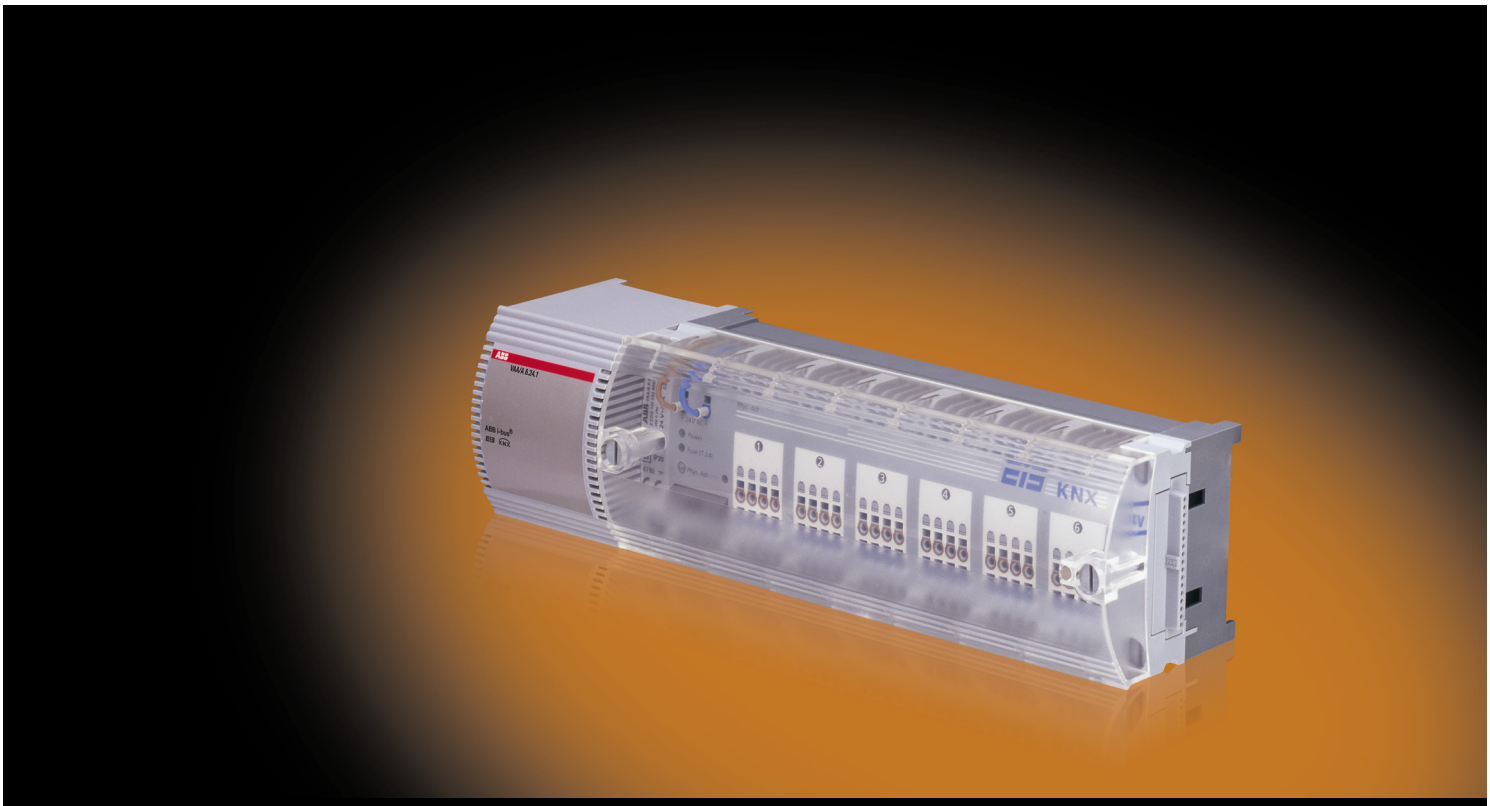

ABB i-bus® KNX
Valve Drive Actuator VAA/A 6.24.1
Product Manual

Power and productivity
for a better world™

This manual describes the function of the Valve Drive Actuator VAA/A 6.24.1 with the application program *Valve drive actuator 6f 24V/… .*

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.

Please inform us of any suggested improvements.

Contents

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1 General

The Valve Drive Actuator VAA/A 6.24.1 can be used for the control of 24 V thermoelectric valve drives, e.g. TSA/K 24.1. It is used in residential buildings and in purpose-built buildings. In conjunction with valve drives, the VAA/A optimises the effect of the use of thermostats (room temperature controllers). It is suitable for the installation in heating circuit distribution systems where the application of triacs ensures silent switching.

1.1 Product and functional overview

The VAA/A 6.24.1 can control up to six separate rooms featuring a maximum of four electrothermal actuator drives per channel. A maximum of up to 13 actuator drives can be connected to the VAA/A in total.

The following functions are available:

- Channel-by-channel selection of the method of operation between using either on/off or continuous control.
- Monitoring of the communication objects *Actuating value:* An emergency program is initiated if the actuating value is absent.
- Override possibilities of the actuating value through the *Forced mode* communication objects.
- The Valve Drive Actuator is deactivated using the *Summer mode* communication object. A valve protection program can be implemented if desired.
- Calculation of the maximum continuous actuating value for the flow control of a boiler.

2 Device technology

VAA/A 6.24.1

The Valve Drive Actuator VAA/A 6.24.1 can be used for the control of 24 V thermoelectric valve drives, e.g. TSA/K 24.1.

It is used in residential buildings and in purpose-built buildings. In conjunction with valve drives, the VAA/A optimises the effect of the use of thermostats (room temperature controllers). It is suitable for the installation in heating circuit distribution systems where the application of triacs ensures silent switching.

2.1 Technical data

Supply	Mains voltage	230 V AC (+10/-15 %), 50-60 Hz
	Maximum power consumption	50 W
	No-load power consumption	3 W
	Leakage loss	18 W
Outputs	Number	6
	Type	Triac
	Output voltage	24 V AC (+/-20 %), 50-60 Hz
	Output current per channel	Maximum 1 A
	Fuse	T2A , common for all outputs
Maximum number of connectable electrothermal valve actuators	Number	13
	Per channel	4
Connections	KNX	Bus connection terminal
	Valve actuator (6) connection	Plug-in terminal 1.0…1.5 mm^2 stranded 0.5…1.5 mm^2 solid
Operating and display elements	LED green	Power on indicator
	LED red	Fuse defective indicator
	LED red (6)	Channel on indicator
	KNX programming LED	Programming mode indicator
	KNX programming button	Assignment of the physical address
Release function	After switch on	10 minutes
Valve protection program	In Summer mode	Once a day for 6 minutes
Emergency program	With bus voltage failure	8 minutes on and 40 minutes off
Enclosure	IP 20	to DIN EN 60529
Safety class	II	to DIN EN 61140
Isolation category	Overvoltage category	III to DIN EN 60664-1
	Pollution degree	2 to DIN EN 60664-1
Temperature range	Operation	-5 °C…+50 °C
	Storage	-25 °C…+60 °C
Ambient conditions	Maximum air humidity	75 %

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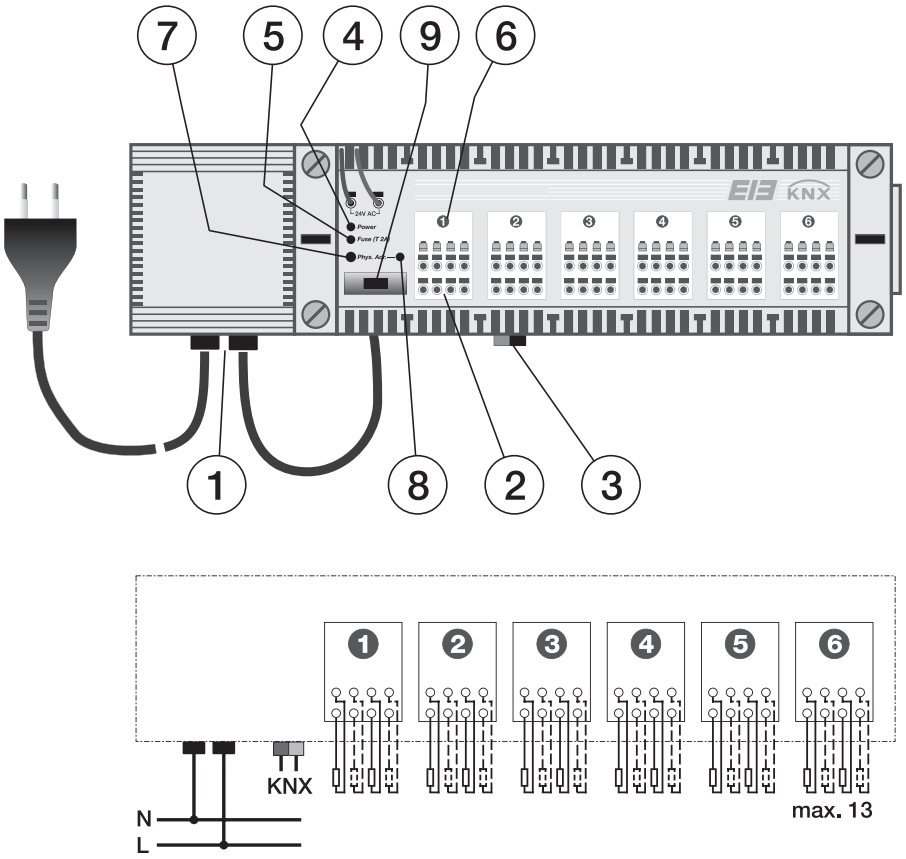
Design	Surface mounted device	Wall-mounted or on mounting rail
	Dimensions	70 x 75 x 302 mm (H x W x L)
Mounting position	as required	
Weight	1.700 kg	
Housing, colour	Plastic housing, grey	
Approvals	KNX to EN 50 090-1, -2	
CE mark	in accordance with the EMC guideline and low voltage guideline	

Device type	Application program	Maximum number of communication objects	Maximum number of group addresses	Maximum number of associations
VAA/A 6.24.1	Valve Drive Actuator 6f 24V/…*	20	66	66

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

Note
The programming requires EIB Software Tool ETS2 V1.3 or higher. If ETS3 is used a *.VD3 or higher type file must be imported. The user program can be found in the ETS2/ETS3 at *ABB/Heating, air-con, ventilation/Valve Drive Actuator*.

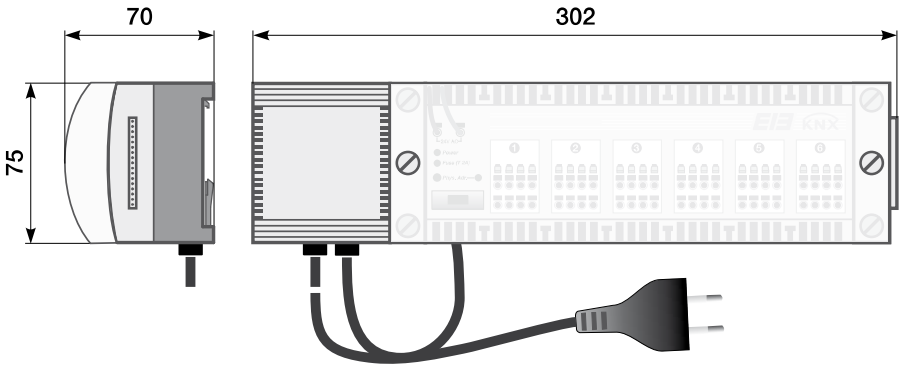
2.2 Circuit diagram



VAA/A 6.24.1

1 230 V connector
2 24 V actuating drive connector
3 KNX connection terminal
4 Operating display
5 Fuse display
6 LED channel
7 KNX programming key
8 KNX programming LED
9 Fuse

2.3 Dimension drawing



VAA/A 6.24.1

2.4 Assembly and installation

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

Commissioning requirements

In order to commission the device, a PC with the Engineering Tool Software ETS from ETS2 V1.3 or higher as well as an interface to the ABB i-bus® via a KNX interface as well as a supply voltage of 230V is required.

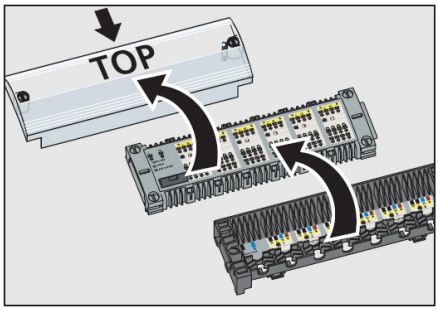
Installation

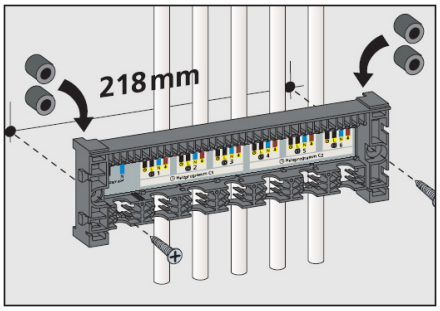
The installation and commissioning may only be carried out by electrical specialists. The appropriate norms, guidelines, regulations and specifications should be observed when planning and setting up electrical installations.

- Protect the device from damp, dirt and damage during transport, storage and operation.
- Only operate the device within the specified technical data limits!

The device can either be mounted directly on the wall or mounted on a mounting rail.

For wall mounting, the base of the device can be mounted directly on the wall with ø 2.5 mm screw holes, use distance sleeves if necessary. Before mounting on the wall, the cover and connection unit should be removed from the base.





There are six channels with 24 V AC output voltage available on the VAA/A. On each output a maximum of up to four electrothermal actuator drives can be connected with screwless, plug-in/clamping terminals. In total a maximum of thirteen actuator drives can be connected to the VAA/A because of the power supply used.

Supplied state

The device is assigned with the physical address 15.15.255 in the factory. The application program is already preloaded.

Assignment of the physical address

The device features a programming button for assignment of the 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.

Cleaning

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

Maintenance

If the fuse has blown it can be replaced by the spare fuse in the cover.

Danger

Electric voltage.
Danger to life.
UNPLUG THE UNIT from the main before opening it!

2.5 Description of the inputs and outputs

Supply voltage

The device is powered with 230 V AC (mains plug).

KNX connection

The supplied bus connection terminal is used to connect to the KNX.

Channels

There are six channels with 24 V AC output voltage available. On each output a maximum of up to four electrothermal actuator drives can be connected with screwless, plug-in/clamping terminals. A maximum of up to thirteen actuator drives can be connected to the VAA/A in total.

2.6 Operating controls

There are no operating controls located on the device.

2.7 Display elements

Nine indicator LEDs are located on the front of the VAA/A:

Power Fuse (T2A) Physical address LED channel 1-6

LED Power, operation indicator

Lights up when mains voltage is applied.

LED Fuse (T2A), fuse indicator

Lights up if the fuse is blown.

LED Physical address, KNX programming LED

Lights, if the device is in programming mode.

LED channel 1-6

Lights, when the actuator voltage switches on the channels (drives).

3 Commissioning

3.1 Overview

Release function

Valve drives are locked into a position in the factory which simplifies the mounting of the valve. After connection of the 230 V AC mains voltage to the VAA/A, the release function for the actuator drive is performed. Here all the outputs of channels 1-6 of the VAA/A are controlled for about ten minutes, the LEDs of channel 1-6 light up.

The release function is undertaken every time the mains supply is applied.

Emergency program

On bus voltage failure, when the bus voltage is not applied or no application is loaded, the VAA/A will commence with the emergency program.

During the emergency program all outputs of channels 1-6 are consecutively switched ON for eight minutes and OFF for forty minutes

3.2 Parameters

The parameterisation of the Valve Drive Actuator is implemented using the Engineering Tool Software ETS from version ETS2 V1.3 or higher.
The application program *Valve Drive Actuator 6f 24V/…* can be found in the ETS2/ETS3 at *ABB/Heating, air-con, ventilation/Valve Drive Actuator*.

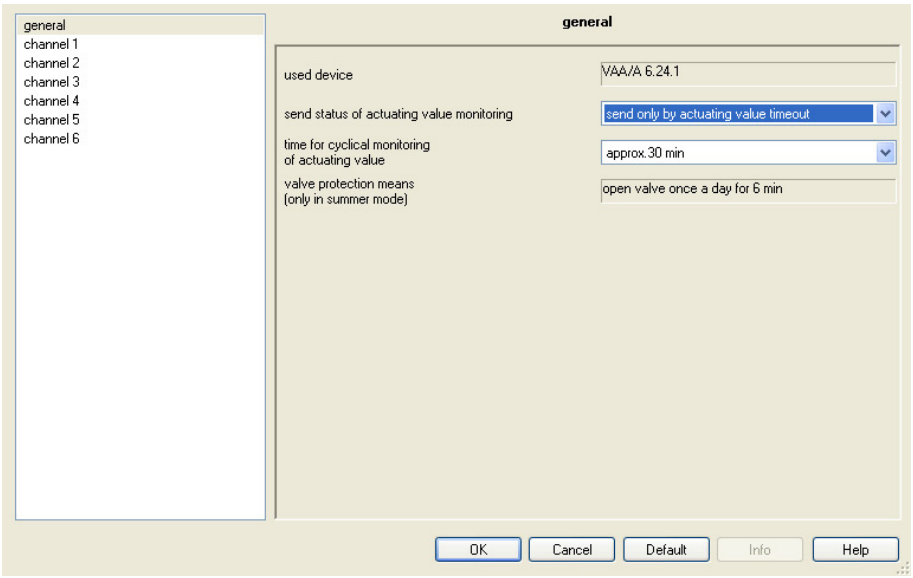
The following chapter describes the parameters of the Valve Drive Actuator using the parameter windows. The parameter window features a dynamic structure so that further parameters may be enabled depending on the parameterisation and the function of the outputs.

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

Option: yes
no

3.2.1 Parameter window *General*

In the parameter *window General*, settings which apply or are made for all channels are shown.



Used device

The device name is shown.

Send status of actuating value monitoring

Options: send always at the end of the monitoring cycle
send only by actuating value timeout

This parameter defines whether the status be sent in general or only in case of a failure of the actuating values.

Time for cyclical monitoring of actuating value

Options: approx. 30 min
approx. 60 min

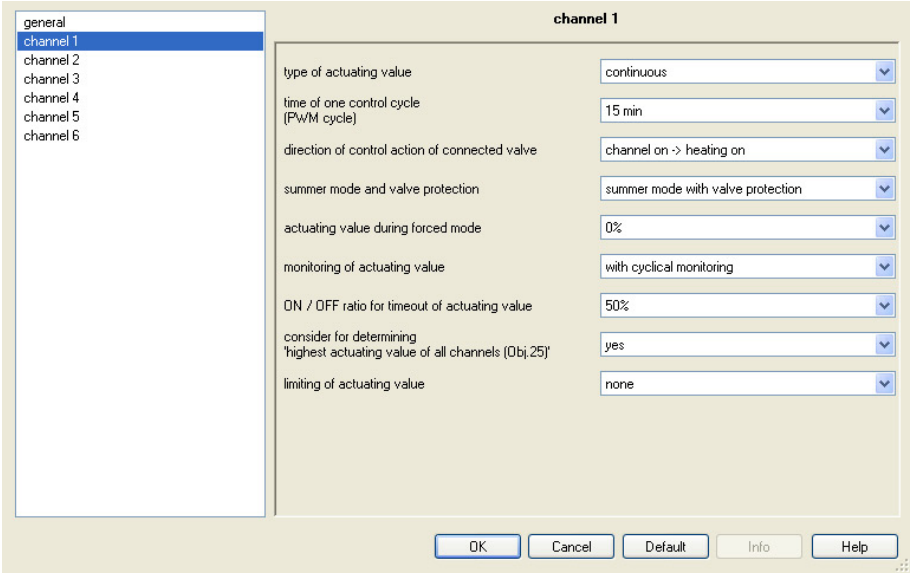
This parameter defines the time setting after which a failure of the room thermostat should be recognised if no further actuating value has been received.

Valve protection means
(only in summer mode)

This setting is for informational purposes only and cannot be changed.

3.2.2 Parameter window *Channel 1-6*

In the parameter windows *Channel 1-6* the individual channels are programmed.



Type of actuating value

Options: <u>continuous</u>
ON/OFF

This parameter defines type of received value.

- *continuous:* The room thermostat sends an actuating value in %.
- *ON/OFF:* The room thermostat only sends ON and OFF telegrams.

The following parameter appears with the selection *continuous*:

Time of one control cycle (PWM cycle)

Options: 4/5/6/8/10/12/<u>15</u>/20/25/30 min.

A control cycle consists of one ON and one OFF operation and together they form a PWM period.

Examples
Actuating value = 20 %, time = 10 min This means that within the actuating cycle of 10 minutes, switch on is for 2 minutes (20 % of the actuating cycle) and switch off for 8 minutes. Actuating value = 70 %, time = 10 min This means that within the actuating cycle of 10 minutes, switch on is for 7 minutes (70 % of the actuating cycle) and switch off for 3 minutes. **For further information see: PWM cycle, page 19**

The following parameter appears with the selection *ON/OFF*:

Time of one control cycle for forced mode and timeout ON/OFF ratio

Options: 4/5/6/8/10/12/15/20/25/30 min

In forced operation and in the emergency program, the ON/OFF switching commands of the thermostat are replaced by a fixed actuating cycle.

This parameter defines the cycle time.

Direction of control action of connected valve

Options: channel on -> heating on
channel on -> heating off

This parameter defines type of connected value.

- *channel on -> heating on:* The valve is open when de-energised.
- *channel on -> heating off:* The valve is closed when de-energised.

Summer mode and valve protection

Options: ignore summer mode
summer mode without valve protection
summer mode with valve protection

This parameter defines how the channel is to react to the object *Summer mode channel x.*

- *ignore summer mode:* The channel should operate normally in summer mode, i.e. heating can be continued.
- *summer mode without valve protection:* During summer mode, there is no heating and also no valve protection (valve purge) in operation.
- *summer mode with valve protection:* During summer mode there is no heating but the valve will be actuated every day for six minutes. This will successfully prevent the valve from seizing up.

Actuating value during forced mode

Options: 0/10/20/30…80/90/100 %

This parameter selects fixed actuating values which should control the valve in the forced mode.

Important
If a limitation of the actuating values is selected, see parameter limiting of actuating value, this will also remain active for forced operation.

Monitoring of actuating value

Options: without cyclical monitoring
with cyclical monitoring

- *without cyclical monitoring:* The actuating value is not monitored.
- *with cyclical monitoring:* It is cyclically monitored if an actuating value is sent from the room thermostat. The cycle duration is determined in the Parameter window *General*, page 12. The emergency program is started if the actuating value fails.

For further information see: Communication objects No. 26-31, page 17

ON/OFF ratio for timeout of actuating value

Options: 0/10/20…50…80/90/100 %

This parameter defines the actuating value which should control the valve in the emergency program.

Important
If a limitation of the actuating value is selected, see parameter *limiting of actuating value* on page 15, this will also remain active for the emergency program.

Consider for determining highest actuating value of all channels (Obj. 25)

This parameter is only visible with the *continuous* setting.

Options: no
yes

This parameter defines if the channels should be considered in the determination of the largest actuating value of all channels (see communication object no. 25 *highest actuating value of all channels,* page *17*).

Limiting of actuating value

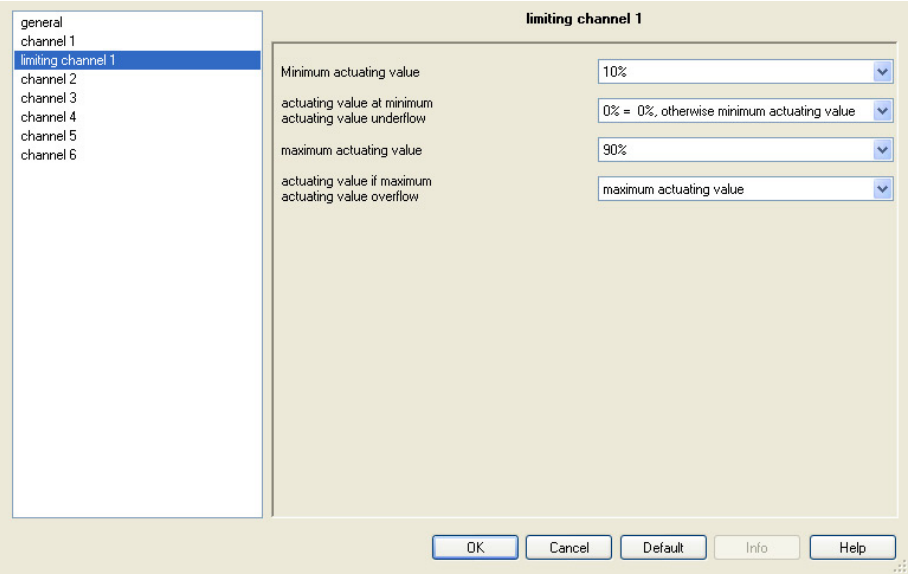
This parameter is only visible with the *continuous* setting.

Options: none
user-defined (on page “limiting channel..”)

- *none:* No limitation of the actuation value is required.
- *user-defined (on page “limiting channel..”):* The respective highest and lowest actuating values should be parameterised. The parameter window *Limiting channel 1-6* appears.

3.2.3 Parameter window *Limiting channel 1-6*

The parameter window *Limiting channel 1-6* is only visible if in parameter window *Channel 1-6*, page 13, the option *user defined (on page "limiting channel..")* is selected for the parameter *Limiting of actuating value.*



Minimum actuating value

Options: 0/5/10/15/20/25/30/35/40/45/50 %

This parameter defines the smallest allowed actuating value.

Actuating value at minimum actuating value underflow

Options: 0 %
0 % = 0 %, otherwise minimum actuating value

This parameter limits the minimum actuating value. Every actuating value received which lies beneath the minimum value will be limited to the value of the minimum actuating value previously set. The minimum value of 10% enables faster reaction capability of the thermal actuator drive during heating requirement.

- *0 %:* Control channel with 0 %
- *0 % = 0 %, otherwise minimum actuating value:* Every actuating value received which lies beneath the minimum value will be limited to the value of the minimum actuating value previously set. If there is however no heat requirement (actuating value = 0 %), then the connected valve will be switched off completely (0 %).

Maximum actuating value

Options: 55/60/65/70/75/80/85/90/95/100 %

This parameter defines the largest allowed actuating value. A maximum value of 90 % lengthens the lifetime of the connected thermal actuator drive without affecting the heating performance. A maximum value of 100 % reduces the number of switching cycles.

Actuating value if maximum actuating value overflow

Options: 100 %
maximum actuating value

This parameter limits the maximum actuating value. Every actuating value received which lies above the maximum value will be limited to the value of the maximum actuating value previously set.

- *100 %:* The channel is controlled with 100 %.
- *Maximum actuating value:* The channel is limited by the maximum actuating value set beforehand.

3.3 Communication objects

Number	Object Function	Name	Length	C	R	W	T	U
0	value [%]	actuating value chan...	1 Byte	C	R	W.	-	U
1	ON / OFF	actuating value chan...	1 bit	C	R	W.	-	U
2	value [%]	actuating value chan...	1 Byte	C	R	W.	-	U
3	ON / OFF	actuating value chan...	1 bit	C	R	W.	-	U
4	value [%]	actuating value chan...	1 Byte	C	R	W.	-	U
5	value [%]	actuating value chan...	1 Byte	C	R	W.	-	U
12	ON / OFF	forced mode channel 1	1 bit	C	R	W.	-	U
13	ON / OFF	forced mode channel 2	1 bit	C	R	W.	-	U
14	ON / OFF	forced mode channel 3	1 bit	C	R	W.	-	U
15	ON / OFF	forced mode channel 4	1 bit	C	R	W.	-	U
16	ON / OFF	forced mode channel 5	1 bit	C	R	W.	-	U
17	ON / OFF	forced mode channel 6	1 bit	C	R	W.	-	U
24	ON / OFF	summmer mode	1 bit	C	R	W.	-	U
25	value [%]	highest actuating val...	1 Byte	C	R	-	T	U
26	1 = yes, 0 = no	timeout of actuating ...	1 bit	C	-	-	T	U
27	1 = yes, 0 = no	timeout of actuating ...	1 bit	C	-	-	T	U
28	1 = yes, 0 = no	timeout of actuating ...	1 bit	C	-	-	T	U
29	1 = yes, 0 = no	timeout of actuating ...	1 bit	C	-	-	T	U
30	1 = yes, 0 = no	timeout of actuating ...	1 bit	C	-	-	T	U
31	1 = yes, 0 = no	timeout of actuating ...	1 bit	C	-	-	T	U

No.	Function	Object name	Data type	Flags
0…5	**On/Off** **value [%]**	**Actuating value channel 1-6**	**1 bit (EIS1)** **1 byte (EIS6)**	**C, R, W, U** **C, R, W, U**
These are the inputs for the actuating value of the particular channel. Every channel can be connected individually to an ON/OFF or continuous regulating room thermostat. The use of the continuous actuating value is recommended. In this case, it is possible to react more quickly to changes and coupling with a boiler controller is possible (refer to Object 25)..				
12…17	**On/Off**	**Forced mode *Channel 1-6***	**1 bit (EIS1)**	**C, R, W, U**
A value of 1 on one of these objects puts the related channel into forced operation. The channel then heats constantly with the fixed actuating value (0...100%) set in Parameter window *Channel 1-6*, page 13.				
24	**ON/OFF**	**Summer mode**	**1 bit (EIS1)**	**C, R, W, U**
A value of 1 on this object sets all channels parameterised for it into summer mode and heating is discontinued. During summer mode, a valve protection program can be implemented if required (valve purge).				
25	**value [%]**	**Highest actuating value of all channels**	**1 byte (EIS6)**	**R,W,T,U**
This communication object is available if at least one channel has been parameterised as a continuous controller. The actuating values of the channels are permanently compared with each other and the currently highest value is always sent to this communication object. In this way, the current heat demand of the system can always be transmitted to the heating boiler which can adapt its capacity exactly to the true demand. For every channel, it is possible to select individually, whether or not it should be taken into account for the calculation of the maximum actuating value. In this way, rooms to be ignored for the heat demand can remain out of consideration.				

No.	Function	Object name	Data type	Flags
26… 31	**1 = yes, 0 = no**	**Timeout of actuating value signal channel 1-6**	**1 bit (EIS1)**	**C, T, U**

This communication object is only available if *cyclical monitoring of the actuating value of the room thermostat* has been selected for the associated channel.

If the monitoring is selected, the channel must receive an actuating value telegram regularly from the room thermostat.

Recommendation: To guarantee fault-free operation, the cyclical sending time of the room thermostat should not amount to more than half of the monitoring time.

Example: Monitoring time 30 min, cyclical sending time of the thermostat at least every 15 min.

If a new actuating value is not received within the parameterised monitoring time, a failure of the room thermostat will be assumed and an emergency program with a fixed actuating value (0 ... 100 %) will be started.

This function can be selected or deactivated individually for every channel.

The monitoring time is set for all channels together in the Parameter window *General*, page 12.

Telegram value: 1 = timeout of actuating value
0 = OK

A Appendix

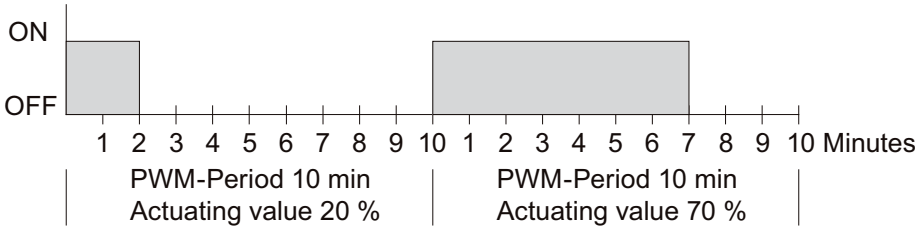
A.1 PWM cycle

A.1.1 Fundamental principle

To obtain, for example, a heating performance of 50 %, the actuating value of 50 % is converted into on/off cycles.

Over a fixed period (10 minutes in our example), the connected valve is switched on 50 % of the time and switched off 50 % of the time.

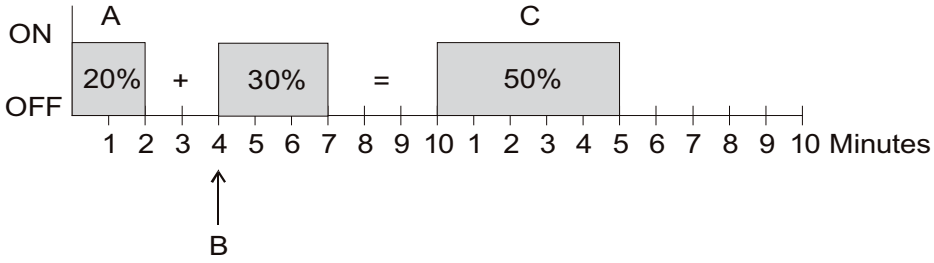
Example
Two different switch-on times of two and seven minutes represent the implementation of 2 different actuating values, one of 20 % and one of 70 %, in one PWM period of ten minutes.



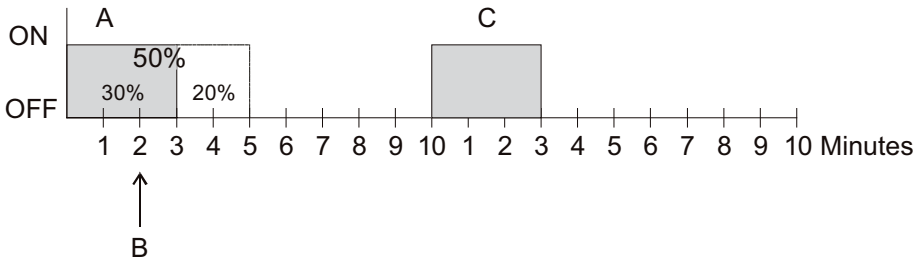
A.1.2 Reaction to changes in actuating values

In order to be able to react as quickly as possible to changes, every actuating value is transferred directly to the PWM cycle.

Example 1
The last actuating value was 20 % (A). A new actuating value of 50 % is received during the cycle (B). The output is switched on immediately and the missing 30 % switch-on time is immediately added. The next cycle will be implemented with 50 % (C).



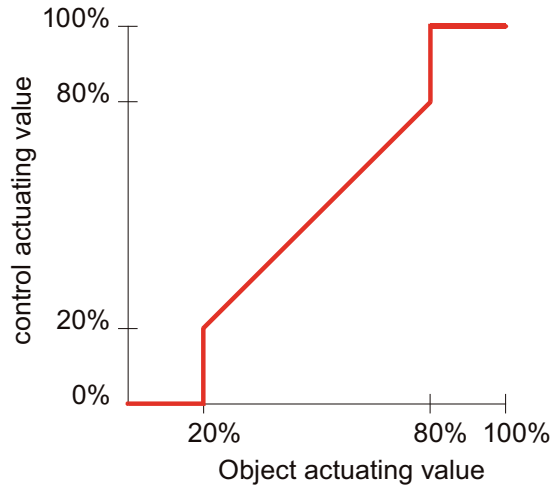
Example 2
The last actuating value was 50 % (A). A new actuating value of 30 % is received during the cycle (B). After 30 % of the PWM cycle has elapsed, the output is switched off and hereby the new actuating value is thus implemented.



Note
If the new target switch-on time has already been exceeded at the time of the receipt of the new actuating value for the current cycle, the output will be switched off immediately and the new actuating value will be implemented with the next cycle.

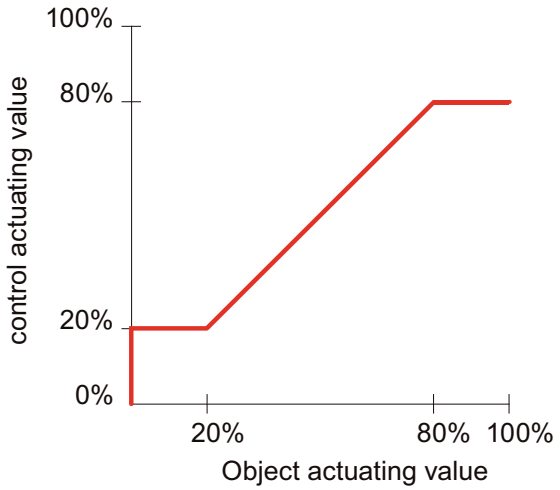
A.2 Limiting of actuating value

Example 1



Minimum actuating value:	20 %
Maximum actuating value:	80 %
Actuating value at minimum actuating value underflow:	0 %
Actuating value if maximum actuating value overflow:	100 %

Example 2



Minimum actuating value:	20 %
Maximum actuating value:	80 %
Actuating value at underflow:	0 % = 0 % otherwise minimum actuating value
Actuating value at overflow:	Maximum actuating value

A.3 Ordering information

Short description	Description	Order No.	bbn 40 16779 EAN	Price group	Weight 1 pc. [kg]	Packaging [pc.]
VAA/A 6.24.1	Valve Drive Actuator	2CDG 120 032 R0011	**670647**	P3	1.7	1

A.4 Notes

A.5 Notes

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