

ExReg-V Volume flow controller 0...300 Pa

Electrical, explosion-proof volume flow controller (CAV / VAV)

in conjunction with ExMax-...-CY... actuators only

24 VAC/DC supply, adaptive PID controller, alarm contact

EC type-approved in acc. with ATEX directive 2014/34/EU for zone 1, 2, 21, 22

ExReg - V-...
ExReg - V-... - A
ExReg - V-... - B
ExReg - V- ... - CT
ExReg - V- ... - OCT
ExReg - V- ... - VA
ExReg - V- ... - OVA

Subject to change!

Compact. Easy installation. Universal. Cost effective. Safe.

Type	Sensor	Supply	Range	Connection / Interface (analogue)	Alarm contact	Wiring diagram
ExReg- V-300	Diff. pressure	24 VAC/DC	0...300 Pa	1 × actuator, 1 × set point	Relay contact 30 V / 0.1 A	SB 1.0
ExReg- V-300 - A	Diff. pressure	24 VAC/DC	0...300 Pa	1 × actuator, 1 × set point, 1 × actual value, 1 × position actuator	Relay contact 30 V / 0.1 A	SB 1.1
ExReg- V-300 - B	Diff. pressure	24 VAC/DC	0...300 Pa	1 × actuator, RS485 communication	Relay contact 30 V / 0.1 A	SB 1.2
ExReg- V- ... - CT	Types as above with aluminium housing and seawater resistant coating (cable glands M16 brass nickel-plated, screws in stainless steel)					
ExReg- V- ... - OCT	Types as above, offshore version with aluminium housing and seawater resistant coating (stainless steel tubes for clamping ring connection, cable glands M20 brass nickel-plated, screws in stainless steel)					
ExReg- V- ... - VA	Types as above with stainless steel housing for aggressive ambient (cable glands M20 brass nickel-plated, screws in stainless steel)					
ExReg- V- ... - OVA	Types as above, offshore version with stainless steel housing for aggressive ambient (tubes for clamping ring connection and screws in stainless steel, cable glands M20 brass nickel-plated)					

Product views and applications

Volume flow controller



...Reg-V...-CT



...Reg-V...-VA



Offshore ...-OVA



ExReg-V + ExMax-...-CY



Description

The ExReg-V... flow controller is an indispensable integrant in Building Management Control Equipment for Chemical, Pharmaceutical, Industrial and Offshore plants for use in hazardous areas of zones 1, 2 (gas) and 21, 22 (dust).

Highest protection class (ATEX) and IP66 protection, small dimensions, universal functions and technical data as well as an optional stainless steel housing guarantee safe operation even in harsh environments.

ExReg-V... is used directly in hazardous areas for control of air flows in ventilation systems. To complete the technical solution an additional damper actuator type ExMax-...-CY or ExMax-...-CYF (with Fail Safe spring return) is required and also a ventilation damper with orifice plate and a known shield factor (called k-factor).

All controllers are programmable on site with menu guide. The internal PID control structure is simple to use and automatically configured for standard applications. The display shows the current status during operation for the actual value, setpoint and actuator position (can be disabled if required).

...Reg-V...-OCT and ...-OVA offshore versions are equipped with stainless steel tubing Ø 6 mm.

Highlights

- ▶ For all type of gas, mists, vapours and dust for use in zone 1, 2, 21 and 22
- ▶ Power supply 24 VAC/DC
- ▶ Sensor and controller in one housing
- ▶ Direct connection of actuator to the controller's integrated Ex-e terminal box
- ▶ No additional Ex-i module in panel required
- ▶ No intrinsically safe wiring/installation between sensor and panel required
- ▶ No intrinsically safe wiring/installation and no space in the panel required
- ▶ Relay output with adjustable alarm monitoring
- ▶ Scalable analogue input and output (selectable für setpoint, actual value, et al.)
- ▶ Optional analogue output for controller feedback
- ▶ Adjustable k-factor, universally applicable for any dampers
- ▶ Display with backlight, can be switched off
- ▶ Password locking
- ▶ Down to -20 °C ambient temperature applicable
- ▶ Compact design and small dimension
- ▶ Robust aluminium housing (optional with seawater resistant coating) or in stainless steel
- ▶ IP66 protection
- ▶ Offshore versions with pressure tube connection for clamping ring Ø 6 mm

ExMax-...-CY... – see additional data sheet



Technical data

Supply voltage / frequency	24 VAC/DC \pm 15 % (20,4...27,6 VAC/DC), frequency 50...60 Hz
Current, power consumption	150 mA, ~ 3 W, internal fuse 500 mA, without bracket, not removable
Galvanic isolation	Supply for analogue in- and outputs min. 1,5 kV, supply for relay output min. 1,5 kV
Electrical connection	Terminals 0,14...2,5 mm ² at integrated Ex-e terminal box, stripping length 9 mm, torque 0,4...0,5 Nm, equipotential bonding 4 mm ²
Cable glands	2 \times M16 \times 1,5 mm, Ex-e approved, for cable diameter \sim \varnothing 4...10 mm
Cable glands ...-CT	2 \times M16 \times 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter \sim \varnothing 6...10 mm
...-VA, ...-OCT, ...-OVA	2 \times M20 \times 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter \sim \varnothing 6...13 mm
Protection class	Class I (grounded)
Display	LCD matrix display with backlight, display for configuration, user guidance, parameter and actual value indication
Control elements	3 buttons for configuration
Housing material	Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CT/...-OCT) or stainless steel housing, № 1.4581 / UNS-J92900 / similar AISI 316Nb (...-VA/...-OVA)
Dimensions (L \times W \times H)	Aluminium housing \sim 180 \times 107 \times 66 mm, stainless steel housing \sim 195 \times 127 \times 70 mm (each without connectors)
Weight	\sim 950 g aluminium housing, stainless steel version \sim 2,5 kg
Ambient temperature	$-20...+50$ °C, storage temperature $-35...+70$ °C
Ambient humidity	0...95 % rH, non condensing
Sensor circuit	Internal intrinsically safe circuit
Sensor	Piezo pressure transmitter
Pressure connection	P+ / P- sleeves \varnothing 4...6 mm. OCT and OVA versions have 2 stainless steel (316L) tube connections for clamp ring fittings \varnothing 6 mm
Measuring range	0...300 Pa, minimum measuring range is 2 % of full scale
Sensor damping (filter)	1...50 seconds, adjustable
Accuracy of pressure	\pm 2,5 % full scale \pm 1 Pa
Setting zero point	Via menu. Short-circuit mechanically both tube connectors P+ / P- for the moment of zero point setting
Air flow	Calculation via k-factor ("shield factor"); adjustable parameters: V_{max} , V_{min} , V_{rated} , k-factor
Regulation	Adaptive PID controller (automatic or manual mode selectable)
Control tolerance	1...5 % adjustable
Delay time	3 s
Alarm monitoring	Monitoring the volume flow; adjustable functions: tolerance limit (fixed and variable value), alarm delay
Alarm contact (terminal 3)	Relay; max. values: 0.1 A (30 VAC/DC), min. values: 10 mW / 0.1 V / 1 mA
Life time mechanically	10×10^6
electrically (rated)	100×10^3
Current output (terminal 6)	Range 4...20 mA, invertible, basic accuracy \pm 1.0 % of full scale, load $<$ 500 Ω , influence $<$ 0.1 %, open circuit voltage 24 V
Voltage input (terminal 8)	Range 0...10 V, invertible, basic accuracy \pm 1.0 % of full scale, over-voltage up to 30 V
Voltage input (terminal 9)	Range 0...10 V, adjustable, basic accuracy \pm 1.0 % of full scale, over-voltage up to 30 V
Voltage output (terminal 11)	Range 0...10 V, adjustable, basic accuracy \pm 1.0 % of full scale, load $>$ 10 k Ω , influence $<$ 0.1 %, short circuit proof (type ...Reg-V300-A)
Voltage input (terminal 13)	Range 0...10 V, adjustable, basic accuracy \pm 1.0 % of full scale, over-voltage up to 30 V (type ...Reg-V300-A)
Wiring diagram	SB 1.0 / 1.1 / 1.2
Scope of delivery	Sensor, 3 self-tapping screws 4,2 \times 13 mm resp. in stainless steel (with ...CT and ...VA versions), short circuit tube

Approbations

ATEX directive	2014/34/EU
EC type-approved	EPS 11 ATEX 1 380
IECEX certified	IECEX EPS 12.0028
Approval for gas	II 2 (1) G Ex e mb ib [ia Ga] IIC T6 Gb
Types ...-CT, ...-OCT	II 2 (1) G Ex e mb ib [ia Ga] IIB T6 Gb
Approval for dust	II 2 (1) D Ex tb ib [ia Da] IIIC T80°C Db IP66
CE identification	CE № 0158
EMC directive	2014/34/EU
Enclosure protection	IP66 in acc. with EN 60529

Special solutions and accessories

...-CT	Types in aluminium housing with seawater resistant coating, parts nickel-plated
...-OCT	Offshore version in aluminium housing with seawater resistant coating, parts nickel-plated
...-VA	Types in stainless steel housing, parts nickel-plated
...-OVA	Offshore version in stainless steel housing, parts nickel-plated
ExMax-...-CY	Control actuator, 4...20 mA Input, 0...10 V output
ExMax-...-CYF	Control actuator, 4...20 mA Input, 0...10 V output with spring return
ExBox-Y/S	Ex-e terminal box, 4 \times M20 \times 1,5 mm cable glands \varnothing 6...13 mm
MKR	Mounting bracket for round ducts up to \varnothing 600 mm
Kit-S8-CBR	2 cable glands M16 \times 1,5 mm, Ex-e, brass nickel-plated, for cable \varnothing 5...10 mm
Kit 2	Flexible pressure tube, 2 m, inner \varnothing 6 mm, 2 connection nipples
Kit-PTC-CBR	2 connecting tubes for tube fittings \varnothing 6 mm, stainless steel 316 L



Electrical Connection

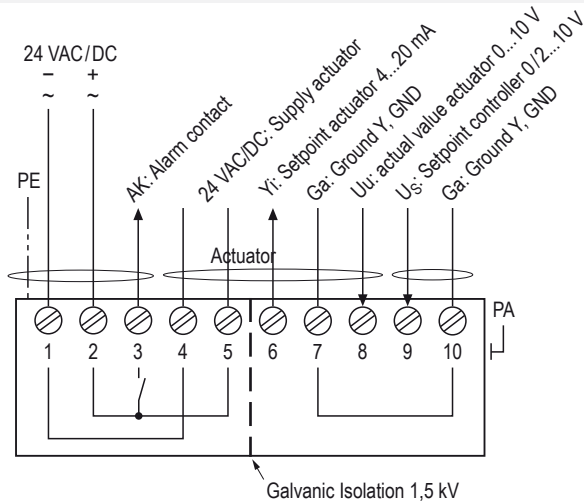
The controller requires a 24 VAC/DC power supply on terminal 1 (-/+) and 2 (+/-). Terminals 1 and 2 are internally connected to terminals 4 and 5 and supplies the control actuator. (Note the actuator needs to initialize about 2 A starting current for max. 1 s). The actuator is connected directly to the controller over terminals 4-8. If there is less than 1 meter

distance between the controller and the actuator, the actuator may be connected directly without the use of an additional terminal box. Otherwise please order terminal box (see accessories).

Attention: Before opening the terminal box cover, the supply voltage must be shut off!

ExReg-V300

SB 1.0



The ExReg-V300 is the basic version and can be used for the control of constant volumetric flow rates (CAV) and variable flow rates of (VAV). The alarm contact (terminal 3) is used as a feedback for normal operation, an analog feedback signal is not provided for these devices.

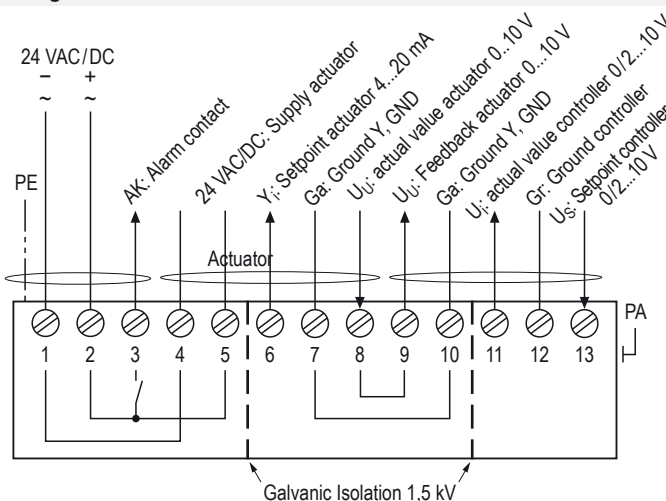
The setpoint is adjusted via terminal 9. The voltage range for the minimum and maximum flow rate is defined by a 2...10 V signal. A voltage value of about 12 V opens the damper below 0.2 V the damper closes completely. During these forced control functions (damper open / close) the controller is without function.

The CAV mode is configured in menu 2 by setting "CAV". The CAV mode is activated when the input voltage is not connected to terminal 9. In this case, the menu 7.2 "default" set value is used as a flow. The force control functions (damper open / close) can be applied by 0 V (close) and +24 V (open) to terminal 9. This can be done by connecting the supply voltage level 0 V and 24 V with two relays.

The simple VAV operation in menu 2 configured via the setting "VAV". This configuration allows a modulation operation in a 2...10 V signal range. In the case of 2 V it is regulated on the minimum value set in menu 5 "flow rate" and at 10 V to the maximum value. The intermediate values are according to the voltage level (2...10 V) linearly as setpoints available.

ExReg-V300-A

SB 1.1



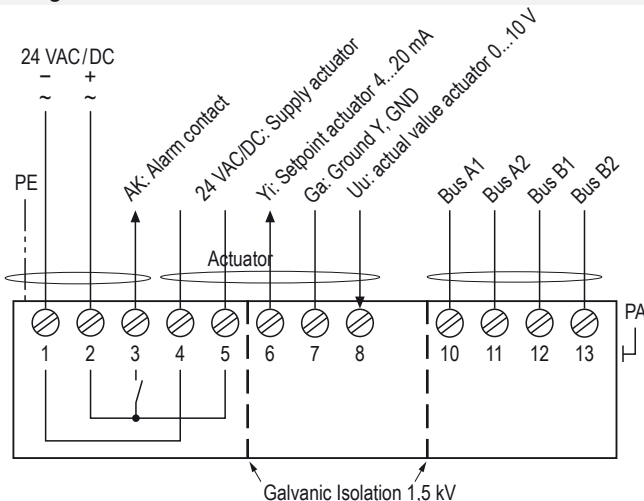
ExReg-V300-A is the standard version for the control of variable volume flow (VAV). The alarm contact (terminal 3) is used as feedback for normal operation and, in addition, the device has an analog output (terminal 11), which outputs the actual value as a continuous signal, and an analog feedback of the actuator position (terminal 9). This feature is primarily used for energy efficiency.

The setpoint is adjusted via terminal 13. The voltage range for the minimum and maximum flow rate is defined as either of 0...10 V or 2...10 V.

In addition, the positive control function can be used depending on the setting in menu 6 "set point". When the voltage value of about 12 V is exceeded the damper opens, when it drops below 0.2 V the damper is completely closed. When utilising these force control (damper open / close) the controller is without function. If the input is not connected, the flow control defaults to the set value in menu 7.2.

ExReg-V300-B

SB 1.2



Bus-Topologie



- There must be connected to a bus only point-to-point connections
- Star wiring is not permitted
- Each device works automatically as a repeater

Important information for installation and operation

A. Installation, commissioning, maintenance

All national and international standards, rules and regulations must be complied with. For electrical installations design, selection and erection, EN/IEC 60079-14 can be used.

Attention: Apply all Ex rules and regulation before opening the internal terminal box. Do not open cover when circuits are live!

Draw the wiring cables through the cable glands. For connection use the internal Ex-approved terminal box and connect equipotential bonding.

After connection install the cables in a fixed position and protect them against mechanical and thermal damage. Close all openings and ensure IP protection (min. IP66).

Avoid temperature transfer and ensure not to exceed max. ambient temperature! For outdoor installation a protective shield against sun, rain and snow should be applied.

After mounting and installation a zero point compensation must be done to ensure correct measurement results (see description).

Sensors are maintenance free. An annual inspection is recommended. For electrical installations inspection and maintenance, EN/IEC 60079-17 can be used.

Clean with damp cloth only.

Ex sensors must not be opened and repaired by the end user.

B. Long cabling

We recommend using shielded signal wires and to connect one end of the shield to the ...Reg... terminal box.

C. Separate ground wires

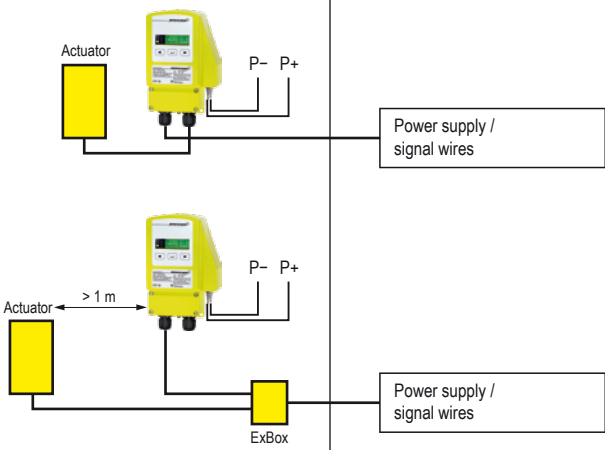
For supply and signal wires use separate grounds.

Installation

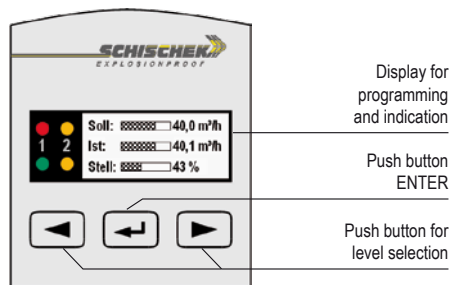
Hazardous area – Zone 1, 2, 21, 22



Safe area



Display, buttons and parameters



Display for programming and indication

Push button ENTER

Push button for level selection

Change operation – parametrisation mode

To change from operation to parametrisation mode and vice versa, push ENTER button for minimum of 3 seconds. Back over the menu "Save" and exit.

Display in operating mode

In operating mode the current set value, the actual value and the set value are displayed. The red and the green LED indicate the current operating status.

When the green LED is illuminated continuously, the system is in a stable state and indicates correct operation. If the limits of the actuator's position are reached or an internal fault is detected, the red LED lights up.

A flashing red LED indicates that the set point can not be achieved. The alarm function is active in this case. The yellow LEDs indicate during adjusting phase the direction of movement of the actuator. The upper LED denotes the actuator opens, the lower LED indicates the actuator closes. The yellow LED does not flash when the system is within the defined tolerance field (menu 12 "Controller / tolerance").

Password input

The default/delivery setup is 0000. In this configuration the password input is not activated. To activate the password protection (menu 12) change the 4 digits into your chosen numbers (e.g. 1234) and press ENTER.

Please keep your password in mind for next parameter change! Due to a new parameter setup the password is requested.

Zero point compensation

...Reg-V... controller are equipped with a zero point compensation to adjust the module to the installation position. The pressure nipples P+ / P- must be connected with a short circuit tube and the zero point compensation performed by following the menu for parametrization (menu 3.2).

Before starting the zero point compensation, the device should be connected to power supply for a minimum of 15 minutes to reach the uniform working temperature!

Control configuration

...Reg-V300 and ...-V300-A are designed for the control of volume flows. The control mode can be set in menu 8 "Controller". Normally, the fully automatic determination of the control parameters (select "Auto") is sufficient. In addition, an adaptive PID (proportional component is calculated automatically) and a standard PID controller can be selected. These settings should only be used by trained personnel.

In certain cases – especially in severe pressure fluctuations in the air duct – the gain of the control loop (menu 8.2) and the control tolerance (menu 8.6) should be adjusted.

Control speed

The control speed can be determined directly over the motor running time of the actuator. The control parameters in this case must not be changed. The controller recognizes the change automatically via the feedback signal of the actuator (terminal 7). This applies to all controller settings. The control speed depends only on the used motor running time.

For more information see data sheet of the actuator.

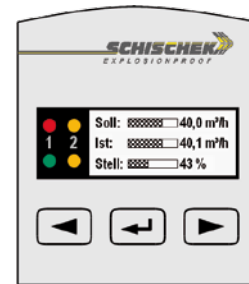
ExMax-...-CY... – see additional data sheet



Parametrisation and commissioning

To change from operation to parametrisation mode push "ENTER" button for minimum 6 seconds.
If password protected: type password and push .
Back over to menu "Save" and exit.

Operation → Parametrisation
push for 6 s



Menu	Function	ENTER	Indication	Select	ENTER	Description
Menu 1	Language Select the language		1: Language English Deutsch, English, Français, Italiano, Español, back			
Menu 2	Application Selection of application		2: Application VAV VAV, back			
2.1	VAV Selecting standard VAV application (factory setting)		Device'll be reconfigured. Continue? no yes			
Menu 3	Sensor Configuration menu for sensor settings		3: Sensor Filter Filter, 0-point comp., status, back			
3.1	Filter Selection filter/damping of sensor measurement		3.1: Filter 20 s select filter time			
3.2	Zero point compensation Short circuit P+ and P- in final position		Start 0-point compensation? no yes			
3.3	Status Indication measurement value in Pa		3.3: Status 87 Pa 5 ... 300 Pa			
Menu 4	Actuator Config menu actuator		4: Antrieb Invers Invers, test, status, back			
4.1	Invers Select inverse mode		4.1: Invers off off, on, back			
4.2	Test Test actuator position manually		4.2: Test 20 % position actuator 0 ... 100 %			
4.3	Status Indication of position actuator		4.3: Status 20 % position actuator 0 ... 100 %			
Menu 5	Air volume Configuration menu for air volume		5: Air volume k-factor k-factor, V nominal, V maximal, V minimum, back			
5.2	k-Factor Input k-factor		5.2: k-factor 50 adjust k-factor			
5.3	V nominal Input nominal air volume		5.3: Vnom 1000 m³/h adjust nominal value			
5.4	V maximum Input maximum air volume		5.4: Vmax 800 m³/h adjust max. Value			
5.5	V minimum Input minimum air volume		5.5: Vmin 200 m³/h adjust min. value			
Menu 6	Actual value Configuration menu for actual value		6: actual value Range, status, back			
6.1	Range Select output value		6.1: Range 0...10 V 0...10 V, 2...10 V, 0/2...10 V, back			
6.2	Status Indication actual value in m³/h		6.2: Status 100 m³/h			



Parametrisation and commissioning

Menu	Function	ENTER	Anzeige	Select	ENTER	Description
Menu 7	Nominal value Configuration menu for nominal value		7: Nominal value Range, status, back			
7.1	Range Select output value		7.1: Range 0...10 V 0...10 V, 2...10 V, 0/2...10/12+ V, back			
7.2	Value Adjust setpoint for CAV modus		7.2: Value 500 m³/h adjust CAV value			CAV modus is automatically activ if no input signal connected terminal 9 resp. 13 (...A version)
7.3	Status Indication of setpoint m³/h		7.3: Status 100 m³/h			
Menu 8	Controller Configuration menu for the controller		8: Controller Type, gain, P-, I-, D, tolerance			
8.1	Type Select controller type		8.1: Type Auto Auto, PID adaptive, PID norm			
8.2	Gain Adjust gain of control loop		8.2: Gain 100 % gain 1 ... 100 %			
8.3	P-ratio Adjust P-ratio		8.3: P-ratio 10 P-ratio 1 ... 100			
8.4	I-ratio Adjust I-ratio		8.4: I-ratio 2.0 s I-ratio 1 ... 10 s			
8.5	D-ratio Adjust D-ratio		8.5: D-ratio 1.0 s D-ratio 0 ... 10 s			
8.6	Tolerance Adjust contoller tolerance		8.6: Tolerance 2.0 % Tolerance 1 ... 5 %			
Menu 9	Switch Configuration menu for the alarm relay		9: Switch contact Alarm function, limit %, limit abs, delay time			
9.1	Alarm function Adjust alarm function		9.1: Alarm function on On, off, back			
9.2	Limit (%) Set alarm limit in %		9.2: Limit (%) 2.0 % Limit 0 ... 10 %			
9.3	Limit (abs) Set alarm limit in m³/h		9.3: Limit (abs) 20 m³/h Limit 0 ... 240 m³/h			
9.4	Delay time Set delay for alarm relay		9.4: Delay time 20.0 s Delay time 10 ... 200 s			
Menu 10	No function (Menu will be skipped)					
Menu 11	Diagnostics Electrical test of all in- and outputs		11: Diagnostics Input 1, input 2, input 3, output 1, output 2, switch, back			
11.1	Input 1 Indication of status terminal 8		11.1: Input 1 10.0 V			
11.2	Input 2 Indication of status terminal 9		11.2: Input 2 10.0 V			
11.3	Input 3 Indication of status terminal 13		11.3: Input 3 10.0 V			
11.4	Output 1 Test output value terminal 6		11.4: Output 1 20.0 mA Set 4 ... 20 mA			
11.5	Output 2 Test output value terminal 11		11.5: Output 2 10.0 V Set 0 ... 10 V			


Parametrisation and commissioning

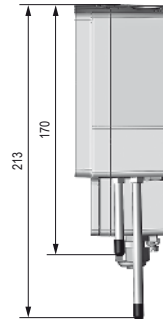
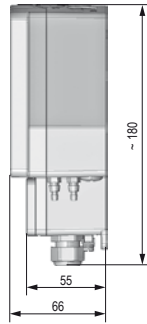
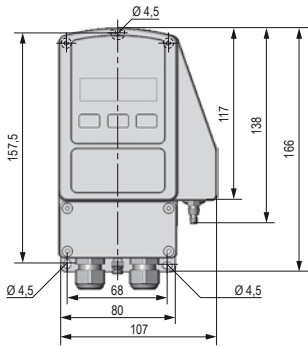
Menu	Function	ENTER	Indication	Select	ENTER	Description
Menu 11.6	Switch Test relay function terminal 3		11.6: Switch Function: open Function open / close status open / close			
Menu 12	Password Configuration menu for the passwords		12: Password Level 1, level 2, level 3, back			
12.1	Level 1 Level 1 password User level		12.1: Level1 0000 Password			
12.2	Level 2 Level 2 password Installation level		12.2: Level 2 0000 Password			
12.3	Level 3 Level 3 password Manufacturer level		12.3: Level 3 0000 Password			
Menu 13	Indication Configuration menu for the indication		13: Indication Display, contrast, brightness, short menu, back			Short menu „on“ reduces the parameterization to a minimum. Detail settings are not possible.
13.1	Display Set display function		13.1: Display on, lighted On lighted, on, off, back			
13.2	Contrast Set display contrast		13.2: Contrast 60.0 % 0 ... 100 %			
13.3	Brightness Set brightness for backlight		13.3: Brightness 100 % 0 ... 100 %			
13.4	Short menu Use short menu		13.4: Short menu off On, off, back			
Menu 14	Parameter Menu for parameter administration		14: Parameter Save, use, activate, erase, back			
14.1	Save Save parameter		14.1: Save P1 (active) P1, P2, P3, back			Save up to 3 different parameters to test the controller.
14.2	Use Edit parameter		14.2: Use P1 (active) P1, P2, P3, back			
14.3	Activate Define active parameter		14.3: Activate P1 (occupied) P1, P2, P3, back			
14.4	Erase Delete parameter		14.4: Erase P1 (occupied) P1, P2, P3, back			
Menu 15	Leave menu Leave menu and save		15: Leave menu Back, yes			



Dimensions [mm]

Aluminium housing

...Reg-V...-OCT



Stainless steel housing

...Reg-V...-OVA

