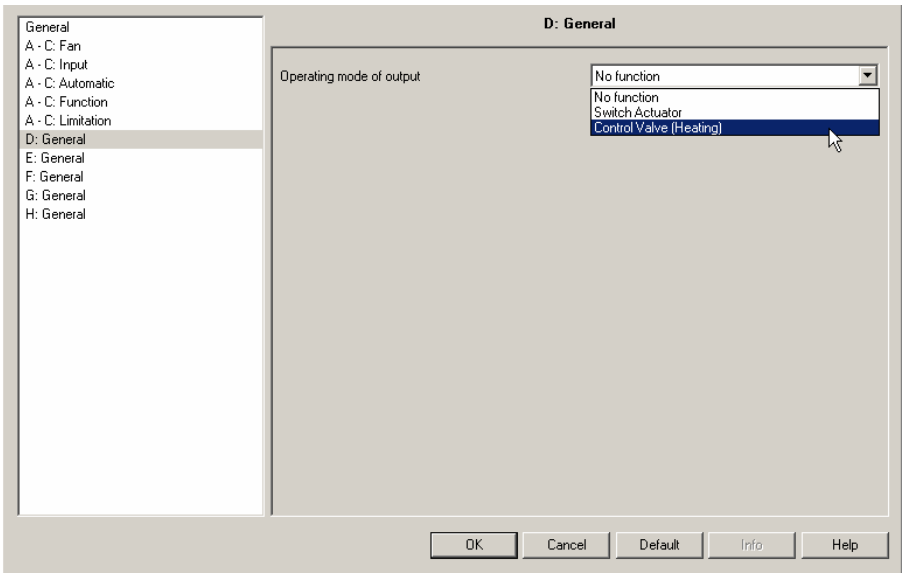


Fig. 22: Parameter window: *D: General* – Control Valve (Heating)

3.5.1 Parameter window *Control Valve (Heating)*

The following section describes parameterisation as a heating actuator. Output D is used for the example. The same parameter window and objects result for other outputs.

The parameter window features a dynamic structure so that further parameter windows may be enabled depending on the parameterisation and the function of the outputs.

3.5.1.1 Parameter window *D: General*

With these parameters the operating mode of the free, unused outputs in fan control can be defined.

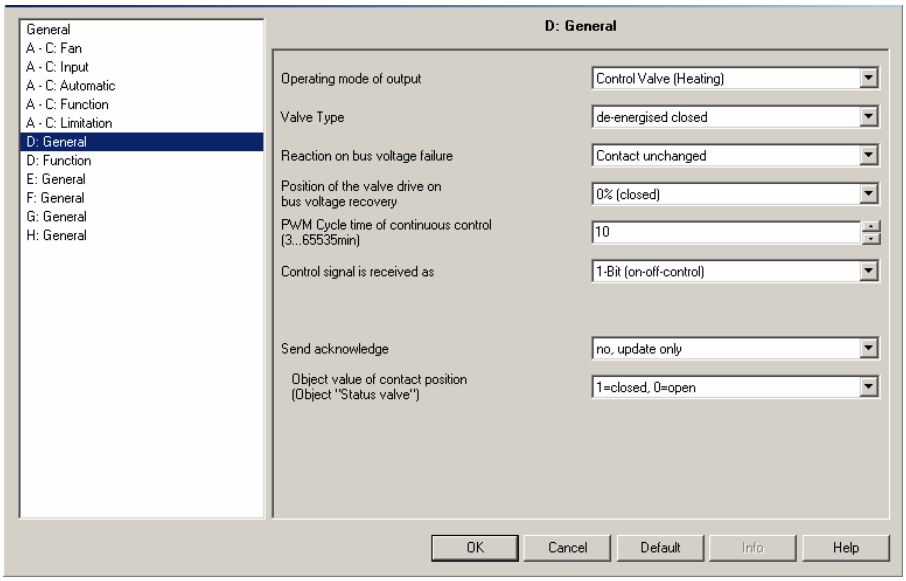


Fig. 23: Parameter window: *D: General* – Control Valve (Heating)

Operating mode of output

Options: no function
Switch Actuator
Control Valve (Heating)

The option *Switch Actuator* defines the output as a switch actuator. The parameterisation possibilities are described in operation mode switch actuator.

The option *Control Valve (Heating)* enables valve control for heating control, whose parameterisation is described in the following section. If the option *Control Valve (Heating)* is selected, the objects *Switch* and Status *valve* are enabled.

Valve type

Options: normally closed
normally open

With this parameter, the valve type which is to be controlled by the output of the Blower/Fan Coil Actuator can be set.

- *normally closed*: The opening of the valve is achieved by closing the relay.
- *normally open*: The opening of the valve is achieved by opening the relay.

Reaction on bus voltage failure

Options: Contact unchanged
Contact closed
Contact open

With this parameter, you set how the contact and accordingly the valve drive reacts to a failure in the bus voltage.

Only the energy for the switching action is available when the bus voltage fails. If a normally closed valve is used, a closed contact means an open valve (100 %) or a closed valve (0 %) with an open contact.

A normally opened valve has the opposite effect.

A middle position of the valve cannot be set on bus voltage failure. With a bus voltage failure, the valve moves after a certain time either to its closed (0 %) or open (100 %) end position.

Position of the valve drive on bus voltage recovery

Options: 0 % (closed)
10 % (26)
...
90 % (230)
100 % (open)

With this parameter, the valve position after bus voltage recovery is defined. This valve position is set via a PWM control and is retained until the first switching or setting command from a thermostat. The Blower/Fan Coil Actuator uses PWM control with the parameterised PWM cycle time until a signal is received from the control.

The values in brackets correspond to a 1-byte value.

The programmed value is used as the PWM cycle time.

PWM Cycle time of continuous control (3...65.535 min)

Options: 3…10…65.535

The periodic duration of the control signals are set with this parameter in the event of bus voltage recovery or the 1-byte control (continuous control). This corresponds to the cycle time $t_{CYC,}$ see PWM- calculation. The input is made in minutes.

For 1-bit control, the pulse width modulation is only used when controlling the LFA/S in fault mode, during forced operation and directly after bus voltage recovery. Or if the actuation as a continuous 1-byte signal is received (see next parameter).

The time should not be selected below 5 minutes, in order to take the operational life of the switching relays into account. See service life of a PWM controller.

Control signal is received as

Options: 1 bit (PWM or 2-point)
1 byte (continuous)

The heating actuator can either be controlled via the 1-bit object *Switch* or the 1-byte object *Control value (PWM)*.

- *1-bit (PWM or 2-point):* The heating actuator functions in a similar way to a standard switch actuator: The room thermostat controls the heating actuator via standard switching commands. A 2-step control of the control value is implemented in this way. The 1-bit value can originate from a pulse width modulation (PWM) which a room thermostat has calculated. Only during a malfunction, when the control signal is not received by the room thermostat, will the switch actuator undertake an autonomous PWM calculation. The switch actuator uses the programmable PWM cycle time for this purpose.
- 1 byte (continuous): Continuous control is activated. For this purpose the object *Control value (PWM)* and the status object *Status heating* are enabled.

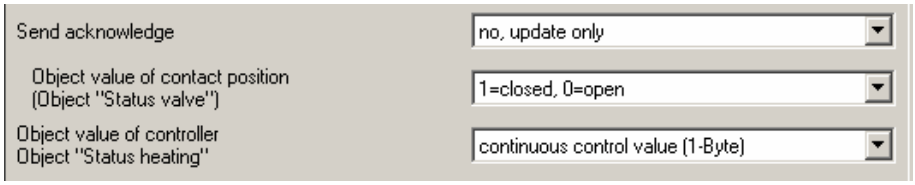
For 1-byte control, a value of 0...255 (corresponds to 0 %...100 %) is preset by the room thermostat. This process is also known as *continuous-action control*. At 0 % the valve is closed and at 100 % it is fully opened. The heating actuator controls intermediate values via pulse width modulation, see PWM calculation.

Send acknowledge

Option: no, update only
after a change
always

- *no, update only*: The switching status of the switching relay is always updated but not sent via the object *Status valve*.
- *after a change*: The switching status is sent via the *Status valve* object after a change in the contact position.
- *always*: The switching status is sent via the object *Switch valve* not only when it changes, but also when the switch status could change.

With the following parameters, the object value of the valve status can be defined and inverted.



Note
The contact position, and thus the switching status can result from a series of priorities and links, see operation mode, control valve (heating).

Object value of contact position (Object *Status Valve*)

Options: 1 = closed, 0 = open
0 = closed, 1 = open

The object *Status valve* is enabled directly if the *Control Valve (Heating)* mode is selected.

The value of the object *Status valve* always defines the current contact position. The specification relates to the relay of the Blower/Fan Coil Actuator and not to the valve positions.

It can be programmed if 0 is to be used to indicate an opened or closed relay contact.

The reaction of the valve is dependent on the position of the actuator relay and the valve type (normally open or normally closed).

Object value of controller (Object *Status heating*)

Options: 0 % = 0 otherwise 1 (1 bit)
0 % = 1 otherwise 0 (1 bit)
continuous control value (1 byte)

With this parameter, you can determine which value the status object *Status heating* displays. The object *Status valve* is enabled if continuous control is selected with the parameter *Control signal is received as*.

- *continuous control value (1 byte)*: The current control value of the output is sent/displayed as a 1-byte value.
- *0 % = 0 otherwise 1 (1 bit)*: The object *Status heating* becomes a 1-bit object and indicates the digital control value of the output. The value 0 will only be displayed if the control value is 0 %. For every other % value the object value 1 is displayed/sent.
- *0 % = 1 otherwise 0 (1 bit)*: An inverted reaction is displayed/sent.

3.5.1.2 Parameter window *D: Function*

In this parameter window different functions can be enabled.

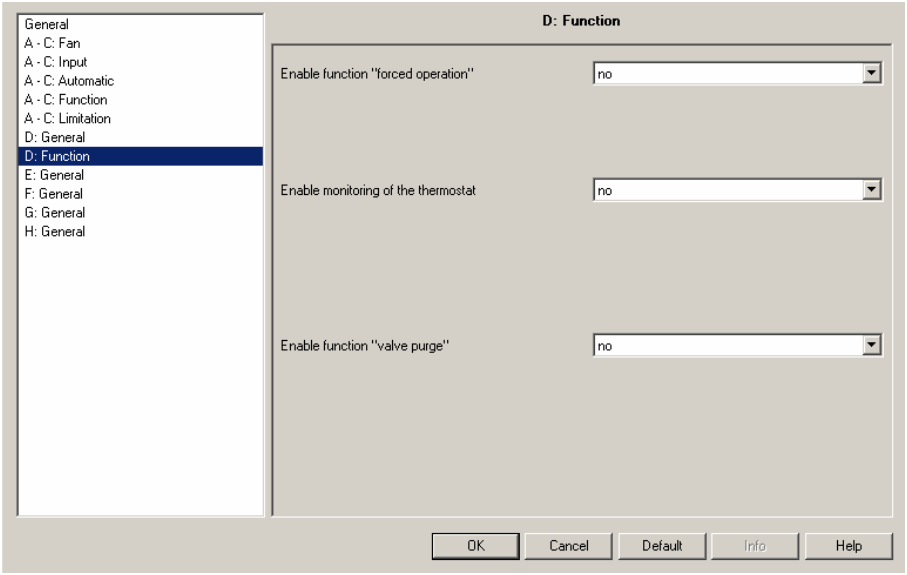


Fig. 31: Parameter window: *D: Function*

Enable function *forced operation*

Options: no
yes

With this parameter, the forced operation of the output can be enabled here in order to move the outputs to a specific position e.g. for inspection purposes.
With *yes*, the object *Forced operation* and the parameter *Valve position during forced positioning* is enabled.

Valve position during forced positioning

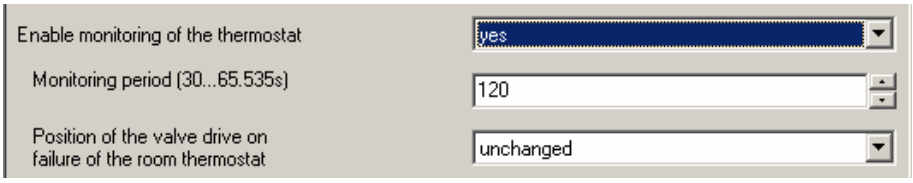
Options: unchanged
0 % (closed)
10 % (26)
20 % (51)
…
100 % (open)

With this parameter, the set position of the valve during forced operation is defined. This value is set via PWM control with the PWM cycle time defined in the parameter window *D: General*.

Enable monitoring of the thermostat

Options: no
yes

With this parameter, a cyclic monitoring of the thermostat can be enabled. The thermostat is monitored. If a telegram is not received, a malfunction of the thermostat is assumed. The output switches to fault mode and moves to a defined valve position.
With *yes*, the object *Thermostat fault* and the parameters *Monitoring period (30...65.535 s)* and *Position of the valve drive on failure of the room thermostat* are enabled.



Monitoring period (30...65.535 s)

The telegrams of the room thermostat are transferred to the electronic actuator at specific intervals. If one or more of the subsequent telegrams is omitted, this can indicate a communications fault or a defect in the room thermostat. If there are no telegrams received by the objects *Switch* or *Control value (PWM)* during the period defined in this parameter, the actuator switches to fault mode and triggers a safety position. The fault mode is ended as soon as a telegram is received as a control value.

Options: 30...120...65.535 seconds

Note
The thermostat must send a cyclic control value, otherwise a thermostat fault is assumed and channel X of the LFA/S goes to fault operation. The monitoring period should be twice as long as the send cycle time of the thermostat.

Valve position during forced positioning

Options: unchanged
0 % (closed)
10 % (26)
20 % (51)
…
100 % (open)

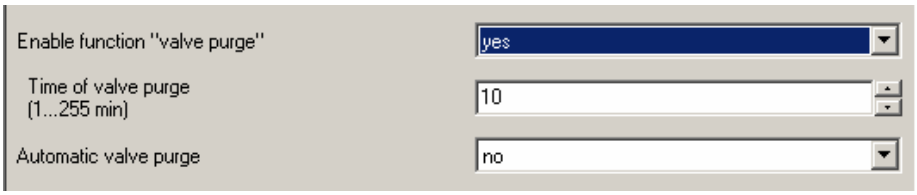
With this parameter, the set position of the valve during forced operation is defined. This value is set via PWM control with the PWM cycle time defined in the parameter window *D: General*.

Enable function *valve purge*

Options: no
yes

With this parameter, the function of a valve purge of the output can be enabled. Regular purging of a heating valve can prevent deposits from forming in the valve area and restricting the valve function. At the same time it is assured that the heating element is purged which simplifies the bleeding of trapped air. This is particularly important at times when the valve position does not change very much. The valve is opened to the maximum during a valve purge. It can be triggered via the object *Trigger valve purge* and/or automatically at adjustable intervals.

With the option *yes*, the objects *Trigger valve purge* and *Status valve purge* are enabled. Also the parameter *Time of valve purge in minutes (0...255)* and *Automatic valve purge* are enabled.



Time of valve purge in minutes (0...255)

Options: 1...10...255

With this parameter, the time duration for the control of the valve during purging is set.

Automatic valve purge
The valve is automatically purged at adjustable intervals with this parameter:

Options: no
one time per day
one time per week
one time per month

A purge can be initiated by the object *Trigger valve purge*.

The counter for automatic purging starts to run when the parameter is loaded in the actuator. 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 object *Trigger valve purge*.

An intermediate switching operation of the switching relay does not affect the time, as it is not ensured that the valve stroke required for purging has been carried out.

Note
Via the object *Trigger valve purge* a purging can be triggered from the KNX.

3.5.2 Communication objects *Control Valve (Heating)*

Communication objects heating actuator

The following objects result with the control 1 bit (PWM or 2-point)

Number	Object Function	Name	Length	C	R	W	T	U
40	Switch	Output D	1 bit	C	-	W	-	-
41	Trigger valve purge	Output D	1 bit	C	-	W	-	-
42	Status valve purge	Output D	1 bit	C	R	-	T	-
43	Thermostat fault	Output D	1 bit	C	R	-	T	-
44	Forced operation	Output D	1 bit	C	-	W	-	-
49	Status valve	Output D	1 bit	C	R	-	T	-

With the control *1 byte (continuous)* the following objects result

Number	Object Function	Name	Length	C	R	W	T	U
40	Control value (PWM)	Output D	1 Byte	C	-	W	-	-
41	Trigger valve purge	Output D	1 bit	C	-	W	-	-
42	Status valve purge	Output D	1 bit	C	R	-	T	-
43	Thermostat fault	Output D	1 bit	C	R	-	T	-
44	Forced operation	Output D	1 bit	C	-	W	-	-
45	Status heating	Output D	1 Byte	C	R	-	T	-
49	Status valve	Output D	1 bit	C	R	-	T	-

No.	Function	Object name	Data type	Flags
40, 50… 80[1)]	**Switch**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.001**	**C, W**
Object *Switch*: 1 bit (EIS1): This object is enabled if the mode of the output is set to *Control Valve (Heating)* and the control is implemented as ***1 bit (PWM or 2-point)*** (setting in parameter window *X: General*). The output is controlled directly depending on whether the valve is a *normally open* or *normally closed* type. The following applies in the case of a normally closed (N.C.) valve Telegram value: 0 = relay open, valve closed 1 = relay closes, valve opens				
40, 50… 80[1)]	**Control value (PWM)**	**Output X** (x = D, E, F, G, H)	**1 byte (EIS 6) DPT 5.010**	**C, W**
Object *Control value (PWM)*: 1 byte (EIS6): This object is enabled if the mode of the output is set to *Control Valve (Heatin*g) and the control is implemented as ***1 byte (continuous)*** (setting in parameter window *X: General*). The object value [0…255] is determined by the variable mark-to-space ratio of the valve. At object value 0 the valve is closed and at object value 255 it is fully opened. Telegram value 0 = Valve closed 255 = Valve fully opened				
41, 51… 81[1)]	**Trigger valve purge**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.001**	**C, W**
Object *Trigger valve purge*: 1 bit (EIS1): This object is enabled if the purge function is enabled in the parameters. This occurs with the parameter *Enable function "valve purge"* in the parameter window *X: Function*. If the value 1 is received, the valve is opened for the duration of the valve purge. If the value 0 is received the valve purge ends. Telegram value 1 = start valve purge 0 = end valve purge				

[1)] LFA/S 1.1 output D = 40, LFA/S 2.1 outputs D, E, F, G, H = 80…89

Table 30 Communication objects: *Control Valve (Heating)*

Communication objects heating actuator – status/force

No.	Function	Object name	Data type	Flags
42, 52… 82 [1)]	**Status valve purge**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.002**	**C, R, T**
Object *Status valve purge*: 1 bit (EIS1): This object is enabled if the purge function is enabled in the parameters. This occurs with the parameter *Enable function valve purge* in the parameter window *X: Function*. This object indicates if the valve purge is active or inactive. Telegram value 0 = valve purge is inactive 1 = valve purge is active				
43, 53... 83 [1)] **233**	**Thermostat fault**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.005**	**C, R, T**
Object *Thermostat fault*: 1 bit (EIS1): This object is enabled if monitoring of the controller is enabled in the parameters. This occurs with the parameter *Enable monitoring of the thermostat* in the parameter window *X: Function* This object indicates a possible fault in the room thermostat (RTR). The objects *Switch* or *Control value (PWM)* can be cyclically monitored. If the object value is not received for a programmable time, the LFA/S assumes that the room thermostat has failed and indicates a fault. Telegram value 0 = no fault 1 = fault				
44, 64... 84 [1)]	**Forced operation**	**Output X** (x = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.003**	**C, W**
Object *Forced operation*: 1 bit (EIS1): This object is enabled if the forced operation is enabled in the parameters. This occurs with the parameter *Enable function forced operation* in the parameter window *X: Function.* This object sets the output to 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 LFA/S receives a new setting signal. Telegram value 0 = forced operation ended 1 = start forced operation				

[1)] LFA/S 1.1 output D = 40, LFA/S 2.1 outputs D, E, F, G, H = 80…89

Table 31 Communication objects heating actuator – status/force

Communication objects heating actuator – status

No.	Function	Object name	Data type	Flags
45, 55... 85[1)]	**Status heating**	**Output X** (X = D, E, F, G, H)	**1 byte (EIS 6) DPT 5.010**	**C, R, T**
Object *Status heating*: 1 byte (EIS6): This object is enabled if the mode of the output is set to *Control Valve (Heating)* and the control is implemented as *1 byte (continuous)* (setting in parameter window *X: General*. Via this object, the current control value is sent as a 1-byte value of the output if the option *continuous control value (1 byte)* has been selected in the parameter *Object value of controller* in the parameter window *X: General*. Telegram value continuous control value (1 byte) (0…255)				
45, 55... 85[1)]	**Status heating**	**Output X** (X = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.001**	**C, R, T**
Object *Status heating*: 1 bit (EIS1): This object is enabled if the mode of the output is set to *Control Valve (Heating)* and the control is implemented as 1 *byte (continuous)* (setting in parameter window *X: General*). Via this object, the current control value is sent as a 1-byte value of the output, if the option *continuous control value (1 byte)* has **not** been selected in the parameter *Object value of controller* in the parameter window *X: General*. In this case, the digital control value of the output is sent. The object value is sent with changes. With the parameterisation *0 % = 0 otherwise 1 (1 bit)*, the following applies Telegram value 0 = if control value = 0 % 1 = if control value not equal to 0 % With the parameterisation *0 % = 1 otherwise 0 (1 bit)*, the following applies Telegram value 0 = if control value not = 0 % 1 = if control value equal to 0 %				
49, 59... 89[1)]	**Status valve**	**Output X** (X = D, E, F, G, H)	**1 bit (EIS 1) DPT 1.001**	**C, R, T**
Object *Status valve*: 1 bit (EIS1): This object is enabled if *Control Valve (Heating)* is selected as the operating mode of the output. In the parameter window *X: General*, it is possible to define with the parameter *Send acknowledge* if the object is only updated, sent after a change or always sent on the KNX. The object value directly indicates the current contact position of the switching relay. The status value can be inverted. Telegram value 1 = Relay ON or OFF depending on the parameterisation 0 = Relay OFF or ON depending on the parameterisation				

[1)] LFA/S 1.1 output D = 40, LFA/S 2.1 outputs D, E, F, G, H = 80…89

Table 32 Communication objects heating actuator – status

4 Planning and application

In this section you will find a description of different types of fans, blowers and fan coil controllers. Furthermore, you will find a few tips and application examples for practical use of Blower/Fan Coil Actuators with the application program *FanCoil xf 6A/1*.

4.1 Fan operation

With fan operation, you can control up to two single-phase fans, blowers or convectors with the switch actuators LFA/S1.1 or LFA/S 2.1.

In combination with a valve controller, various fan coil operations can be implemented as a 2-, 3- or 4-pipe system.

The fans are controlled via a 3-speed or 5-speed controller. For this purpose, 3 or 5 windings are tapped off on the fan motor. The speed is dependent on the tap-off. It must be ensured that 2 contacts are not switched on simultaneously. For control purposes, a 3- or 5-speed changeover switch with zero position is usually used. This switch is mapped with a group of outputs in the switch actuator.

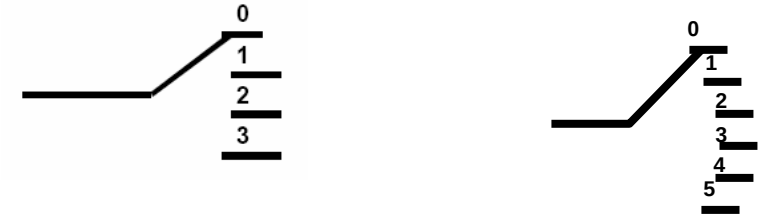


Fig. 24: Three-speed and five-speed changeover switch

The control of the LFA/S is implemented in accordance with the following schematic principle:

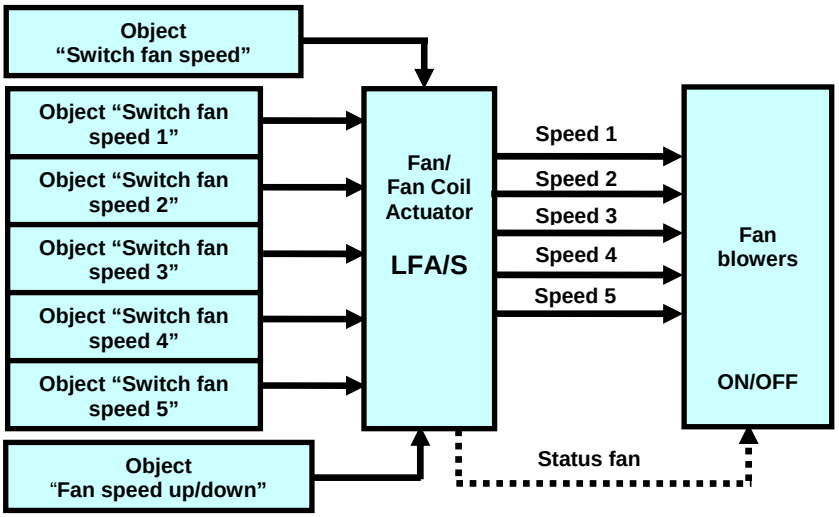


Fig. 25 Principle schematic of fan control via KNX

With three or five *Switch fan speed x* (x = 1, 2, … 5) objects independent of each other, the fan speeds are controlled via the outputs of the Blower/Fan Coil Actuator. Alternatively, the fan control can be implemented via a 1-byte object *Switch fan speed* or via the object *Fan speed up/down*.

Some ventilation devices require an additional central starting mechanism (master switch) in addition to the step switch. This can be implemented with a further output of the Blower/Fan Coil Actuator. It is switched on as soon as at least one fan speed is activated.

4.1.1 Fan control with changeover switch

The control of the fan can be implemented as a changeover switch. For a 3-speed fan, the following control table for the LFA/S results:

	Output A/D	Output B/E	Output C/F
OFF	0	0	0
Speed 1	1	0	0
Speed 2	0	1	0
Speed 3	0	0	1

For both 3-speed fans are the following output assignment possible:

- Fan 1 (fan A-C):
  Speed 1 = output A, Speed 2 = output B, Speed 3 = output C
- Fan 2 (Fan D-F):
  Speed 1 = output D, Speed 2 = output E, Speed 3 = output F

For a 5-speed fan, the following control table (Fan A-E):

	Output A	Output B	Output C	Output D	Output E
OFF	0	0	0	0	0
Speed 1	1	0	0	0	0
Speed 2	0	1	0	0	0
Speed 3	0	0	1	0	0
Speed 4	0	0	0	1	0
Speed 5	0	0	0	0	1

Speed 1 = output A, Speed 2 = output B, Speed 3 = output C,
Speed 4 = output D, Speed 5 = output E

4.1.2 Fan control with step switch

The control of the fan can be implemented alternatively as a step switch. For a 3-speed fan, the following control table for the LFA/S results:
Fan 1 Output A…C, or Fan 2 Output D…F

	Output A/D	Output B/E	Output C/F
OFF	0	0	0
Speed 1	1	0	0
Speed 2	1	1	0
Speed 3	1	1	1

For a 5-speed fan, output A…E

	Output A	Output B	Output C	Output D	Output E
OFF	0	0	0	0	0
Speed 1	1	0	0	0	0
Speed 2	1	1	0	0	0
Speed 3	1	1	1	0	0
Speed 4	1	1	1	1	0
Speed 5	1	1	1	1	1

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

4.2 HVAC systems

The Blower/Fan Coil Actuators LFA/S x.1 control single-phase fans, blowers or fan coil units. First of all the required fan is selected. 3-speed or 5-speed, single-phase fans are available which feature a step or changeover control. Special fan properties such as switchover pauses, dwell times and a start-up phase can be parameterised. An HVAC system with an integrated fan can be selected independently of the fan. Up to two input variables for heating and cooling signals, for example, for a thermostat are available. The Blower/Fan Coil Actuators LFA/S x.1 generate up to two valve objects as output variables with which any heating actuator or a free channel of the Blower/Fan Coil Actuator can control the valves in a heating or cooling circuit.

Due to the separate fan and HVAC parameterisation with separate objects for valve control, maximum flexibility and combination possibilities are produced for various applications in the heating, ventilation and air-conditioning (HVAC) field. In the following section, the different HVAC systems are described together with their heating and cooling circuits.

4.2.1 Fan/Fan coil units

The fan/fan coil unit consists of a fan or fan convector and one or two heat exchangers, which emit the heat output and/or cooling capacity to the room. If only one heat exchanger and one heating or cooling circuit are 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 Blower/Fan Coil Actuators LFA/S 1.1 or LFA/S 2.1 directly control the fan and provide one or two objects for control of the valves.

A fan convector or fan coil unit is designed in principle as follows:

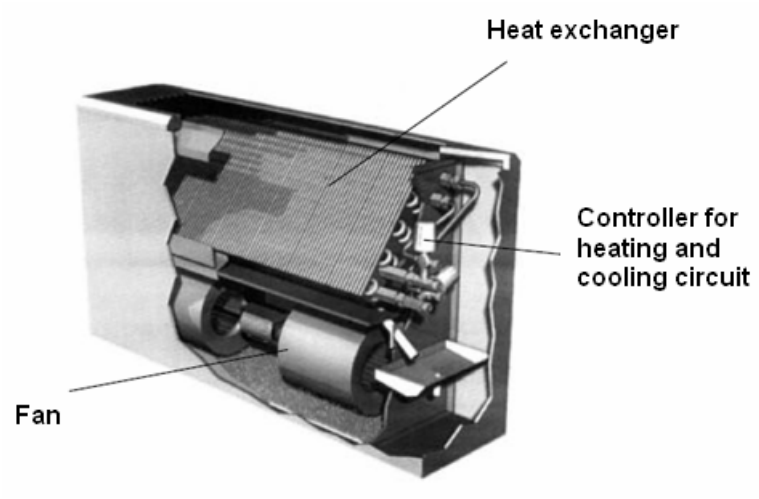


Fig. 26: Example of a fan convector

4.2.2 2-pipe fan coil system

A 2-pipe system features only one heat exchanger with a cooling or heating circuit, which consists of an inlet (pipe) with valve and an outlet (pipe).

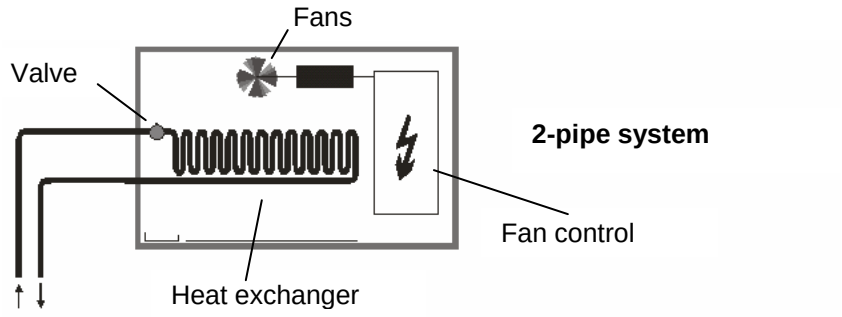


Fig. 27: Design of 2-pipe fan coil unit

2-pipe heating and cooling system:

Only one heat exchanger (for common heating and cooling) is available. Depending on the weather, warm or cold water is supplied centrally to the pipe system (2 pipes). The Blower/Fan Coil Actuator or the thermostat is informed if warm or cold water is currently flowing through the system. Accordingly the heating or cooling values are evaluated or sent by the thermostat. The LFA/S or the thermostat only controls one valve.

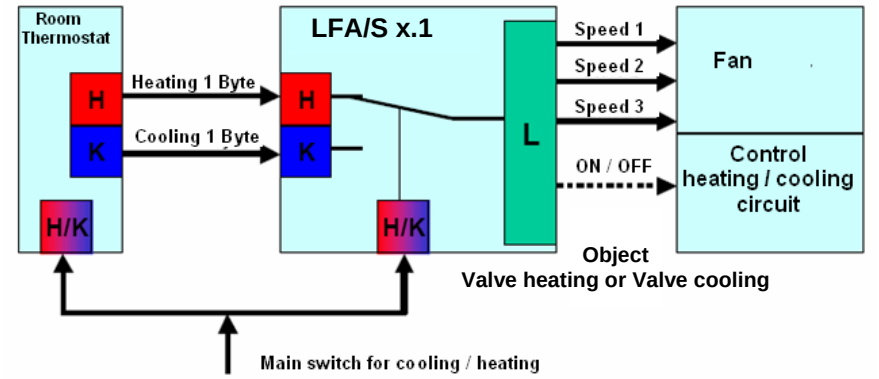


Fig. 28: Principle schematic of 2-pipe heating and cooling system (3-speed fan)

2-pipe heating or cooling system:

Only one heat exchanger (for common heating or cooling) is available. The fan/fan coil unit is only used for heating or cooling. Generally only warm or only cold water is supplied centrally to the pipe system (2 pipes). The LFA/S or the thermostat only controls one valve.

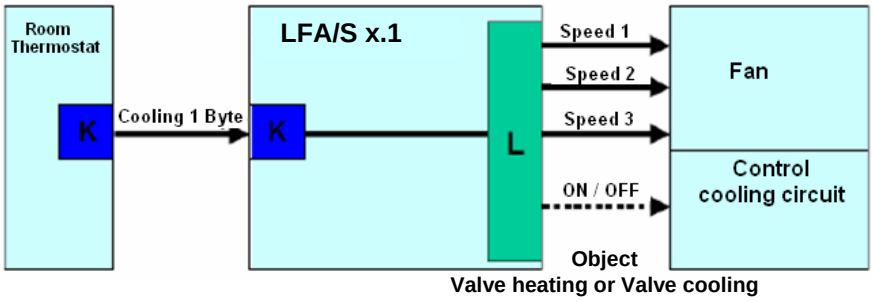


Fig. 29: Principle schematic of 2-pipe heating or cooling system (cooling with 3-speed fan is shown)

Both systems can be established using a 3- or 5-speed fan or blower.

In the following description, a 3-speed fan is used since 3-speed fans are generally used and provide a better overview.

Depending on the control value (1 byte or 1 bit), which is normally sent from a thermostat, the Blower/Fan Coil Actuator determines a fan speed via parameterisable 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: 3-speed fan	5-speed fan
Fan speed 1: 1...29 %;	Fan speed 1: 1...29 %;
Fan speed 2: 30...59 %;	Fan speed 2: 30...59 %;
Fan speed 3: 60...100 %	Fan speed 3: 60...79 %
Fan speed 5: 90...100 %	Fan speed 4: 80...89 %

This results in the following threshold values:

Off -> Speed 1 = 1 %	Off -> Speed 1 = 1 %
Speed 1 -> 2 = 30 %	Speed 1 -> 2 = 30 %
Speed 2 -> 3 = 60 %	Speed 2 -> 3 = 60 %
Speed 3 -> 4 = 80 %	Speed 4 -> 5 = 90 %

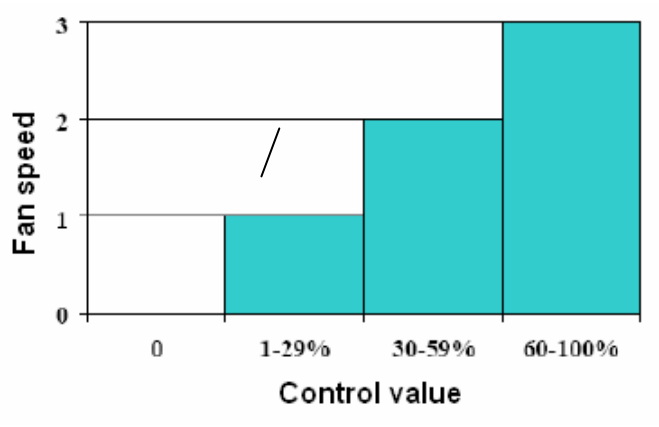


Fig. 30: Function diagram for 2-pipe fan coil system (3-speed fan)

4.2.3 3-pipe fan coil system

The 3-pipe system has a similar design to the 4-pipe system. In the 3-pipe system, there is also a separate inlet for hot and cold 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 hot and cold water.

The Blower/Fan Coil Actuators LFA/S 1.1 or LFA/S 2.1 directly control the fan and provide two objects for control of the valves.

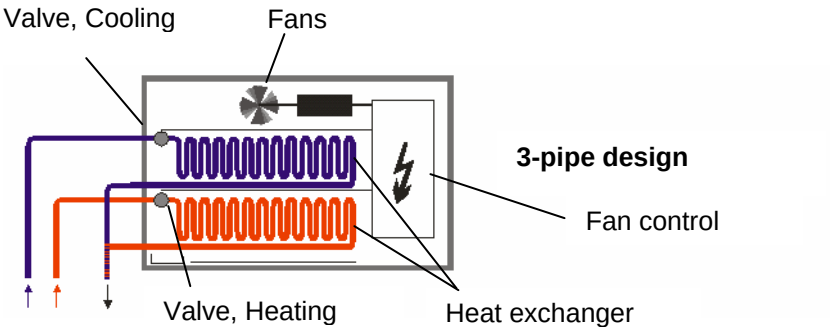


Fig. 31: Design of 3-pipe fan coil unit

The 3- and 4-pipe systems can be established with a 3- or 5-speed fan or blower.

In the following description, a 3-speed fan is used since 3-speed fans are generally used and provide a better overview.

Depending on how much cooling capacity or heat output you need, the thermostat sends a cooling or heating signal (1-byte value) to the setting element of the Blower/Fan Coil Actuator. This sets the fan speeds dependent on the parameterised threshold values and provides, for example, the information for valve control for a heating actuator.

Example:

Fan speed 1: 1...29 %;
Fan speed 2: 30...59 %;
Fan speed 3: 60...100 %

This results in the following:

Threshold value off -> speed 1 = 1 %
Threshold value speed 1 -> 2 = 30 %
Threshold value speed 2 -> 3 = 60 %

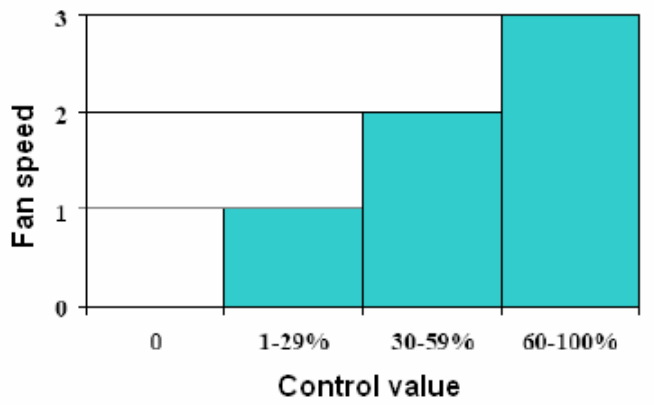


Fig. 32: Function diagram for 4-pipe fan coil system (3-speed fan)

4.2.4 4-pipe fan coil system

In a 4-pipe system, two heat exchangers (separate for heating and cooling) are available. Warm and cold water is provided centrally to two separate pipe systems (with 2 pipes each). The thermostat on-site decides if heating or cooling is applied. It provides either a separate heating and cooling system or a common heating/cooling system. In this case an additional signal (Enable object *Toggle Heating/Cooling*) decides if the system is in heating or cooling mode.

The Blower/Fan Coil Actuators LFA/S 1.1 or LFA/S 2.1 directly control the fan and provide two objects for control of the valves.

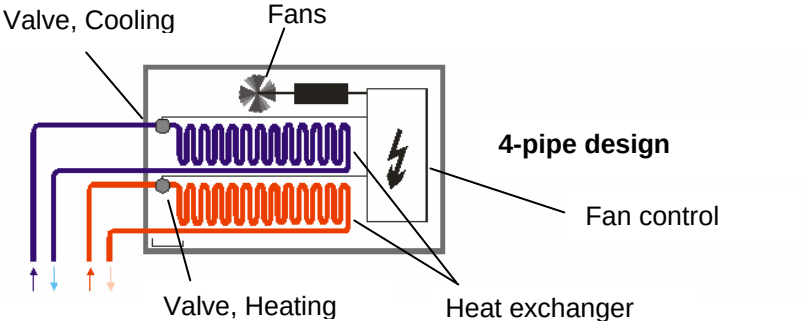


Fig. 33: Design of 4-pipe fan coil unit

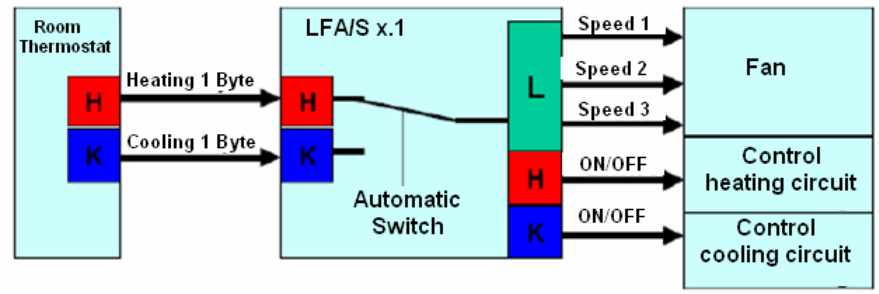


Fig. 34: Principle schematic of 4-pipe system (3-speed fan)

4.3 Automatic operation

The Blower/Fan Coil Actuators LFA/S x.1 are pure actuators and feature no integrated controllers. In addition to a manual control via the objects *Fan speed x*, *Switch fan speed* or *Fan speed up/down*, the actuators can operate in automatic mode together with a thermostat. The objects *Control Value, Heating*, *Control Value, Cooling* or when operating with just a single input variable the object *Control Value, Heating/Cooling* are available. The switch thresholds can be set in the parameter window *X-Y: Automatic*.

The automatic mode is enabled in ETS in the parameter window *X-Y: Input* with the parameter *1-byte object(s) for automatic mode…*. The setting value objects are enabled depending on the parameterisable pipe system in this parameter window.

The automatic mode is automatically active after the first download with automatic mode selected in the parameters. With a subsequent download, the automatic state (active, inactive) is retained as it was before the download. There is however an exception when system properties such as pipe systems, fan control (changeover, step control) or the number of fan speeds has changed (3/5). In these cases, the automatic mode is activated if automatic mode has been enabled in the ETS.

Automatic mode is switched off either by a manual setting command via the objects *Speed x*, *Switch fan speed* or *Fan speed up/down* or if a telegram with the value 0 is received via the object *Automatic ON/OFF*.
Automatic mode can be reactivated via the object *Automatic ON/OFF* (telegram value 1) or the 1-byte object *Change Limitation* (0 = Automatic).

The telegrams at the control value objects *Control Value, Heating*, *Control Value, Cooling* or *Control Value, Heating/Cooling* are only evaluated if automatic mode is activated.

An activation of one of the 4 limitations or the forced operation does not end automatic mode. Hereby with a range limit (several fan speeds are permissible) a limited automatic control with several fan speeds is possible.

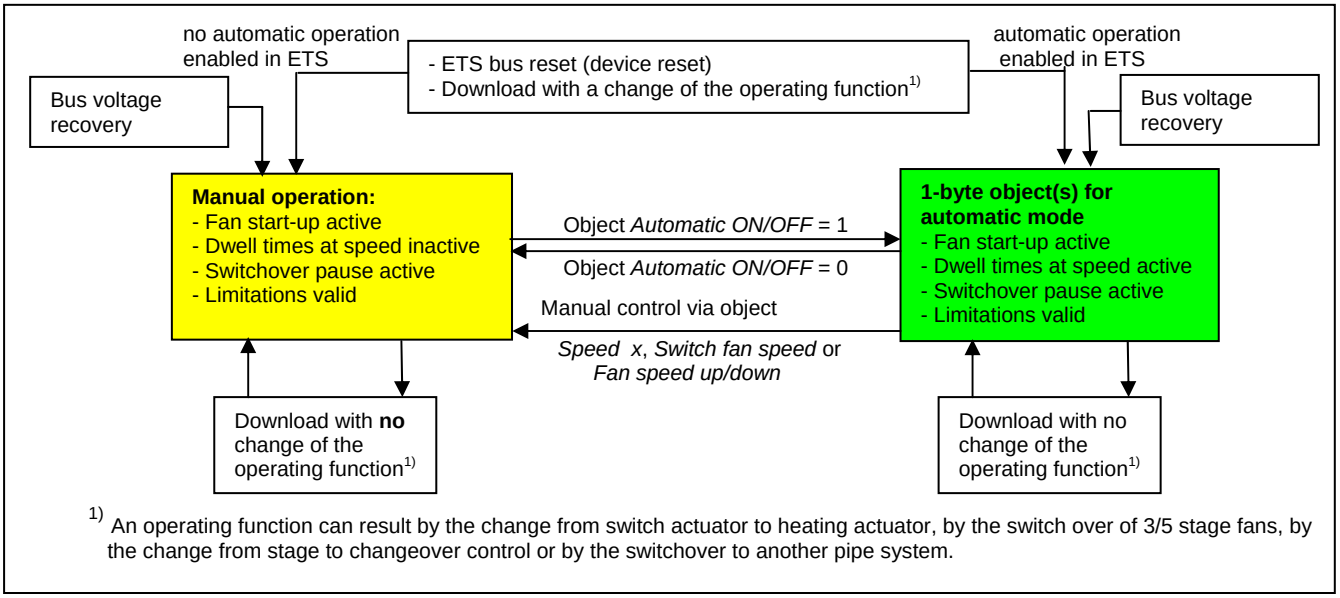


Fig. 35: Automatic mode function schematic

4.4 Logic for changing fan speeds

The following illustration indicates the logic when changing speeds for a Blower/Fan Coil Actuator LFA/S depending on the control values and the parameterised threshold values and hysteresis.

The diagram relates to a 3-speed fan without parameterised fan limitations. A corresponding logic applies for a 5-speed fan. The fan limitations are only relevant after the fan speed has been determined and do not change the flow chart.

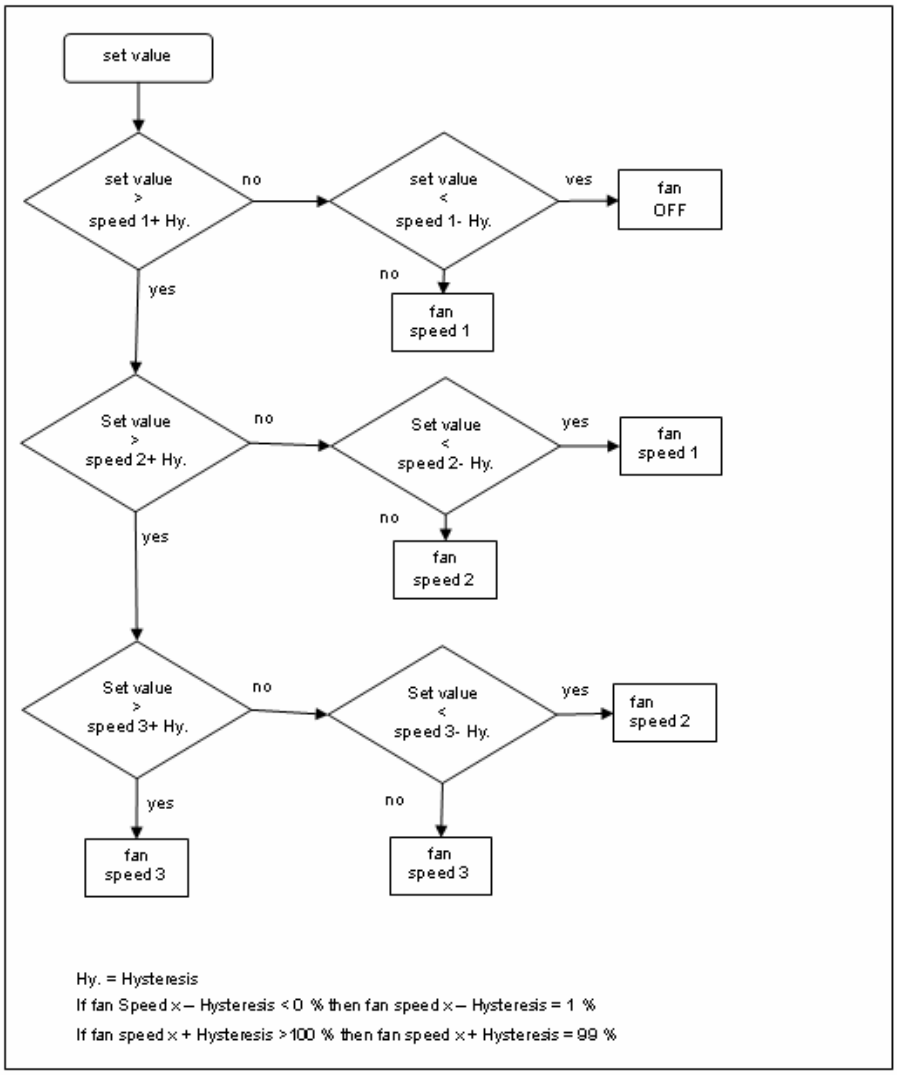


Fig. 36: Logic for changing fan speed

4.5 LFA/S application overview

In the following table, an overview of possible output assignments of the Blower/Fan Coil Actuator is represented. As the application program can be structured to combine various functions, this overview indicates only a few of the possible combinations.

Note

The control of the valves is implemented with the Blower/Fan Coil Actuators LFA/S via communication objects. With this procedure, the valve control can be undertaken in the LFA/S or with mechanical or electronic switch actuators (SA/S or ES/S) with a suitable switching capacity or operational life. This may not only be useful from the point of view of the switching capacity and operational life, but also due to a reduction in noise. Due to the mechanical design of the relay in the Blower//Fan Coil Actuator, switching noise cannot be fully avoided.

Application	Outputs	Objects for valve control	For switch actuator
One 3-speed fan Plus switch outputs	A-C Fan D or D-H	none	LFA/S 1.1 LFA/S 2.1
Two 3-speed fans Plus switch outputs	A-C Fan 1 D-F Fan 2 G-H Actuators	none	LFA/S 2.1
Two 3-speed fans (Fan coil, 4 pipe plus additional fan)	A-C Fan 1 D-F Fan 2 G Valve, Heating H Valve, Cooling	 Valve, Heating Valve, Cooling	LFA/S 2.1
One 5-speed fan Plus switch outputs	A-E Fan F-H Actuators	none	LFA/S 2.1
One 5-speed fan with master switch	A-E Fan F Master switch G-H Actuators	 Status fan	LFA/S 2.1
Fan coil, 2 pipe (3-speed fan and 1 valve)	A-C Fan D Valve	Valve, Heating/Cooling	LFA/S 1.1 LFA/S 2.1
Fan coil, 2 pipe 3-speed fan and 1 valve and master switch	A-C Fan D Master switch E Valve	Status fan Valve, Heating/Cooling	LFA/S 2.1
Fan coil, 4 pipe (3-speed fan with 2 valves)	A-C Fan D Valve, Heating E Valve, Cooling	 Valve, Heating Valve, Cooling	LFA/S 2.1
Fan coil, 4 pipe (3-speed fan with 2 valves) Plus switch output for lamp	A-C Fan D Actuator for lamp ES/S Valve, Heating ES/S Valve, Cooling	 Valve, Heating Valve, Cooling	LFA/S 2.1 plus ES/S for valve control
Fan coil, 4 pipe (5-speed fan with 2 valves) Plus 3 switch outputs	A-E Fan F-H Actuators ES/S Valve, Heating ES/S Valve, Cooling	 Valve, Heating Valve, Cooling	LFA/S 2.1 plus ES/S for valve control
Fan coil, 4 pipe (5-speed fan with 2 valves)	A-E Fan F Valve, Heating G Valve, Cooling H Reserved	 Valve, Heating Valve, Cooling	LFA/S 2.1

Table 33 Various fan applications

4.6 Function chart

4.6.1 Fan operation

The following illustration indicates the sequence in which the functions of the fan control are processed. Objects which lead to the same box have the same priority and are processed in the sequence in which the telegrams are received.

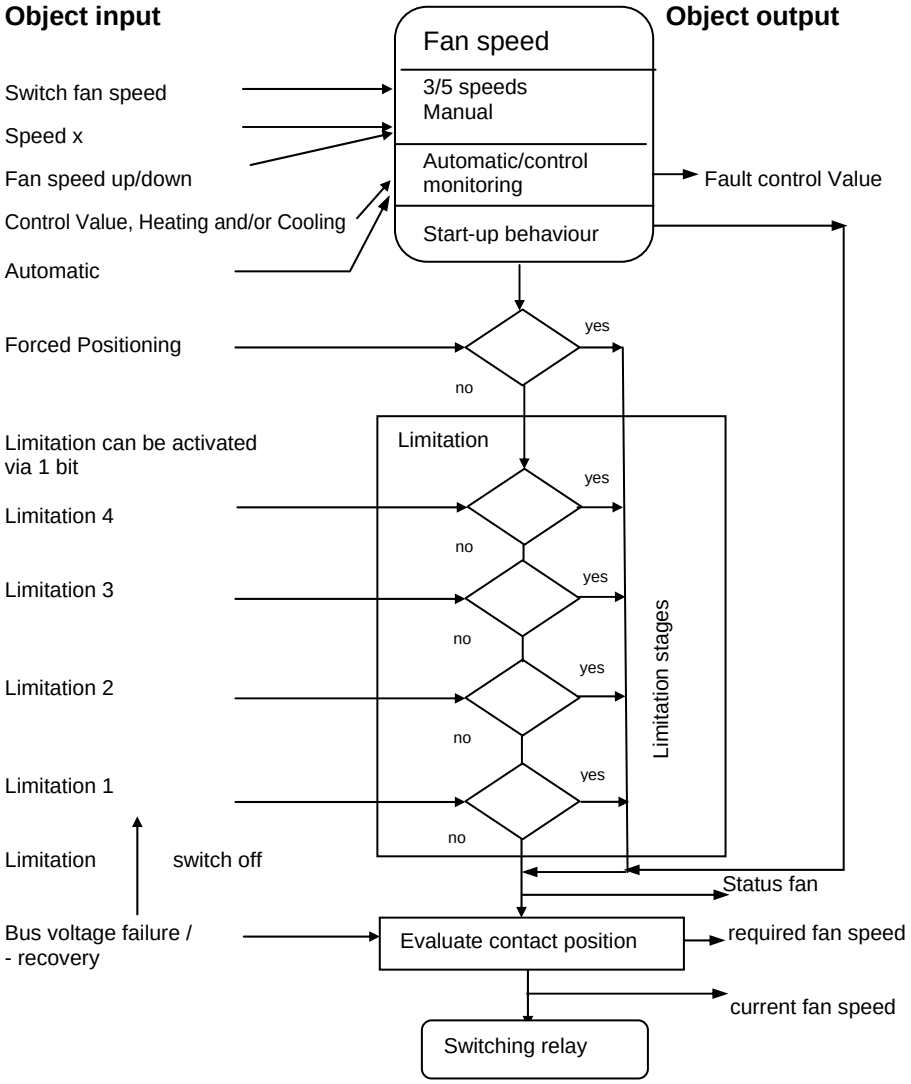


Fig. 37: Functional schematic of limitations of the switch actuators

Example
If a manual or automatic control value is received, the fan speed is determined taking the threshold values into consideration. Subsequently the resulting fan speed is initiated via the forced operation logic and the limitations. The fan speed is limited accordingly and given to the contact position logic. The control of the relays (changeover or step switch) is evaluated and the status message is generated. The start-up behaviour as a property of the fan is always carried out from the OFF state regardless of whether a limitation (forced operation or limitation) is activated.

4.6.2 Switch actuator operation

The following illustration indicates the sequence in which the functions of the *switch actuator* operating mode are processed. Objects which lead to the same box have the same priority and are processed in the sequence in which the telegrams are received.

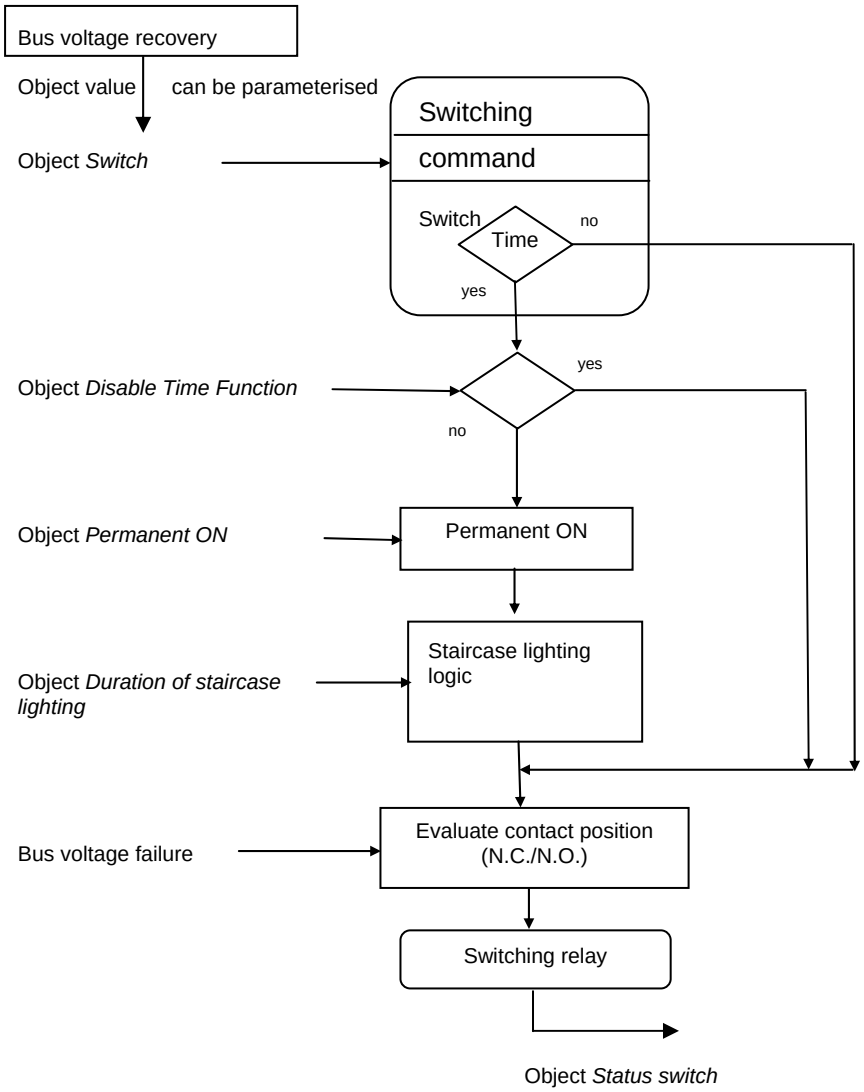


Fig. 38: Function diagram for switch actuator mode

Example
If a telegram is received via the object *Switch*, it is initially verified whether a time function (staircase lighting) is parameterised. If this is not the case, the N.C./N.O. parameterisation is checked and the contact is switched if the contact position has changed. With an unchanged contact, a new switching command is not executed. If the time function is activated, the logic for the staircase lighting function is undertaken with *Disable Time Function*, *Permanent ON* and *Time Function*.

4.6.3 Control Valve (Heating)

The following illustration indicates the sequence in which the functions of the *Control Valve (Heating)* operating mode are processed.

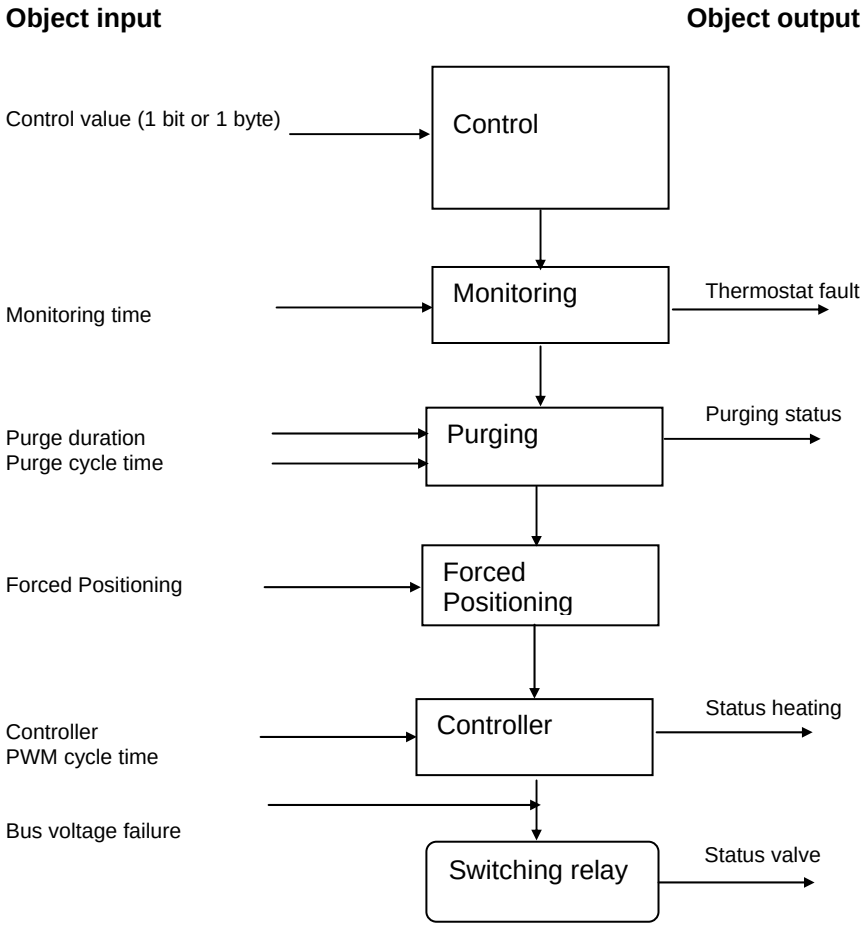


Fig. 39: Function schematic – Control Valve (Heating)

4.7 Operating mode
Heating actuator

4.7.1 2-step control

2-step control is the simplest form of control. A control value is not calculated here. The room thermostat sends a 1 via the object *Switch* if a certain temperature is exceeded and a 0 if the value drops below a certain temperature. These switch values are implemented by the actuator.

The room thermostat hysteresis limits can be used to stabilise control. Use of these limits does not affect the method of operation of the switch actuator.

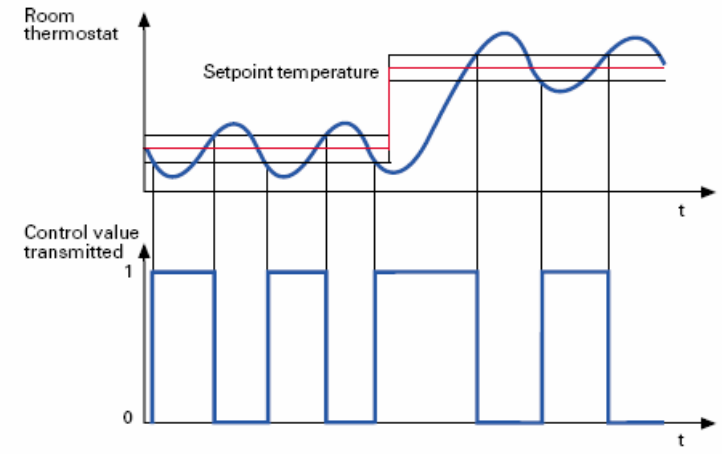


Fig. 40: Diagram for 2-step control

A room thermostat can use the control algorithm of a PWM controller. As the room thermostat sends ON and OFF commands to the actuator, the actuator operates like a 2-step controller.

4.7.2 PWM control

If the switch actuator receives a 1-byte value (continuous control) as an input signal, the switch actuator can use this value together with the programmed cycle time of the received value and control an output via a PWM calculation.

With PWM control, the value calculated in the control algorithm (0...100 %) is converted to a PWM. The conversion is always based on a constant cycle time. If the switch actuator for example, receives a control value of 20 %, then for a cycle time of 15 minutes a 1 will be sent for 3 minutes (20 % of 15 minutes) and a 0 will be sent for 12 minutes.

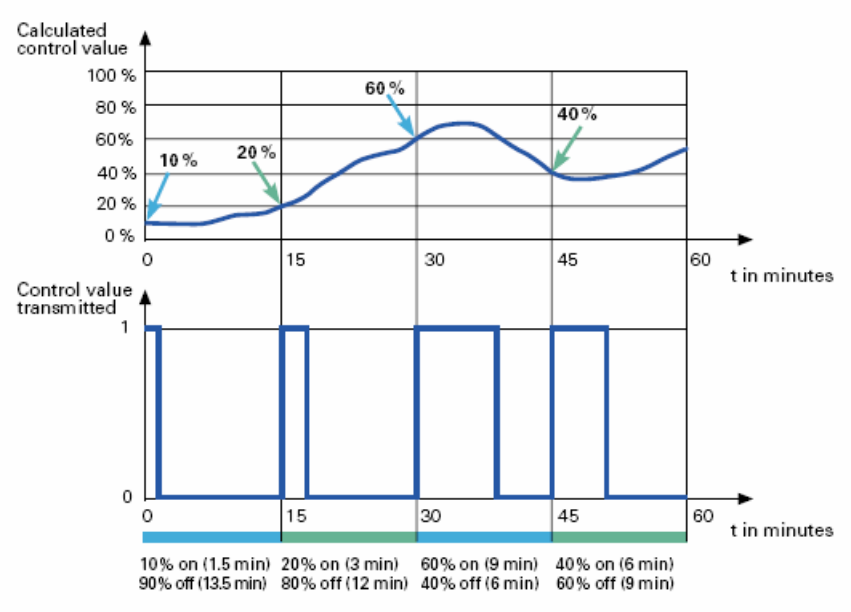


Fig. 41: PWM control diagram

4.7.3 PWM calculation

With pulse width modulation, the control is implemented by a variable mark-space ratio. The following diagram clarifies this:

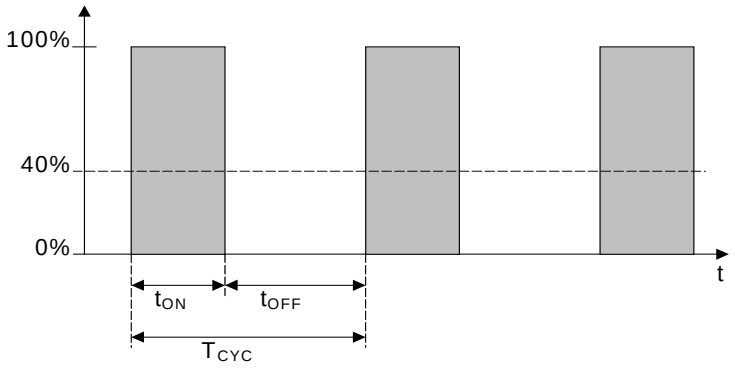


Fig. 42: Diagram for PWM calculation

During the time $t_{ON,}$ the valve is controlled with OPEN, during the time t_{OFF} with CLOSE. 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.

Note
Pulse width modulation leads to frequent switching of the outputs. Consider the limited number of switching operations with normal switch actuators and/or Blower/Fan Coil Actuator, see Technical Data. The use of electronic switch actuators should be the preferred method.

4.7.4 Service life of a PWM controller

If a PWM cycle time of 15 minutes has been selected, this means that 4 switching operations (switching on/of) occur each hour. 96 in a day; 3000 in a month. About 36,000 switching operations are achieved annually. With a relay life of 10^5 switching operations, this means a switch actuator life of less than 3 years.

If however, the cycle time is set to just 3 minutes, this means about 150,000 switching operations annually, which normally means the life of the switch actuator would be less than a year.

This observation assumes an AC1 (practically ohmic load) switch loading at rated current. If the maximum number of switching operations for a purely mechanical relay loading is assumed, the life of the switch actuator is extended. This has an inherent risk, as the contact materials will wear prematurely and cannot safely guarantee conduction of current.

In the following table, conventional cycle times for control of various heating and air-conditioning systems are listed:

Heating system	Control type	Cycle time
Hot water Supply temperature 45 °C – 70 °C	PWM	15 minutes
Hot water Supply temperature < 45 °C	2-step PWM	- 15 minutes
Underfloor/wall heating	PWM	30-20 minutes
Electric underfloor heating	PWM	30-20 minutes
Electric fan heating	2-step	-
Electric convection heating	PWM 2-step	10-15 min -

Table 34 Cycle times

4.8 Behaviour on bus voltage failure, recovery and download

Reaction on bus voltage failure

After the contact positions have been set on bus voltage recovery, the switch actuator remains functional until the bus voltage recovers.

With a bus voltage failure, the only parameterisation options available to the fan are retaining its speed (unchanged) or switching it off.

The special behaviour is described in the following table.

Reaction on bus voltage recovery

With a bus voltage recovery, the object values can often be parameterised. If this is not the case, this value is set to 0. The following tables are the exceptions (e.g. automatic operation)

Timers are shut down and should be restarted.

Status objects should be updated and sent.

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 failure (no manual operation possibilities). Only after a new switching event is the contact position known to the Blower/Fan Coil Actuator.

The reaction of the switching times after bus voltage recovery should be taken from the Technical data.

The special behaviour is described in the following table.

Download:

After a change of the fan control (step control or changeover control) or the fan type (3- or 5-speed fan), a full reset of the actuator is required in order to avoid incorrect function. The full reset has the same effect as an ETS bus reset. In this case, the objects are normally written with the value 0. The timers stop and are set to 0. Status 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-parameterisation 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. Object values remain unchanged, timers remain stationary and only need to be triggered, status values are updated and sent. The contact position remains unchanged and only changes with the next switching command.

The special behaviour is described in the following table.

Behaviour of the fan speed after a download, ETS bus reset, bus voltage failure and recovery

Behaviour on:	**Bus voltage recovery (BR)**	**Bus voltage failure (BF)**	**Download,** if no change of the operating function[1)] occurs.	**ETS bus reset and download** (if a change of the operating function[1)] occurs) **complete reset**
Fans				
Fan speed	Programmable (*X--Y: Fan*): Unchanged, off or speed x	Programmable (*X-Y: Fan*): Unchanged, OFF	Unchanged or moves from a previously selected required speed, if this has not been achieved by switchover pauses and dwell times.	OFF, contacts open
Forced positioning	inactive	no function Fan speed as parameterised with BF	OFF, inactive	OFF, inactive
Limitation x X= 1…4	inactive	no function Fan speed as parameterised with BF	OFF, inactive	OFF, inactive
Automatic mode	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.
Object “Status Automatic”	Is updated and sent dependent on the parameterisation (always, when changed, not)	no function	Is updated and sent dependent on the parameterisation (always, when changed, not)	Is updated and sent dependent on the parameterisation (always, when changed, not)
Object *Status Fan ON/OFF*	Will be updated and sent	no function	Unchanged, implemented when the next telegram is received	Is updated (OFF, object value 0) and sent
Objects Valve Control	Values are recalculated and sent after a parameterised send delay (*X: General)*	no function	Unchanged and sent	Cooling or cooling/heating, object value 0
Status byte	Values are updated and sent dependent on the parameterisation (always, when changed, not)	no function	Values are updated and sent dependent on the parameterisation (always, when changed, not)	Values are updated and sent dependent on the parameterisation (always, when changed, not) .

Table 35 Behaviour of *Fan* after bus voltage failure, recovery and download

[1)] An operating function can occur by changing from a switch actuator to a heating actuator or by switching between a 3- / 5-speed fan or by changing from step control to changeover control of the fan.

Behaviour of the switch actuator output after a download, ETS bus reset, bus voltage failure and recovery

Behaviour on:	**Bus voltage recovery (BR)**	**Bus voltage failure (BF)**	**Download,** if no change of the operating function[1)] occurs.	**ETS bus reset and download** (if a change of the operating function[1)] occurs) **complete reset**
Switch actuator				
Switch object *Switch*	Can be parameterised - written with 0 or 1 - (*X: General*, switch actuator)	Object no longer available. Relay position parameterised on BF - Contact open or closed - (*X: General*)	Unchanged. Evaluation only after a new event has been received.	Contacts are opened. Renewed evaluation only after a new event has been received.
Time function inhibit object *Disable time function*	Can be parameterised - written with 0 (time function enabled) or 1 (time function inhibited) - (*X: Time Function*)	Object no longer available. Timer stops. Staircase light remains on, if it is on during the BF.	Unchanged.	Contacts are opened. Renewed evaluation only after a new event has been received.
Staircase lighting	Can be set in parameter window *X: Time Function* if the time function is disabled or not disabled after bus voltage recovery. Timer stops. Light stays on, if staircase lighting time has run with BF. Otherwise unchanged. Change only after a new event has been received. The staircase lighting time changed via the bus is lost and is replaced by the time programmed in ETS.	No function Relay control as parameterised on BF (*X: General*)	Unchanged. Change only after an event has been received. e.g. the staircase lighting remains on until it is started again or switched off	Running staircase lighting time stops. Switch contact is opened. Staircase lighting timer is set to 0. Staircase lighting time is set to the value parameterised in the ETS. The staircase lighting time sent via the bus is overwritten and is lost. If a time function is parameterised this will remain active. The object “Disable time function” is reset to the value “0” (time function activated).
Permanent ON	Permanent ON becomes inactive. Relay position is defined by the object value *Switch* (can be parameterised *X: Time Function*).	No function Relay control as parameterised on BF (*X: General)*	Is inactive after a download	inactive

[1)] An operating function can occur by changing from a switch actuator to a heating actuator or by switching between a 3- / 5-speed fan or by changing from step control to changeover control of the fan.

Table 36 Behaviour of *Switch actuator* on bus voltage failure, recovery and download

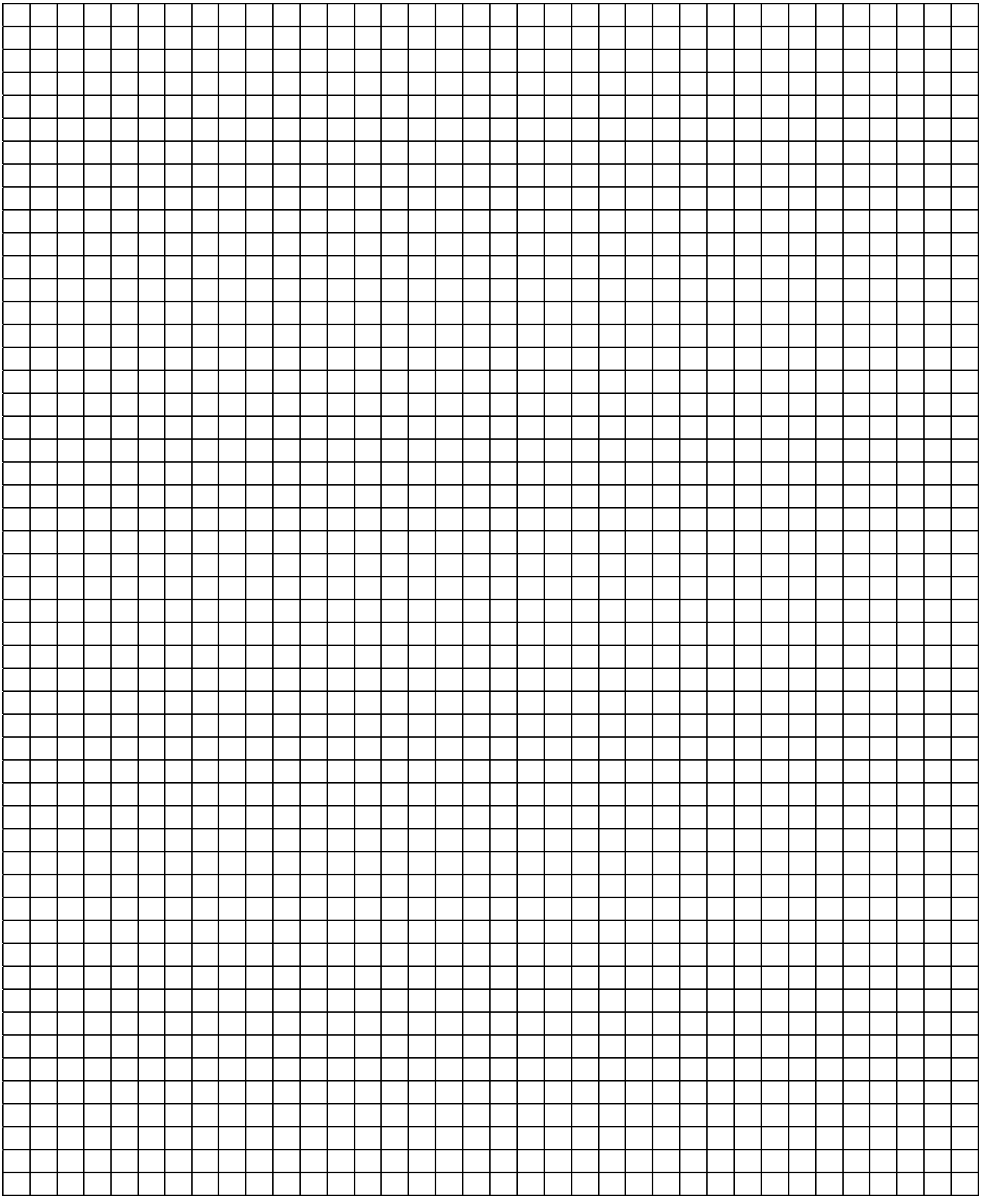
Behaviour of the heating actuator output after a download, ETS bus reset, bus voltage failure and recovery

Behaviour on:	**Bus voltage recovery (BR)**	**Bus voltage failure (BF)**	**Download,** if no change of the operating function[1] occurs.	**ETS bus reset and download** (if a change of the operating function[1] occurs) **complete reset**
Control Valve (Heating)			Object values are available	
Valve operation (relay position)	Valve position programmable (*X: General*). Position is approached with PWM control.	Contact position programmable (*X: General*) Unchanged, closed, opened.	Calculation (PWM)/evaluation will be continued with the existing object values (input values) Object value is retained	Calculation/evaluation for valve control is set. Valve will be opened
Functions	Unchanged	Unchanged, however without function. Contact position is parameterisable.	Will be accepted, if changed	Will be accepted, if changed
Monitoring (Object *Thermostat fault)*	Monitoring time will be restarted. Object value is 0	No monitoring	Monitoring time will be restarted. Object value unchanged	Monitoring time will be restarted. Thermostat fault is reset
Behaviour on 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 changing from a switch actuator to a heating actuator or by switching between a 3- / 5-speed fan or by changing from step control to changeover control of a fan.

Table 37 Reaction *Control Valve (Heating)* with bus voltage failure, recovery and download

Appendix



A.1 Table with status byte for forced operation

In the following table, the binary and decimal values of the status byte for forced operation are listed.

Bit no.		7	6	5	4	3	2	1	0		
8-bit value	Hexadecimal	Forced operation	Limitation 4	Limitation 3	Limitation 2	Limitation 1	Thermostat fault	Automatic	Heating (1), cooling (0)		
0	00	0	0	0	0	0	0	0	0		
1	01	0	0	0	0	0	0	0	1		
2	02	0	0	0	0	0	0	1	0		
3	03	0	0	0	0	0	0	1	1		
4	04	0	0	0	0	0	1	0	0		
5	05	0	0	0	0	0	1	0	1		
6	06	0	0	0	0	0	1	1	0		
7	07	0	0	0	0	0	1	1	1		
8	08	0	0	0	0	1	0	0	0		
9	09	0	0	0	0	1	0	0	1		
10	0A	0	0	0	0	1	0	1	0		
11	0B	0	0	0	0	1	0	1	1		
12	0C	0	0	0	0	1	1	0	0		
13	0D	0	0	0	0	1	1	0	1		
14	0E	0	0	0	0	1	1	1	0		
15	0F	0	0	0	0	1	1	1	1		
16	10	0	0	0	1	0	0	0	0		
17	11	0	0	0	1	0	0	0	1		
18	12	0	0	0	1	0	0	1	0		
19	13	0	0	0	1	0	0	1	1		
20	14	0	0	0	1	0	1	0	0		
21	15	0	0	0	1	0	1	0	1		
22	16	0	0	0	1	0	1	1	0		
23	17	0	0	0	1	0	1	1	1		
24	18	0	0	0	1	1	0	0	0		
25	19	0	0	0	1	1	0	0	1		
26	1A	0	0	0	1	1	0	1	0		
27	1B	0	0	0	1	1	0	1	1		
28	1C	0	0	0	1	1	1	0	0		
29	1D	0	0	0	1	1	1	0	1		
30	1E	0	0	0	1	1	1	1	0		
31	1F	0	0	0	1	1	1	1	1		
32	20	0	0	1	0	0	0	0	0		
33	21	0	0	1	0	0	0	0	1		
34	22	0	0	1	0	0	0	1	0		
35	23	0	0	1	0	0	0	1	1		
36	24	0	0	1	0	0	1	0	0		
37	25	0	0	1	0	0	1	0	1		
38	26	0	0	1	0	0	1	1	0		
39	27	0	0	1	0	0	1	1	1		
40	28	0	0	1	0	1	0	0	0		
41	29	0	0	1	0	1	0	0	1		
42	2A	0	0	1	0	1	0	1	0		
43	2B	0	0	1	0	1	0	1	1		
44	2C	0	0	1	0	1	1	0	0		
45	2D	0	0	1	0	1	1	0	1		
46	2E	0	0	1	0	1	1	1	0		
47	2F	0	0	1	0	1	1	1	1		
48	30	0	0	1	1	0	0	0	0		
49	31	0	0	1	1	0	0	0	1		
50	32	0	0	1	1	0	0	1	0		
51	33	0	0	1	1	0	0	1	1		
52	34	0	0	1	1	0	1	0	0		
53	35	0	0	1	1	0	1	0	1		
54	36	0	0	1	1	0	1	1	0		
55	37	0	0	1	1	0	1	1	1		
56	38	0	0	1	1	1	0	0	0		
57	39	0	0	1	1	1	0	0	1		
58	3A	0	0	1	1	1	0	1	0		
59	3B	0	0	1	1	1	0	1	1		
60	3C	0	0	1	1	1	1	0	0		
61	3D	0	0	1	1	1	1	0	1		
62	3E	0	0	1	1	1	1	1	0		
63	3F	0	0	1	1	1	1	1	1		
64	40	0	1	0	0	0	0	0	0		
65	41	0	1	0	0	0	0	0	1		
66	42	0	1	0	0	0	0	1	0		
67	43	0	1	0	0	0	0	1	1		
68	44	0	1	0	0	0	1	0	0		
69	45	0	1	0	0	0	1	0	1		
70	46	0	1	0	0	0	1	1	0		
71	47	0	1	0	0	0	1	1	1		
72	48	0	1	0	0	1	0	0	0		
73	49	0	1	0	0	1	0	0	1		
74	4A	0	1	0	0	1	0	1	0		
75	4B	0	1	0	0	1	0	1	1		
76	4C	0	1	0	0	1	1	0	0		
77	4D	0	1	0	0	1	1	0	1		
78	4E	0	1	0	0	1	1	1	0		
79	4F	0	1	0	0	1	1	1	1		
80	50	0	1	0	1	0	0	0	0		
81	51	0	1	0	1	0	0	0	1		
82	52	0	1	0	1	0	0	1	0		
83	53	0	1	0	1	0	0	1	1		
84	54	0	1	0	1	0	1	0	0		
85	55	0	1	0	1	0	1	0	1		
86	56	0	1	0	1	0	1	1	0		
87	57	0	1	0	1	0	1	1	1		
88	58	0	1	0	1	1	0	0	0		
89	59	0	1	0	1	1	0	0	1		
90	5A	0	1	0	1	1	0	1	0		
91	5B	0	1	0	1	1	0	1	1		
92	5C	0	1	0	1	1	1	0	0		
93	5D	0	1	0	1	1	1	0	1		
94	5E	0	1	0	1	1	1	1	0		
95	5F	0	1	0	1	1	1	1	1		
96	60	0	1	1	0	0	0	0	0		
97	61	0	1	1	0	0	0	0	1		
98	62	0	1	1	0	0	0	1	0		
99	63	0	1	1	0	0	0	1	1		
100	64	0	1	1	0	0	1	0	0		
101	65	0	1	1	0	0	1	0	1		
102	66	0	1	1	0	0	1	1	0		
103	67	0	1	1	0	0	1	1	1		
104	68	0	1	1	0	1	0	0	0		
105	69	0	1	1	0	1	0	0	1		
106	6A	0	1	1	0	1	0	1	0		
107	6B	0	1	1	0	1	0	1	1		
108	6C	0	1	1	0	1	1	0	0		
109	6D	0	1	1	0	1	1	0	1		
110	6E	0	1	1	0	1	1	1	0		
111	6F	0	1	1	0	1	1	1	1		
112	70	0	1	1	1	0	0	0	0		
113	71	0	1	1	1	0	0	0	1		
114	72	0	1	1	1	0	0	1	0		
115	73	0	1	1	1	0	0	1	1		
116	74	0	1	1	1	0	1	0	0		
117	75	0	1	1	1	0	1	0	1		
118	76	0	1	1	1	0	1	1	0		
119	77	0	1	1	1	0	1	1	1		
120	78	0	1	1	1	1	0	0	0		
121	79	0	1	1	1	1	0	0	1		
122	7A	0	1	1	1	1	0	1	0		
123	7B	0	1	1	1	1	0	1	1		
124	7C	0	1	1	1	1	1	0	0		
125	7D	0	1	1	1	1	1	0	1		
126	7E	0	1	1	1	1	1	1	0		
127	7F	0	1	1	1	1	1	1	1		
128	80	1	0	0	0	0	0	0	0		
129	81	1	0	0	0	0	0	0	1		
130	82	1	0	0	0	0	0	1	0		
131	83	1	0	0	0	0	0	1	1		
132	84	1	0	0	0	0	1	0	0		
133	85	1	0	0	0	0	1	0	1		
134	86	1	0	0	0	0	1	1	0		
135	87	1	0	0	0	0	1	1	1		
136	88	1	0	0	0	1	0	0	0		
137	89	1	0	0	0	1	0	0	1		
138	8A	1	0	0	0	1	0	1	0		
139	8B	1	0	0	0	1	0	1	1		
140	8C	1	0	0	0	1	1	0	0		
141	8D	1	0	0	0	1	1	0	1		
142	8E	1	0	0	0	1	1	1	0		
143	8F	1	0	0	0	1	1	1	1		
144	90	1	0	0	1	0	0	0	0		
145	91	1	0	0	1	0	0	0	1		
146	92	1	0	0	1	0	0	1	0		
147	93	1	0	0	1	0	0	1	1		
148	94	1	0	0	1	0	1	0	0		
149	95	1	0	0	1	0	1	0	1		
150	96	1	0	0	1	0	1	1	0		
151	97	1	0	0	1	0	1	1	1		
152	98	1	0	0	1	1	0	0	0		
153	99	1	0	0	1	1	0	0	1		
154	9A	1	0	0	1	1	0	1	0		
155	9B	1	0	0	1	1	0	1	1		
156	9C	1	0	0	1	1	1	0	0		
157	9D	1	0	0	1	1	1	0	1		
158	9E	1	0	0	1	1	1	1	0		
159	9F	1	0	0	1	1	1	1	1		
160	A0	1	0	1	0	0	0	0	0		
161	A1	1	0	1	0	0	0	0	1		
162	A2	1	0	1	0	0	0	1	0		
163	A3	1	0	1	0	0	0	1	1		
164	A4	1	0	1	0	0	1	0	0		
165	A5	1	0	1	0	0	1	0	1		
166	A6	1	0	1	0	0	1	1	0		
167	A7	1	0	1	0	0	1	1	1		
168	A8	1	0	1	0	1	0	0	0		
169	A9	1	0	1	0	1	0	0	1		
170	AA	1	0	1	0	1	0	1	0		
171	AB	1	0	1	0	1	0	1	1		
172	AC	1	0	1	0	1	1	0	0		
173	AD	1	0	1	0	1	1	0	1		
174	AE	1	0	1	0	1	1	1	0		
175	AF	1	0	1	0	1	1	1	1		
176	B0	1	0	1	1	0	0	0	0		
177	B1	1	0	1	1	0	0	0	1		
178	B2	1	0	1	1	0	0	1	0		
179	B3	1	0	1	1	0	0	1	1		
180	B4	1	0	1	1	0	1	0	0		
181	B5	1	0	1	1	0	1	0	1		
182	B6	1	0	1	1	0	1	1	0		
183	B7	1	0	1	1	0	1	1	1		
184	B8	1	0	1	1	1	0	0	0		
185	B9	1	0	1	1	1	0	0	1		
186	BA	1	0	1	1	1	0	1	0		
187	BB	1	0	1	1	1	0	1	1		
188	BC	1	0	1	1	1	1	0	0		
189	BD	1	0	1	1	1	1	0	1		
190	BE	1	0	1	1	1	1	1	0		
191	BF	1	0	1	1	1	1	1	1		
192	C0	1	1	0	0	0	0	0	0		
193	C1	1	1	0	0	0	0	0	1		
194	C2	1	1	0	0	0	0	1	0		
195	C3	1	1	0	0	0	0	1	1		
196	C4	1	1	0	0	0	1	0	0		
197	C5	1	1	0	0	0	1	0	1		
198	C6	1	1	0	0	0	1	1	0		
199	C7	1	1	0	0	0	1	1	1		
200	C8	1	1	0	0	1	0	0	0		
201	C9	1	1	0	0	1	0	0	1		
202	CA	1	1	0	0	1	0	1	0		
203	CB	1	1	0	0	1	0	1	1		
204	CC	1	1	0	0	1	1	0	0		
205	CD	1	1	0	0	1	1	0	1		
206	CE	1	1	0	0	1	1	1	0		
207	CF	1	1	0	0	1	1	1	1		
208	D0	1	1	0	1	0	0	0	0		
209	D1	1	1	0	1	0	0	0	1		
210	D2	1	1	0	1	0	0	1	0		
211	D3	1	1	0	1	0	0	1	1		
212	D4	1	1	0	1	0	1	0	0		
213	D5	1	1	0	1	0	1	0	1		
214	D6	1	1	0	1	0	1	1	0		
215	D7	1	1	0	1	0	1	1	1		
216	D8	1	1	0	1	1	0	0	0		
217	D9	1	1	0	1	1	0	0	1		
218	DA	1	1	0	1	1	0	1	0		
219	DB	1	1	0	1	1	0	1	1		
220	DC	1	1	0	1	1	1	0	0		
221	DD	1	1	0	1	1	1	0	1		
222	DE	1	1	0	1	1	1	1	0		
223	DF	1	1	0	1	1	1	1	1		
224	E0	1	1	1	0	0	0	0	0		
225	E1	1	1	1	0	0	0	0	1		
226	E2	1	1	1	0	0	0	1	0		
227	E3	1	1	1	0	0	0	1	1		
228	E4	1	1	1	0	0	1	0	0		
229	E5	1	1	1	0	0	1	0	1		
230	E6	1	1	1	0	0	1	1	0		
231	E7	1	1	1	0	0	1	1	1		
232	E8	1	1	1	0	1	0	0	0		
233	E9	1	1	1	0	1	0	0	1		
234	EA	1	1	1	0	1	0	1	0		
235	EB	1	1	1	0	1	0	1	1		
236	EC	1	1	1	0	1	1	0	0		
237	ED	1	1	1	0	1	1	0	1		
238	EE	1	1	1	0	1	1	1	0		
239	EF	1	1	1	0	1	1	1	1		
240	F0	1	1	1	1	0	0	0	0		
241	F1	1	1	1	1	0	0	0	1		
242	F2	1	1	1	1	0	0	1	0		
243	F3	1	1	1	1	0	0	1	1		
244	F4	1	1	1	1	0	1	0	0		
245	F5	1	1	1	1	0	1	0	1		
246	F6	1	1	1	1	0	1	1	0		
247	F7	1	1	1	1	0	1	1	1		
248	F8	1	1	1	1	1	0	0	0		
249	F9	1	1	1	1	1	0	0	1		
250	FA	1	1	1	1	1	0	1	0		
251	FB	1	1	1	1	1	0	1	1		
252	FC	1	1	1	1	1	1	0	0		
253	FD	1	1	1	1	1	1	0	1		
254	FE	1	1	1	1	1	1	1	0		
255	FF	1	1	1	1	1	1	1	1		

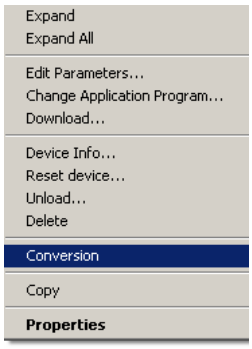
Table 38 Code table for status byte

A.2 Conversion of earlier user programs

With the aid of the conversion it is possible from ETS3 to accept the parameters and group addresses from previous application programs.

Procedure:

1. Import the current VD3 file into the ETS3 and append a product with the current application program into the project.
2. Click with the right mouse button on the product and select *Convert*.



3. Then follow the instructions

The following application programs can be converted:

Application program	Conversion is possible completely
Luefter 1f 6A/1 Luefter 2f 6A/1	Luefter 1f 6A/1.1 Luefter 2f 6A/1.1

Note
Please note that the standard values can be set after conversion of newly added parameters.

4. Then change the existing physical address and delete the old device.

A.3 Scope of delivery

The ABB i-bus® KNX Blower/Fan Coil Actuator LFA/S is supplied with the following components. Please check the items received using the following list.

– 1 pc. LFA/S x.1[1)], MDRC

– 1 pc. installation and operating instructions

– 1 pc. bus connection terminal (red/black)

– 1 pc. inscription label

[1)] Note: x = 1: 1-fold (4 switch outputs)
2: 2-fold (8 switch outputs)

A.4 Ordering information

Blower/Fan Coil Actuator, 1-fold, MDRC

The ABB i-bus ® KNX blower-/fan coil-actuator LFA/S 1.1 allows the realisation of diverse applications in the ventilation and climatisation segment, from simple 3-step motors or complex fan coil systems with one valve.

LFA/S 1.1	1-fold	2CDG 110 077 R0011	**26**	2

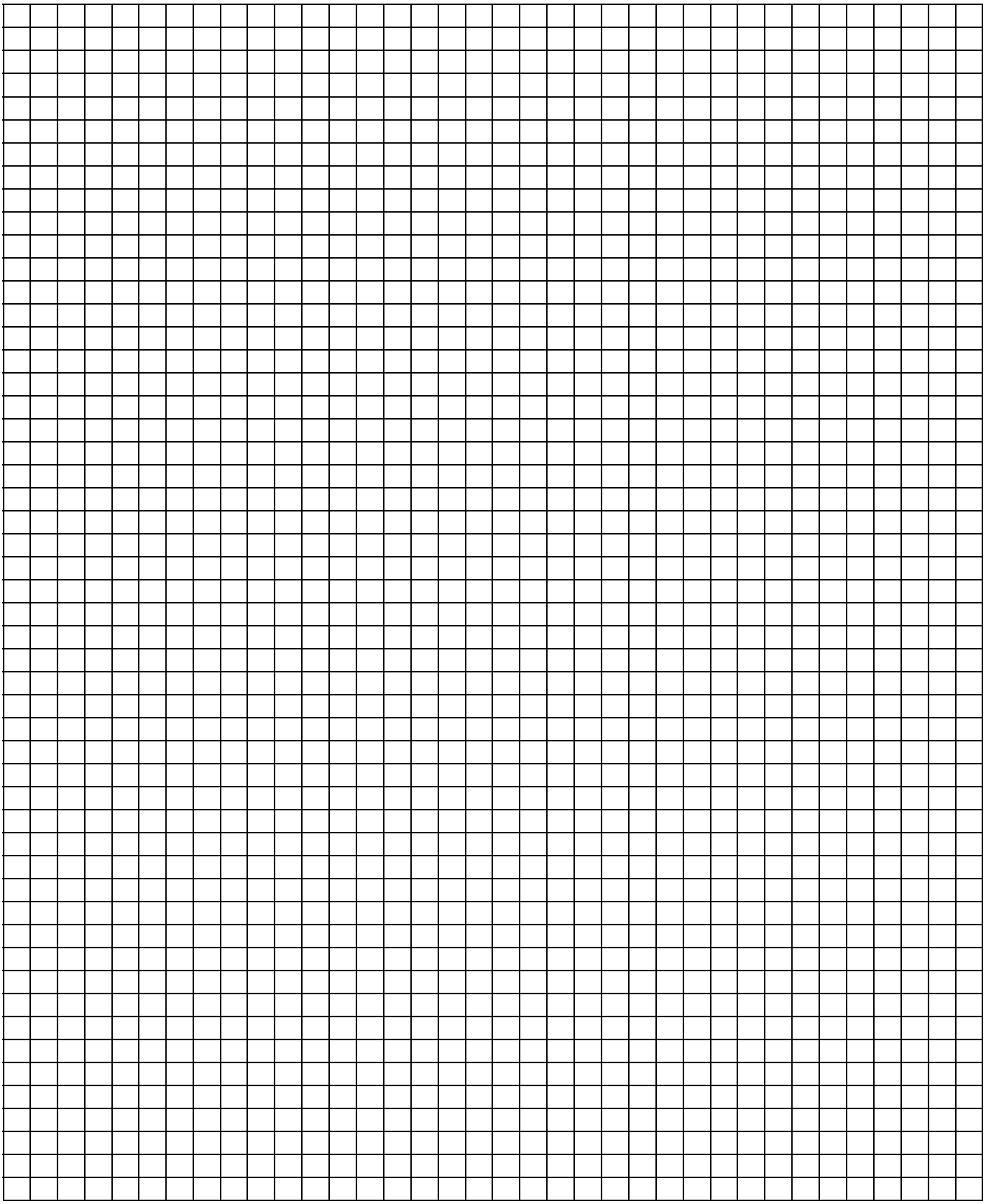
Blower/Fan Coil Actuator, 2-fold, MDRC

The ABB i-bus ® KNX blower-/fan coil-actuator LFA/S 2.1 allows the realisation of diverse applications in the ventilation and climatisation segment, from simple 3- or 5-step motors or complex fan coil systems with two valves.

LFA/S 2.1	2-fold	2CDG 110 078 R0011	**26**	4

Table 39 Ordering details of the LFA/S Blower/Fan Coil Actuator

A.5 Notes



Pub. No. 2CDC 508 054 D0202
replace 2CDC 508 054 D0201

Your KNX-Partner