



ACTUATORS MANUAL

VAV BR, BS & BB

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GRUNER ACTUATORS

TYPES

Grada code	Type	Torque	Control
GM01	327VM-024-05-MB/GRA	5 Nm	0(2)-10VDC / Modbus
GM02	327VM-024-10-MB/GRA	10 Nm	0(2)-10VDC / Modbus



TECHNICAL INFORMATION

Electrical data	Nominal voltage	24 VAC/DC, 50/60 Hz
	Nominal voltage range	19...29 VAC/DC
	Power consumption motor	< 3,0 W
	Power consumption standby	< 2,0 W
	Wire sizing	< 5,5 VA
	Control	(0)2...10 VDC
	Feedback signal	(0)2...10 VDC, max. 5 mA
	Priority control	close / min / btw / max / open / stop
	Connection motor	cable 1000 mm, 4 x 0,75 mm ² (halogen free)
Connection GUV	via service plug	
Functional data	Torque	5 / 10 Nm
	Direction of rotation	adjustable
	Manual override	gear de-clutch with pushbutton, lockable
	Angle of rotation	0°...max. 95° can be limited with adjustable mechanical end stops
	Running time	5 Nm: 100 s / 90° 10 Nm: 150 s / 90°
	Shaft coupling	Universal shaft clamp 6...20 mm
	Position indication	mechanical with pointer
Modbus data	Protocol	Modbus RTU
	Connection	cable 1000 mm, 2 x 0,38 mm ² (halogen free) RS-485, not electrically isolated
	Number of nodes	max. 128
	Baud rates	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 76800 / 115200 Bd
	Byte sequence	MSB / LSB
	Byte format	1 start bit, 8 data bits, 2 stop bits, none parity 1 start bit, 8 data bits, 1 stop bit, even parity 1 start bit, 8 data bits, 1 stop bit, odd parity
	Terminating Resistor	120 Ω
	Response time	≤ 10 ms + delay
	Standard parameter	Address 1, 19200 Bd, 1 start bit, 8 data bits, 1 stop bit, even parity, 0 ms delay
Sensor data	Sensor	differential dynamic pressure sensor 500Pa
	Burst pressure	1 bar
	Medium	air -40°C...85°C / 5...95% r.H., non condensing
	Mounting position	independent of position
	Material	PA, glass, LCPT (dynamic version)
	Connection	tube clip Ø 4-6 mm
Safety data	Protection class	III (safety extra-low voltage)
	Degree of protection	IP 42 (cable downwards, tube clip connected)
	EMC	CE (2014/30/EU)
	LVD	CE (2014/35/EU)
	RoHS	CE (2011/65/EU - 2015/863/EU - 2017/2101/EU)
	Mode of operation	Typ 1 (EN 60730-1)
	Rated impulse voltage	0,5 kV (EN 60730-1)
	Control pollution degree	3 (EN 60730-1)
	Ambient temperature operation	0°C...+50°C
	Storage temperature	-20°C...+80°C
	Ambient humidity	5...95% r.F., non-condensing (EN60730-1)

ELECTRICAL CONNECTION

327VM-...-MB

GM01 & GM02

No.	Designation	Wire colors	Function
1	⊥ / -	Black	Power supply 24 VAC/DC
2	~ / +	Red	Power supply 24 VAC/DC
3	Y	White	Setpoint signal 0(2)-10 VDC
4	U	Orange	Feedback signal 0(2)-10 VDC
A	CA -	Pink	Modbus RTU -
B	CB +	Grey	Modbus RTU +

1	2	3	4	A	B
BK	RD	WH	OG	PK	GY
⊥	~	↑	↓	CA	CB
-	+	Y	U	-	+

WIRING DIAGRAM

327VM-...-MB

GM01 & GM02

VAV operation: modulating	Wire colors	Note
	1 = Black 2 = Red 3 = White 4 = Orange A = Pink B = Grey	24 VAC/DC power supply from isolating transformer. The - / ⊥ of the power supply must be connected correctly, as it is used for the reference of input Y & output U. The setpoint value signal Y depends on the chosen mode, i.e. 0-10 VDC or 2-10 VDC. In mode 2-10 VDC: in the range of Y = 0 to 0.8 VDC the override command Close will be detected.
CAV operation: 1 setpoint	Wire colors	Note
	1 = Black 2 = Red 3 = White 4 = Orange A = Pink B = Grey	24 VAC/DC power supply from isolating transformer. The desired air flow rate should be configured as Vmin. The VAV will operate continuously at Vmin.
CAV operation: multiple setpoints	Wire colors	Note
	1 = Black 2 = Red 3 = White 4 = Orange A = Pink B = Grey	24 VAC/DC power supply from isolating transformer. Setting for CAV application: mode 2-10V, shut-off level 0.8VDC. Contact a = Close b = Vmin c = Vmax

VAV operation: master - slave connection	Wire colors	Note
	1 = Black 2 = Red 3 = White 4 = Orange A = Pink B = Grey	24 VAC/DC power supply from isolating transformer. Master & slave VAV should have the same dimension. The slave VAV may also have a larger dimension than the master VAV. Settings slave VAV: $V_{min} = 0 \text{ m}^3/\text{h}$ $V_{max} = V_{nom} \text{ master VAV}$

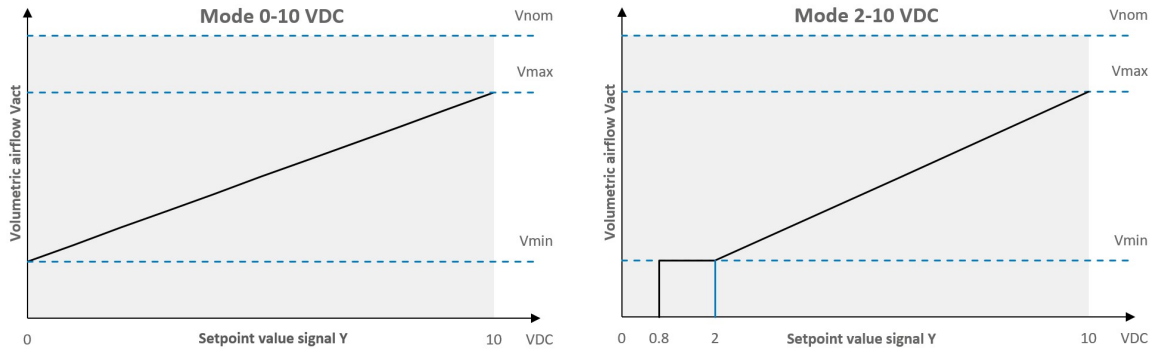
Modbus RTU	Wire colors	Note
	1 = Black 2 = Red 3 = White 4 = Orange A = Pink B = Grey	24 VAC/DC power supply from isolating transformer. The wiring of the line for Modbus RTU is to be carried out in accordance with applicable RS-485 regulations. Modbus: Supply and communication are not galvanically isolated. Connect earth signal of the devices with one another. Functions: CA = - = A CB = + = B

Hybrid operation	Wire colors	Note
	1 = Black 2 = Red 3 = White 4 = Orange A = Pink B = Grey	24 VAC/DC power supply from isolating transformer. Hybrid operation: Modbus RTU with analogue setpoint.

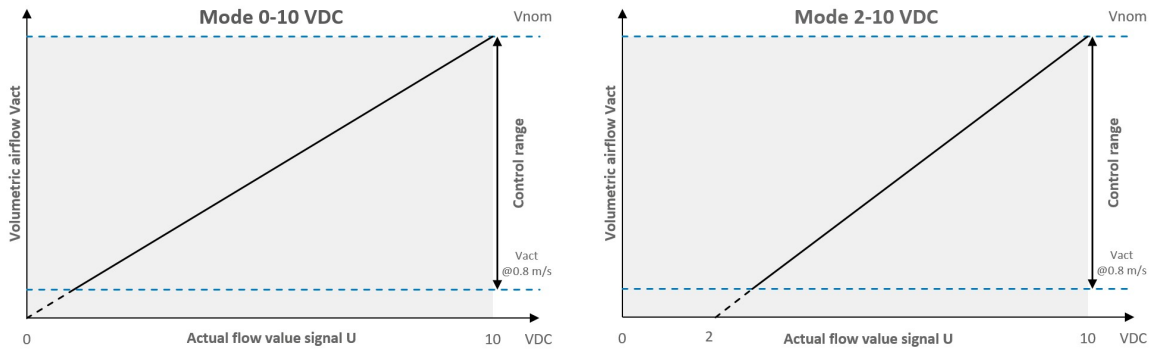
OPERATING PRINCIPLE

Graphs

Reference signal Y



Actual value signal U



Formulas

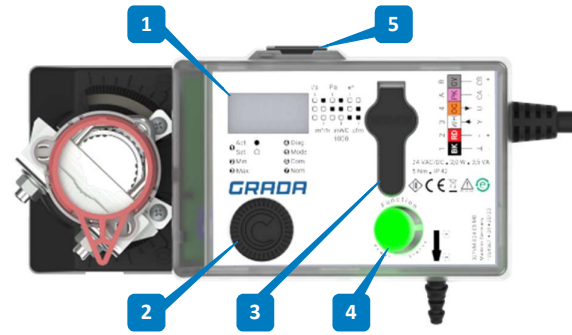
<p>Reference signal Y – Mode 0-10 VDC</p> $Vact = Vmin + \frac{Y}{10 \text{ VDC}} \times (Vmax - Vmin)$ $Y = 10 \text{ VDC} \times \frac{Vact - Vmin}{Vmax - Vmin}$	<p>Note</p> <p>In mode 0-10 VDC the flow (Vact) match to Y = 0 VDC as Vmin and Y = 10 VDC as Vmax.</p> <p>And the input signal Y matches to the following flow.</p>
<p>Reference signal Y – Mode 2-10 VDC</p> $Vact = Vmin + \frac{Y - 2 \text{ VDC}}{8 \text{ VDC}} \times (Vmax - Vmin)$ $Y = 2 \text{ VDC} + 8 \text{ VDC} \times \frac{Vact - Vmin}{Vmax - Vmin}$	<p>Note</p> <p>In mode 2-10 VDC the flow (Vact) match to Y = 2 VDC as Vmin and Y = 10 VDC as Vmax.</p> <p>And the input signal Y matches to the following flow.</p>
<p>Actual value signal U – Mode 0-10 VDC</p> $Vact = Vnom \times \frac{U}{10 \text{ VDC}}$ $U = 10 \text{ VDC} \times \frac{Vact}{Vnom}$	<p>Note</p> <p>In mode 0-10 VDC to calculate the actual flow (Vact) from the feedback signal U.</p> <p>And the output signal U matches to the following flow.</p>
<p>Actual value signal U – Mode 2-10 VDC</p> $Vact = Vnom \times \frac{U - 2 \text{ VDC}}{8 \text{ VDC}}$ $U = 2 \text{ VDC} + 8 \text{ VDC} \times \frac{Vact}{Vnom}$	<p>Note</p> <p>In mode 0-10 VDC to calculate the actual flow (Vact) from the feedback signal U.</p> <p>And the output signal U matches to the following flow.</p>

CONFIGURATION SETTINGS

Actuator

Display and operating buttons

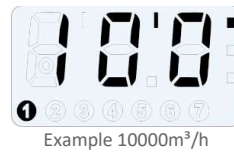
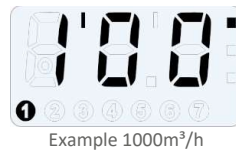
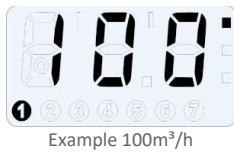
No.	Function
1	Display with backlighting
2	Scroll selection button
3	Service port
4	LED push button
5	gear de-clutch with pushbutton, lockable



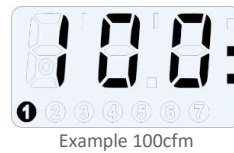
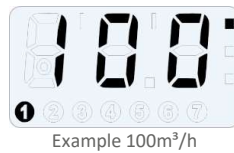
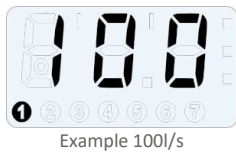
Display description

The actuator is equipped with a backlit display for reading actual values and settings.

The display shows up to three characters. Decimal numbers are indicated by a dot. Thousands are indicated by an apostrophe.



The squares on the far right of the display indicate which unit the actuator is set to: l/s, m³/h & cfm (default m³/h).



LED push button

The actuator is equipped with an LED push button to navigate the menu. The push button has a dual function depending on how long the button is pressed. The LED function provides 3 different indications.

LED function	Push button
Not illuminated: No 24V power supply.	Short press <2 sec
Illuminated: The desired flow rate (setpoint) has been reached. Current measured flow rate corresponds to the setpoint.	<ul style="list-style-type: none"> Scroll forward in the menu system. Confirm selected values or function.
Flashing: Current measured flow rate does not correspond to the desired flow rate (setpoint). The LED flashes as long as the setpoint is not reached.	Long press >2 sec
	<ul style="list-style-type: none"> Open functions menu system. Activate editing mode.



Scroll selection button

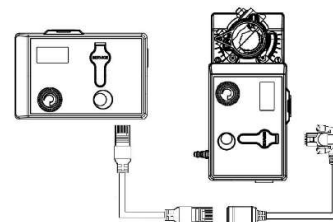
The actuator is equipped with a scroll button to navigate the submenus or change set values.

- Rotate clockwise: increase the selected value or navigate forward in the submenu.
- Rotate counterclockwise: decrease the selected value or navigate backwards in the submenu.



Service port & GUIV3-M

The actuator is equipped with a service port. Through this port one can connect the external service tool GUIV3-M to the actuator. This service tool mirrors the menu of the actuator and thus provides no additional functionality to settings. However, the service tool does have a built-in battery that allows configuring the actuator without a 24V power supply connected.



Menu tree

	Description	Display	Unit / Remark
1 Act. / Set.	Shows actual value / setpoint	0-XXX	m ³ /h (standard), l/s or cfm
	Submenu Adjust preferred unit	m ³ /h, l/s or cfm	m ³ /h (standard), l/s or cfm
2 Min.	Shows actual Vmin value	0-XXX	m ³ /h (standard), l/s or cfm
	Submenu Adjust the desired Vmin value	0-XXX	m ³ /h (standard), l/s or cfm
3 Max.	Shows actual Vmax value	0-XXX	m ³ /h (standard), l/s or cfm
	Submenu Adjust the desired Vmax value	0-XXX	m ³ /h (standard), l/s or cfm
4 Diag.	Shows actual input signal (Y) and actual output signal (U)	yX.X / uX.X	VDC
	Submenu		
	1: Start submenu	oFF	
	2: Function Open	oP	Actuator fully open
	3: Function Close	cL	Actuator fully close
	4: Function High	Hi	Actuator operating at Vmax
	5: Function Low	Lo	Actuator operating at Vmin
	6: Function Between	bE	Actuator operating at Vmid
	7: Stop Function	St	Actuator stops
	8: Adaption Function	AdP	Actuator does adaptation run
9: Function Version	XXX	Software version display	
5 Mode	Shows selected mode	0Ai / 2Ai	0Ai = 0-10 V DC / 2Ai = 2-10 V DC (standard)
	Submenu Adjust mode 0-10 VDC or 2-10 VDC	0Ai / 2Ai	0Ai = 0-10 V DC / 2Ai = 2-10 V DC (standard)
6 Com.²⁾	Shows actual Modbus address	1-247	1 (standard)
	Submenu		
	Adjust Modbus address	1-247	1 (standard)
7 Nom.	Adjust Modbus communication settings	b1 – b32	b14 (standard)
	Shows Vnom value ¹	0-XXX	m ³ /h (standard), l/s or cfm

¹⁾ Write access only in OEM access level

²⁾ More information regarding Modbus interface description available on request.

Display examples



BELIMO ACTUATORS

TYPES

Grada code	Type	Torque	Control
B-01	LMV-D3-MP-GD	5 Nm	0(2)-10VDC
B-02	NMV-D3-MP	10 Nm	0(2)-10VDC
B-03	LMV-D3-MF-GD	5 Nm	0(2)-10VDC
BM01	LMV-D3-MOD-GD	5 Nm	0(2)-10VDC / Modbus / BACnet
BM02	NMV-D3-MOD	10 Nm	0(2)-10VDC / Modbus / BACnet
BX01	LMV-D3-KNX	5 Nm	KNX
BX02	NMV-D3-KNX	10 Nm	KNX



TECHNICAL INFORMATION

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50 / 60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	2 W (5 Nm), 3 W (10 Nm)
	Power consumption in rest position	1 W (5 Nm), 1.5 W (10 Nm)
	Power consumption for wire sizing	4 VA (5 Nm), 5 VA (10 Nm)
	Connection supply / control	Imax 8 A @ 5 ms Cable 1 m, 4x 0.75 mm ² (-MF / -MP) Cable 1 m, 6x 0.75 mm ² (-MOD / -KNX)
Functional data	Torque motor	5 Nm (LMV) 10 Nm (NMV)
	Operating range Y	2...10 V (-MF / -MP / -MOD)
	Input impedance	100 kΩ (-MF / -MP / -MOD)
	Operating range Y variable	0...10 V (-MF / -MP / -MOD)
	Position feedback U	2...10 V (-MF / -MP / -MOD)
	Position feedback U note	Max. 0.5 mA (-MF / -MP / -MOD)
	Position feedback U variable	Start point 0...8 V / End point 2...10 V (-MF / -MP / -MOD)
	V'max adjustable	20...100% of V'nom
	V'mid adjustable	>V'min...<V'max
	V'min adjustable	0...100% of V'nom (<V'max)
	Manual override	with push-button, can be locked
	Angle of rotation	95°, adjustable mechanical or electrical limitation
	Mechanical interface	Universal shaft clamp 6...20 mm
Position indication	Mechanical	
MP-Bus data (-MP / -MOD)	Communicative control	MP-Bus
	Number of nodes	MP-Bus max. 8
Modbus data (-MOD)	Communicative control	Modbus RTU
	Number of nodes	Max. 32 (without repeater)
	Baud Rates	9600 / 19200 / 38400 / 76800 / 115200
	Transmission Formats	1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1
	Terminating Resistor	120 Ω
Standard parameter	Address 1, Baud rate 38400, Transmission format 1-8-N-2	
BACnet data (-MOD)	Communicative control	BACnet MS/TP
	Number of nodes	Max. 32 (without repeater), 1 full bus load
	Baud Rates	9'600, 19'200, 38'400, 76'800
	Terminating Resistor	120 Ω
Standard parameter	Address 1, Baud rate 38400	
KNX data (-KNX)	Communicative control	KNX (S-Mode)
	Number of nodes	max. 64 per line segment, reduce number of nodes with connecting cable with short lines
	Communication medium	KNX TP
	Configuration mode	S-Mode
	Current consumption of KNX-Bus	max. 5 mA
Sensor data	Measuring principle	Belimo D3, dynamic flow sensor
	Installation orientation	position-independent, no zeroing necessary
	Measuring range	-20...500 Pa
	Functional range differential pressure	0...500 Pa
	Maximum system pressure	1500 Pa
	Burst pressure	±5 kPa
	Height compensation	Adjustment of system height (range 0...3000 m above sea level)
	Condition measuring air	0...50°C / 5...95% RH, non-condensing
	Pressure tube connection	Nipple diameter 5.3 mm

Safety data	Protection class IEC/EN	III, Protective Extra-Low Voltage (PELV)
	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	EMC	CE according to 2014/30/EU
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14
	Type of action	Type 1
	Rated impulse voltage supply / control	0.8 kV
	Pollution degree	3
	Operation humidity	Max. 95% RH, non-condensing
	Operation temperature	-30...50°C
	Storage temperature	-20...80°C

ELECTRICAL CONNECTION

-MP & -MF

B-01, B-02 & B-03

	No.	Designation	Wire colors	Function
1	1	\perp / -	Black	Power supply 24 VAC/DC
2	2	~ / +	Red	Power supply 24 VAC/DC
3	3	Y	White	Setpoint signal 0(2)-10 VDC
5	5	U	Orange	Feedback signal 0(2)-10 VDC

1	2	3	5
BK	RD	WH	OG
\perp	~	↑	↓
-	+	Y	U

-MOD

BM01 & BM02

	No.	Designation	Wire colors	Function
1	1	\perp / -	Black	Power supply 24 VAC/DC
2	2	~ / +	Red	Power supply 24 VAC/DC
3	3	Y	White	Setpoint signal 0(2)-10 VDC
5	5	U	Orange	Feedback signal 0(2)-10 VDC
6	6	C1	Pink	Modbus RTU - / BACnet MS/TP -
7	7	C2	Grey	Modbus RTU + / BACnet MS/TP +

1	2	3	5	6	7
BK	RD	WH	OG	PK	GY
\perp	~	↑	↓	C1	C2
-	+	Y	U		

-KNX

BX01 & BX02

	No.	Designation	Wire colors	Function
1	1	\perp / -	Black	Power supply 24 VAC/DC
2	2	~ / +	Red	Power supply 24 VAC/DC
3	3	Y	White	Setpoint signal 0(2)-10VDC
5	5	U	Orange	Feedback signal 0(2)-10VDC
6	6	C1	Pink	KNX +
7	7	C2	Grey	KNX -

1	2	3	5	6	7
BK	RD	WH	OG	PK	GY
\perp	~	↑	↓	D+	D-
-	+	Y	U		

WIRING DIAGRAM

-MP & -MF

B-01, B-02 & B-03

VAV operation: modulating	Wire colors	Note
	<p>1 = Black 2 = Red 3 = White 5 = Orange</p>	<p>24 VAC/DC power supply from isolating transformer.</p> <p>The - / \perp of the power supply must be connected correctly, as it is used for the reference of input Y & output U.</p> <p>The setpoint value signal Y depends on the chosen mode, i.e. 0-10 VDC or 2-10 VDC.</p> <p>In mode 2-10 VDC: in the range of Y = 0 to 0.1 VDC the override command Close will be detected.</p>
CAV operation: 1 setpoint	Wire colors	Note
	<p>1 = Black 2 = Red 3 = White 5 = Orange</p>	<p>24 VAC/DC power supply from isolating transformer.</p> <p>The desired air flow rate should be configured as Vmin. The VAV will operate continuously at Vmin.</p>
CAV operation: multiple setpoints	Wire colors	Note
	<p>1 = Black 2 = Red 3 = White 5 = Orange</p>	<p>24 VAC/DC power supply from isolating transformer.</p> <p>Setting for CAV application: mode 2-10V, shut-off level 0.1VDC.</p> <p>Contact a = Close b = Vmin c = Vmax</p>
VAV operation: parallel connection	Wire colors	Note
	<p>1 = Black 2 = Red 3 = White 5 = Orange</p>	<p>24 VAC/DC power supply from isolating transformer.</p> <p>Maximum 8 actuators in parallel.</p>

VAV operation: master - slave connection	Wire colors	Note
	1 = Black 2 = Red 3 = White 5 = Orange	24 VAC/DC power supply from isolating transformer. Master & slave VAV should have the same dimension. The slave VAV may also have a larger dimension than the master VAV. Settings slave VAV: Vmin = 0 m ³ /h Vmax = Vnom master VAV

-MOD

BM01 & BM02

Modbus RTU - BACnet MS/TP	Wire colors	Note
	1 = Black 2 = Red 3 = White 5 = Orange 6 = Pink 7 = Grey	24 VAC/DC power supply from isolating transformer. The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS-485 regulations. Modbus / BACnet: Supply and communication are not galvanically isolated. Connect earth signal of the devices with one another. Functions: C1 = D- = A C2 = D+ = B

Hybrid operation	Wire colors	Note
	1 = Black 2 = Red 3 = White 5 = Orange 6 = Pink 7 = Grey	24 VAC/DC power supply from isolating transformer. Hybrid operation: Modbus RTU / BACnet MS/TP with analogue setpoint.

-KNX

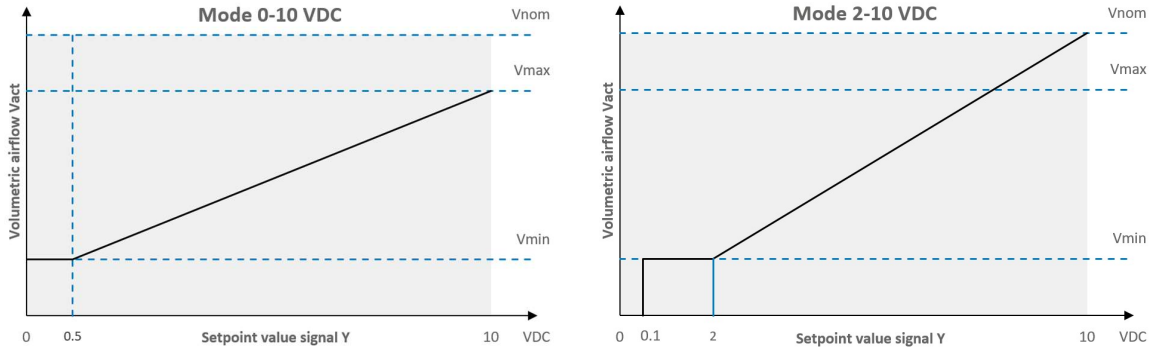
BX01 & BX02

KNX	Wire colors	Note
	1 = Black 2 = Red 3 = White 5 = Orange 6 = Pink 7 = Grey	24 VAC/DC power supply from isolating transformer. Functions: D+ = KNX+ D- = KNX-

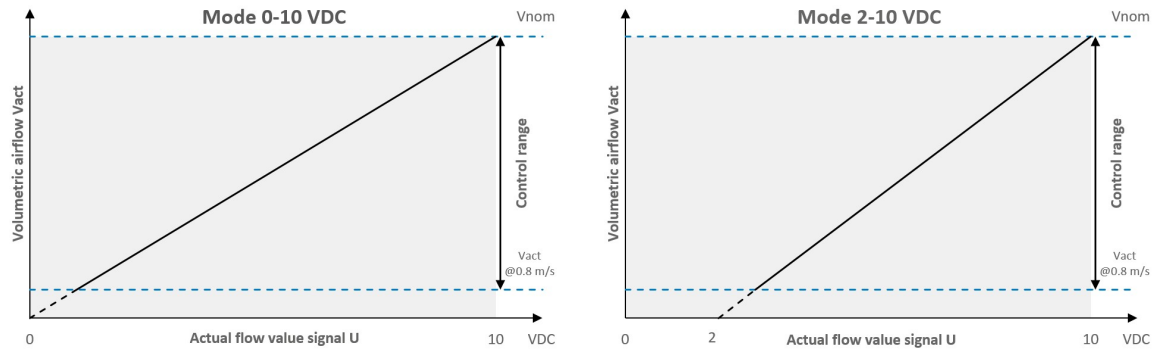
OPERATING PRINCIPLE

Graphs

Reference signal Y



Actual value signal U



Formulas

<p>Reference signal Y – Mode 0-10 VDC</p> $Vact = Vmin + \frac{Y}{10 \text{ VDC}} \times (Vmax - Vmin)$ $Y = 10 \text{ VDC} \times \frac{Vact - Vmin}{Vmax - Vmin}$	<p>Note</p> <p>In mode 0-10 VDC the flow (Vact) match to Y = 0 VDC as Vmin and Y = 10 VDC as Vmax.</p> <p>And the input signal Y matches to the following flow.</p>
<p>Reference signal Y – Mode 2-10 VDC</p> $Vact = Vmin + \frac{Y - 2 \text{ VDC}}{8 \text{ VDC}} \times (Vmax - Vmin)$ $Y = 2 \text{ VDC} + 8 \text{ VDC} \times \frac{Vact - Vmin}{Vmax - Vmin}$	<p>Note</p> <p>In mode 2-10 VDC the flow (Vact) match to Y = 2 VDC as Vmin and Y = 10 VDC as Vmax.</p> <p>And the input signal Y matches to the following flow.</p>
<p>Actual value signal U – Mode 0-10 VDC</p> $Vact = Vnom \times \frac{U}{10 \text{ VDC}}$ $U = 10 \text{ VDC} \times \frac{Vact}{Vnom}$	<p>Note</p> <p>In mode 0-10 VDC to calculate the actual flow (Vact) from the feedback signal U.</p> <p>And the output signal U matches to the following flow.</p>
<p>Actual value signal U – Mode 2-10 VDC</p> $Vact = Vnom \times \frac{U - 2 \text{ VDC}}{8 \text{ VDC}}$ $U = 2 \text{ VDC} + 8 \text{ VDC} \times \frac{Vact}{Vnom}$	<p>Note</p> <p>In mode 0-10 VDC to calculate the actual flow (Vact) from the feedback signal U.</p> <p>And the output signal U matches to the following flow.</p>

CONFIGURATION SETTINGS

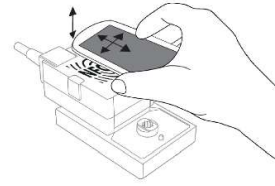
NFC

The Belimo -MP motor is compatible with NFC communication.

Requirement:

- NFC- or Bluetooth-capable smartphone
- Belimo Assistant App (Google Play & Apple AppStore)

Align NFC-capable smartphone on the device so that both NFC antennas are superposed.
Connect Bluetooth-enabled smartphone via the Bluetooth-to-NFC Converter ZIP-BT-NFC to the device.



ZTH EU

The ZTH-EU service tool is used for parameterizing and configuring Belimo VAV actuators.
The service tool is connected via the service plug on the actuator.

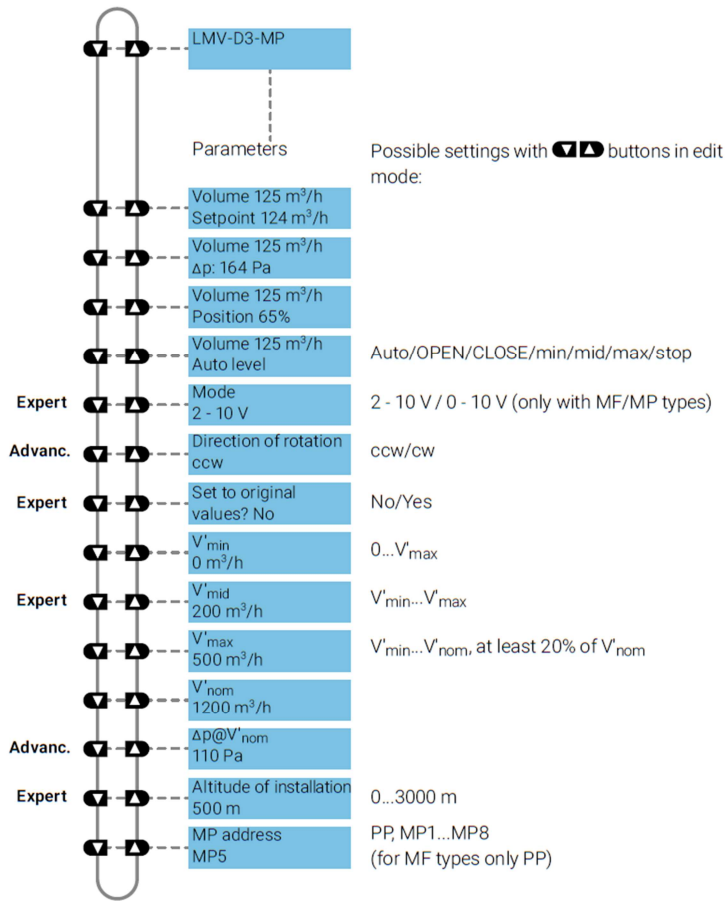


Operating

- ▼ and ▲** Forward/backward, change value/status
- OK** Confirm input, switch to submenu
- esc** Cancel entry, exit submenu, discard change
- i** Shows additional information (if available)

General settings

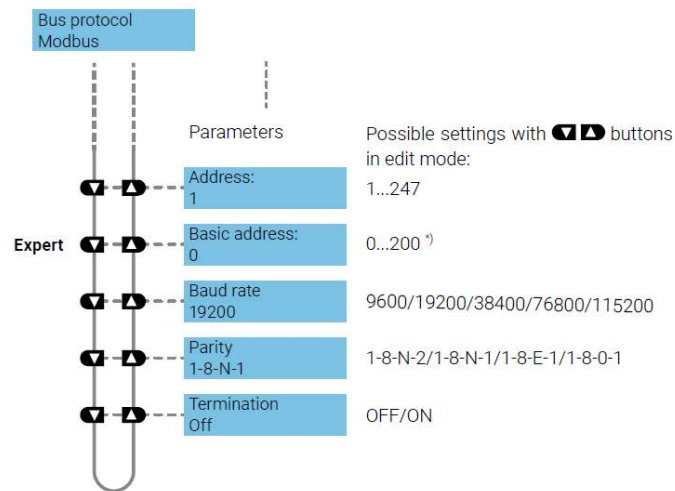
The following menu tree corresponds to the menu control for the VAV-Compact D3 product range.



Modbus settings

BM01 & BM02

The following menu tree shows the setting/display options for the Modbus communication settings. More information regarding Modbus interface description available on request.

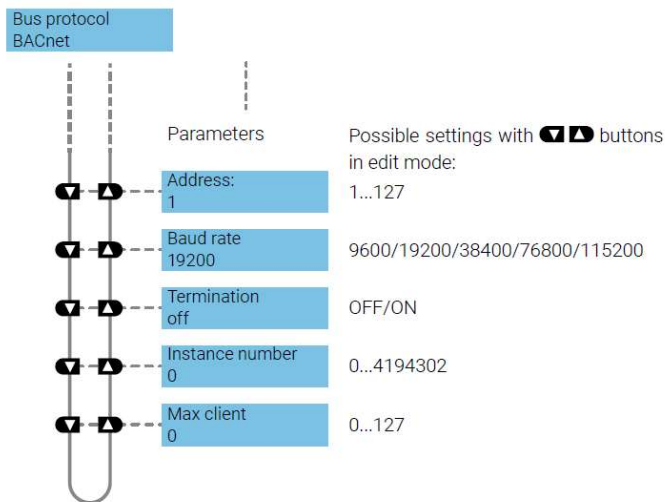


*The setting of the base address is also taken into account for the BACnet MS/TP address.

BACnet settings

BM01 & BM02

The following menu tree shows the setting/display options for the BACnet communication settings. More information regarding BACnet interface description available on request.



SIEMENS ACTUATORS

TYPES

Grada code	Type	Torque	Control
S-01	GDB181.1E/3	5 Nm	0(2)-10VDC
S-02	GLB181.1E/3	10 Nm	0(2)-10VDC
SM01	GDB181.1E/MO	5 Nm	Modbus
SM02	GDB181.1E/MO	10 Nm	Modbus
SB01	GDB181.1E/BA	5 Nm	BACnet
SB02	GLB181.1E/BA	10 Nm	BACnet
SX01	GDB181.1E/KN	5 Nm	KNX
SX02	GLB181.1E/KN	10 Nm	KNX



TECHNICAL INFORMATION

Electrical data	Operating voltage	AC 24 V ± 20 %
	Operating voltage frequency	50/60 Hz
	Power consumption in operation	3 VA / 2.5 W (at 50 Hz)
	Power consumption in rest position	1 VA / 0.5 W (at 50 Hz)
	Cable length	0.9 m
	Power supply	6 x 0.75 mm ² (G.B181.1E/3) 2 x 0.75 mm ² (G.B181.1E/MO / G.B181.1E/BA / G.B181.1E/KN)
	Communication	2 x 0.75 mm ² (G.B181.1E/KN) 3 x 0.75 mm ² (G.B181.1E/MO / G.B181.1E/BA)
	Service interface	7-pin, grid 2.00 mm
Function data	Running time	150 s
	Nominal torque	5 Nm (GDB) 10 Nm (GLB)
	Nominal / maximum rotation angle	90° / 95° ± 2°
	Direction of rotation	Clockwise (CW), Counter-clockwise (CCW)
	Input voltage	(0)2...10 VDC (G.B181.1E/3)
	Contact sensing open	DC 30 V contact voltage (G.B181.1E/3)
	Contact sensing closed	DC 0 V, 8 mA contact current (G.B181.1E/3)
	Output voltage	(0)2...10 VDC limited to DC 12 V (G.B181.1E/3)
	Max. output current	DC ± 1 mA (G.B181.1E/3)
	VAV controller type	3-position controller with hysteresis
	V ^{max} adjustable	20%...120%
V ^{mid} adjustable	0%...100%	
V ^{min} adjustable	-20%...100%	
Modbus data (G.B181.1E/MO)	Modbus RTU	RS-485, galv. separated
	Number of nodes	Max. 32
	Address range	1...247 / 255 (Default: 255)
	Transmission formats	1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 (Default: 1-8-E-1)
	Baudrates	Auto / 9600 / 19200 / 38400 / 57600 / 76800 / 115200 (Default: Auto)
	Termination	120 Ω electronically switchable (Default: Off)
BACnet data (G.B181.1E/BA)	BACnet MS/TP	RS-485, galv. separated
	Number of nodes	Max. 32
	Address range	0...128 (Default: 1)
	Transmission format	1-8-N-1
	Max. master	1...127 (Default: 127)
	Device object ID	0...4193404 (Default: 10000)
	Baudrates	Auto / 9600 / 19200 / 38400 / 57600 / 76800 / 115200 (Default: Auto)
Termination	120 Ω electronically switchable (Default: Off)	
KNX data (G.B181.1E/KN)	Connection type	KNX-TP (galvanically isolated)
	Bus load	5 mA
Sensor data	Connection tubes	3...8 mm
	Measuring range	0...500 Pa
	Operating range	0...300 Pa
	Max. operating pressure	3000 Pa
Safety data	Degree of protection EN	IP54
	Safety class EN60730	III
	Operation climatic conditions	Class 3K5
	Operation humidity	5...95% RH, non-condensing
	Operation temperature	0...50 °C
	Storage climatic conditions	Class 1K3
	Storage humidity	5...95% RH, non-condensing
	Storage temperature	-5...45 °C

Product standard	EN60730-x
Product family standard	EN 50491-3, EN 50491-5 General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)
Electromagnetic compatibility	For residential, commercial and industrial environments
EU Conformity (CE)	The documents can be downloaded from http://siemens.com/bt/download
RCM Conformity	The documents can be downloaded from http://siemens.com/bt/download
UL, cUL AC 24 V	UL 873 http://ul.com/database

ELECTRICAL CONNECTION

G.B181.1E/3

S-01 & S-02

	No.	Designation	Wire colors	Function
1	1	~ / G	Red	Power supply 24 VAC
2	2	⊥ / G0	Black	Power supply 24 VAC
6	6	Y1	Violet	Positioning signal
7	7	Y2	Orange	Positioning signal
8	8	YC	Grey	Setpoint signal 0(2)-10 VDC
9	9	U	Pink	Feedback signal 0(2)-10 VDC

G.B181.1E/MO

SM01 & SM02

	No.	Designation	Wire colors	Function
1	1	~ / G	Red (black cable)	Power supply 24 VAC
2	2	⊥ / G0	Black (black cable)	Power supply 24 VAC
6	6	Ref	Violet (blue cable)	Reference
8	8	+	Grey (blue cable)	Modbus RTU +
9	9	-	Pink (blue cable)	Modbus RTU -

G.B181.1E/BA

SB01 & SB02

	No.	Designation	Wire colors	Function
1	1	~ / G	Red (black cable)	Power supply 24 VAC
2	2	⊥ / G0	Black (black cable)	Power supply 24 VAC
6	6	Ref	Violet (blue cable)	Reference
8	8	+	Grey (blue cable)	BACnet MS/TP +
9	9	-	Pink (blue cable)	BACnet MS/TP -

G.B181.1E/KN

SX01 & SX02

	No.	Designation	Wire colors	Function
1	1	~ / G	Red (black cable)	Power supply 24 VAC
2	2	⊥ / G0	Black (black cable)	Power supply 24 VAC
1	1	CE+	Red (green cable)	KNX CE+
2	2	CE-	Black (green cable)	KNX CE-

WIRING DIAGRAM

G.B181.1E/3

S-01 & S-02

VAV operation: modulating	Wire colors	Note
	<p>G = Red G0 = Black Y1 = Violet Y2 = Orange YC = Grey U = Pink</p>	<p>24 VAC power supply from isolating transformer.</p> <p>The - / ⊥ of the power supply must be connected correctly, as it is used for the reference of input Y & output U.</p> <p>Operating mode setting: CON</p> <p>The setpoint value signal Y depends on the chosen mode, i.e. 0-10 VDC or 2-10 VDC.</p> <p>In mode 2-10 VDC: in the range of Y = 0 to 0.5 VDC the override command Close will be detected. The override command Close stops from Y = 0.9 VDC.</p>
CAV operation: 1 setpoint	Wire colors	Note
	<p>G = Red G0 = Black Y1 = Violet Y2 = Orange YC = Grey U = Pink</p>	<p>24 VAC power supply from isolating transformer.</p> <p>Operating mode setting: CON</p> <p>The desired air flow rate should be configured as Vmin. the "VAV" will operate continuously at Vmin.</p>
CAV operation: multiple setpoints	Wire colors	Note
	<p>G = Red G0 = Black Y1 = Violet Y2 = Orange YC = Grey U = Pink</p>	<p>24 VAC/DC power supply from isolating transformer.</p> <p>Operating mode setting: STP</p>
VAV operation: master - slave connection	Wire colors	Note
	<p>G = Red G0 = Black Y1 = Violet Y2 = Orange YC = Grey U = Pink</p>	<p>24 VAC/DC power supply from isolating transformer.</p> <p>Operating mode setting: CON</p> <p>Master & slave VAV should have the same dimension. The slave VAV may also have a larger dimension than the master VAV.</p> <p>Settings slave VAV: Vmin = 0 m³/h Vmax = Vnom master VAV</p>

G.B181.1E/MO
SM01 & SM02

Modbus RTU	Wire colors	Note
	1 = Red 2 = Black 6 = Violet 8 = Grey 9 = Pink	24 VAC power supply from isolating transformer. + = Modbus RTU - = Modbus RTU

G.B181.1E/BA
SB01 & SB02

BACnet MS/TP	Wire colors	Note
	1 = Red 2 = Black 6 = Violet 8 = Grey 9 = Pink	24 VAC power supply from isolating transformer. + = BACnet MS/TP - = BACnet MS/TP

G.B181.1E/KN
SX01 & SX02

KNX	Wire colors	Note
	Black cable 1 = Red 2 = Black Green cable 1 = Red 2 = Black	24 VAC power supply from isolating transformer. CE+ = KNX CE+ CE- = KNX CE-

CONFIGURATION SETTINGS

AST20

The AST20 service tool is used for parameterizing and configuring Siemens VAV actuators. The service tool is connected via the service plug on the actuator.



Operating

The AST20 is operated by five keys.

- Keys UP (3) and DOWN (4) are used to navigate to a menu item.
- If pressing ENTER (5) on a highlighted menu item, the value can be changed with UP/DOWN (if not protected or read-only).
- Pressing ENTER (5) confirms the value change.
- By pressing ESCAPE (2), a value change can be cancelled or a menu page can be left to the next higher level.
- To reset the AST20, press RESET (1) until the display gets dark. The restart takes ca. 20s.

General settings

Start screen

AST20 <> VAV KNX	1/1 SVC
Online view	▶
Field device configuration	▶
Diagnostics and maintenance	▶
AST20 settings	▶

Online view

Display of the current VAV state.

Online view	1/1 SVC	▲
Setpoint: flow	23%	▲
Actual flow	58m³/h	▼
Diff. pressure	20%	▼
Diff. pressure	50m³/h	
Diff. pressure	33Pa	
Override ctrl	Off	✓

Field device configuration 1/2

Configuration of various parameters (Vmin, Vmax...)

Field device configuration	1/2 SVC
Operating mode	VAV mode
Opening dir	CW
Adaptive pos	On
Vn value	2.04
Vmin	10%
Vmax	90%
Vnom	450m³/h

Field device configuration 2/2

Field device configuration	2/2 SVC
Altitude level	1000m
Unit vol. flow	m³/h
Unit Vmin&Vmax	%

Menu tree G..B181../3

S-01 & S-02

Online view	Setpoint: flow / pos.	Display of actual setpoint (depends on operating mode)
	Actual flow / position	Actual flow or damper position in %
	Diff. pressure	Actual differential pressure in Pa
	Override control	Override control: Off, open, close, stop, setpoint
Field device configuration	Operating mode	Operating mode (VAV / STP / 3P)
	Opening direction	Opening direction CW or CCW
	Adaptive positioning	Adaptive positioning On or Off
	Vn value ¹⁾	Coefficient for nominal differential pressure
	Vmin	Minimum volume flow [%]
	Vmax	Maximum volume flow [%]
	Vmid ²⁾	Mid volume flow [%]
	Vnom ¹⁾	Nominal volume flow [m³/h] or [l/s]
	U-signal	Setting for the 0/2..10V feedback signal to flow or position
	Range Y-signal	Setting the signal range to 0..10V or 2..10V
	Range U-signal	Setting the signal range to 0..10V or 2..10V
Diagnostics and maintenance	Altitude level	Altitude level in 100m steps
	Unit vol. flow	m³/h or l/s
	Unit Vmin & Vmax	Display Vmin / Vmax in absolute (m³/h / l/s) or in relative units (%)
AST20 settings	Field device info	Basic info on connected device
	Field device statistics	Counters and statistical data of connected device
	Handheld tool settings	Settings like language, brightness etc. and software version information

¹⁾ Write access only in OEM access level

²⁾ Used in STP mode only. Note: Vmax can't be lower than Vmid!

Menu tree G..B181..

SM01, SM02, SB01 & SB02

Menu tree for communicative VAV controllers: Modbus & BACnet.

Online view	Setpoint: flow / pos.	Display of actual setpoint (depends on operating mode)
	Actual flow	Actual flow in % and m3/h (or l/s)
	Actual position ¹⁾	Actual relative damper position
	Diff. pressure	Actual differential pressure in Pa
	Override control	Override control: Off, open, close, stop, setpoint
Field device configuration	Operating mode	Operating mode (VAV / STP / 3P)
	Opening direction	Opening direction CW or CCW
	Adaptive positioning	Adaptive positioning On or Off
	Vn value ²⁾	Coefficient for nominal differential pressure
	Vmin	Minimum volume flow [%]
	Vmax	Maximum volume flow [%]
	Vnom ²⁾	Nominal volume flow [m3/h] or [l/s]
	Altitude level	Altitude level in 100m steps
	Unit vol. flow	m3/h or l/s
Unit Vmin & Vmax	Display Vmin / Vmax in absolute (m3/h / l/s) or in relative units (%)	
Bus configuration ¹⁾	Address	Address for RS-485 networks (Modbus / BACnet MS/TP)
	Baudrate	Baudrate
	Transmission format	Start-/Stopbit, Parity
	Termination	Termination electronically switchable
	Backup Mode	Setpoint monitoring On or Off
	Backup Position	Position if backup mode entered
Diagnostics and maintenance	Backup Timeout	Monitoring waiting time
	Field device info	Basic info on connected device
AST20 settings	Field device statistics	Counters and statistical data of connected device
	Handheld tool settings	Settings like language, brightness etc. and software version information

¹⁾ Available for Modbus / BACnet MS/TP types

²⁾ Write access only in OEM access level