

Solenoid Valve Type 3967

for the control of pneumatic actuators



General

The Type 3967 Solenoid Valve is used to control rotary actuators with NAMUR interface or linear actuators with NAMUR rib.

Intrinsically safe, low-power binary signals issued by automation or fieldbus systems can be used for controlling purposes.

Different nominal signals and connection types allow the solenoid valve to be tailor-made to the specific task. Special features of the Type 3963 Solenoid Valve include:

General features

- Safety Integrity Level SIL according to IEC 61508 (Report No. V 177 2009 T1)
- Service life with over 20 million switching cycles
- Ambient temperature -45 to $+80^{\circ}\text{C}$
- Corrosion-resistant enclosure with degree of protection IP 65 for humid and aggressive environments
- NAMUR interface $\frac{1}{4}$ " according to VDI/VDE 3845 for rotary actuators or connection block with positioner for SAMSON Type 3277 Linear Actuators
- Adapter plate for linear actuators with NAMUR rib according to IEC 60534-6-1, panel, wall or rail mounting

Electric features

- E/P binary converter with flapper/nozzle assembly
- Type of protection (ATEX):
 - II 2 G Ex ia IIC T6 (gases in zone 1),
 - II 3 G Ex nA II T6/II 3 G Ex nL II T6 (gases in zone 2),
 - II 2 D Ex tD A21 IP 65 T 80°C (dusts in zone 21),
 - II 3 D Ex tD A21 IP 65 T 80°C (dusts in zone 22)
- Nominal signal 6/12/24 V DC
- Power consumption 6 to 27 mW
- Manual override
- Connection to terminals with cable gland M 16 \times 1.5

Pneumatic features

- Plug/seat valve with return spring
- 3/2-way function
- K_{vs} value 0.32
- Air supply 1.4 to 10.0 bar
- Operating pressure max. 10.0 bar
- Threaded connection G (NPT) $\frac{1}{4}$
- Restrictor plate (accessories)

Versions



Version with NAMUR interface $\frac{1}{4}$ "



Version with adapter plate



Version with restrictor plate

Fig. 1 · Type 3967 Solenoid Valve

Function

The solenoid valve consists of an E/P binary converter (A) with manual override (B) and a single actuated booster valve (C) with return spring (Fig. 2).

The air supply for the E/P binary converter (A) is connected internally over connection 1 or externally over connection 9. Rotating a flat gasket allows the connection to external air supply (see Mounting and Instruction Manual EB 3967 EN).

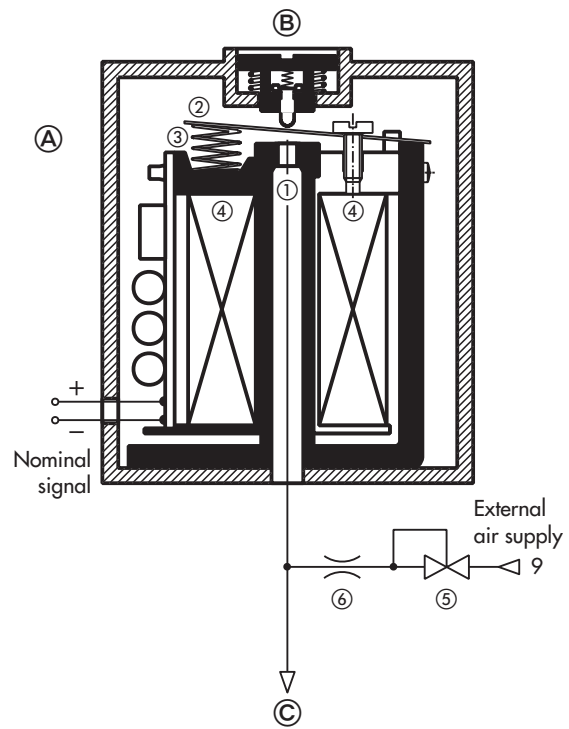
The pressure reducer (5) reduces the air supply pressure to 1.4 bar.

In the normal position the flapper (2) is lifted off the outlet nozzle (1) by the spring (3). As a result, a pressure lower than the switch-off pressure of the booster valve (C) builds up in the pressure divider that consists of the restriction (6) and the outlet nozzle (1).

When the solenoid (4) is energized by an electrical binary signal, the outlet nozzle (1) is closed by the flapper (2) against the force of the spring (3). As a result, the pressure in the pressure divider rises above the switch-on pressure of the booster valve (C), thus switching it to the operating position.

After de-energizing the electrical binary signal, the booster valve (C) is switched to the normal position by a return spring.

Function diagram



- (A) E/P binary converter
- (1) Outlet nozzle
- (2) Flapper
- (3) Spring
- (4) Solenoid
- (5) Pressure reducer
- (6) Restrictor
- (B) Manual override
- (C) Booster valve

Fig. 2

Technical Data

General data		
Construction	Solenoid with flapper/nozzle assembly and booster valve	
Material	Enclosure	Polyamide PA 6-3-T-GF35, black
	Connection plate	AlMgSiPb, powder-coated, black
	Blind plate	AlMgSiPb, powder-coated, black
	Adapter plate	AlMgSiPb, powder-coated, grayish beige RAL 1019, or stainless steel 1.4404
	Screws	Stainless steel A2-70
	Springs	Stainless steel 1.4310
	Gaskets	Silicone rubber
Air connection	G (NPT) 1/4"/NAMUR interface 1/4"	
Electrical connection	Screw terminal, 2-poles, with cable gland M 16 x 1.5	
Degree of protection	IP 65	
Ambient temperature ¹⁾	-20 ... +80 °C, -45 ... +80 °C	
Weight approx.	450 g, 800 g with adapter plate	

¹⁾ The permissible maximum ambient temperature depends on the permissible ambient temperature of the cable gland, the type of protection and the temperature class

Electrical data			
Type 3967	-XXX1	-XXX2	-XXX3
Nominal signal U_N	6 V DC max. 27 V ¹⁾	12 V DC max. 40 V ¹⁾	24 V DC max. 60 V ¹⁾
Switching point "On" $U_{+80^\circ\text{C}}$	≥ 4.8 V	≥ 9.6 V	≥ 18 V
	$P_{+20^\circ\text{C}} \geq 5.47$ mW	≥ 13.05 mW	≥ 26.71 mW
"Off" $U_{-25^\circ\text{C}}$	≤ 1.0 V	≤ 2.3 V	≤ 4.6 V
Impedance $R_{+20^\circ\text{C}}$	2.6 k Ω	5.3 k Ω	10.5 k Ω
Temperature effect to R	0.4 %/°C	0.2 %/°C	0.1 %/°C
Type of protection Ex ia IIC ²⁾ for use in hazardous areas (zone 1 or 21)			
Type 3967	-1101	-1102	-1103
Permissible maximum values for connection to a certified intrinsically safe circuit			
Output voltage U_i	The following values U_i/I_i apply for nominal signals 6/12/24 V DC:		
Output current I_i	25 V/150 mA, 27 V/125 mA, 28 V/115 mA, 30 V/100 mA, 32 V/85 mA		
Power dissipation ³⁾ P_i	250 mW	No limitations	
External capacitance C_i	≈ 0		
External inductance L_i	≈ 0		
Ambient temperature in temperature class			
	T6	-45 to +60 °C	
	T5	-45 to +70 °C	
	T4	-45 to +80 °C	
Type of protection Ex nA II/Ex nL IIC ⁴⁾ for use in hazardous areas (zone 2 or 22)			
Type 3967	-8101	-8102	-8103
Permissible maximum values for connection to a certified energy-limited circuit			
Output voltage U_i	32 V		
Output current I_i	132 mA		
Power dissipation P_i	No limitation		
External capacitance C_i	≈ 0		
External inductance L_i	≈ 0		
Ambient temperature in temperature class			
	T6	-45 to +60 °C	
	T5	-45 to +70 °C	
	T4	-45 to +80 °C	

¹⁾ Permissible maximum values during 100 % duty. For Ex versions the permissible maximum value U_i is relevant.

²⁾ II 2 G Ex ia IIC T6 (gases in zone 1),
II 2 D Ex tD A21 IP 65 T 80 °C (dusts in zone 21)
according to EC Type Examination Certificate PTB 06 ATEX 2027

³⁾ The permissible maximum power dissipation at 6 V DC and a rectangular characteristic is 250 mW. With a linear characteristic there are no limitations.

⁴⁾ II 3 G Ex nA II T6/II 3 G Ex nL IIC T6 (gases in zone 2),
II 3 D Ex tD A21 IP 65 T 80 °C (dusts in zone 22)
according to Certificate of Conformity PTB 06 ATEX 2028 X

Technical data (continued from page 3)

Pneumatic data	
Switching function	3/2-way function with spring return mechanism
K_{VS} value ¹⁾	0.32
Safety function	SIL ²⁾
Construction	Plug/seat valve with return spring
Air supply	Medium Pressure
	Instrument air, free of corrosive particles, or nitrogen 1.4 ... 10.0 bar ³⁾ , 1.4 ... 6.0 bar (at 0 ... 6.0 bar operating pressure) ⁴⁾ , 1.9 ... 10.0 bar (at 0 ... 10.0 bar operating pressure) ⁴⁾
Operating medium	Instrument air, free of corrosive particles, or nitrogen ³⁾ , Instrument air, free of corrosive particles, oil containing air or noncorrosive gases ⁴⁾
Operating pressure	1.4 ... 10.0 bar ³⁾ , 0 ... 10.0 bar ⁴⁾
Output signal	Operating pressure
Air consumption at 1.4 bar air supply	≤ 25 l/h (actuated), ≤ 80 l/h (unactuated)
Switching time	≤ 65 ms
Switching cycles	≥ 2 × 10 ⁷

1) Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{VS} \times 36.22$, expressed in m³/h

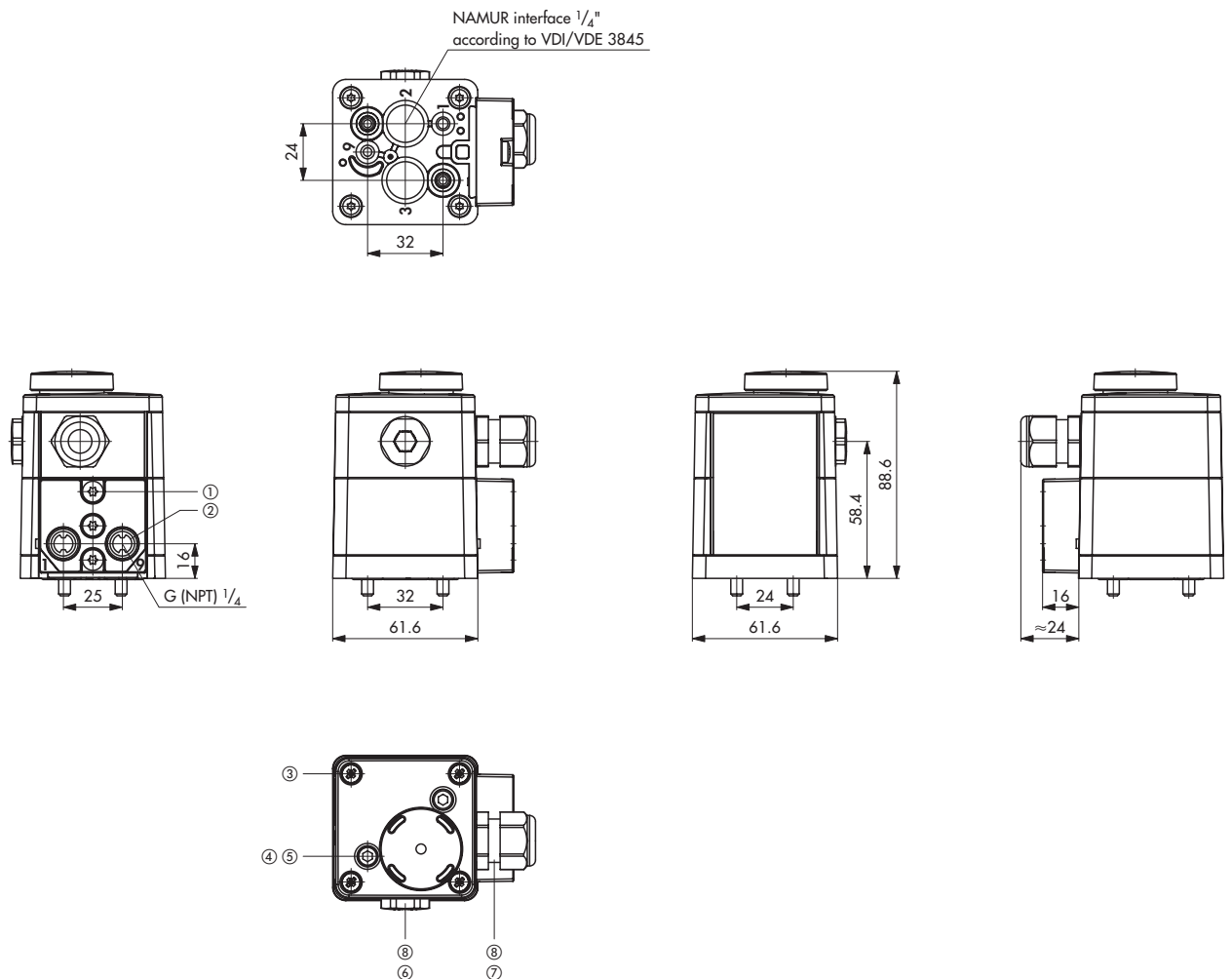
2) Safety Integrity Level SIL according to IEC 61508 (Report No. V 177 2009 T1)

3) With internal air supply

4) With external air supply

Dimensions

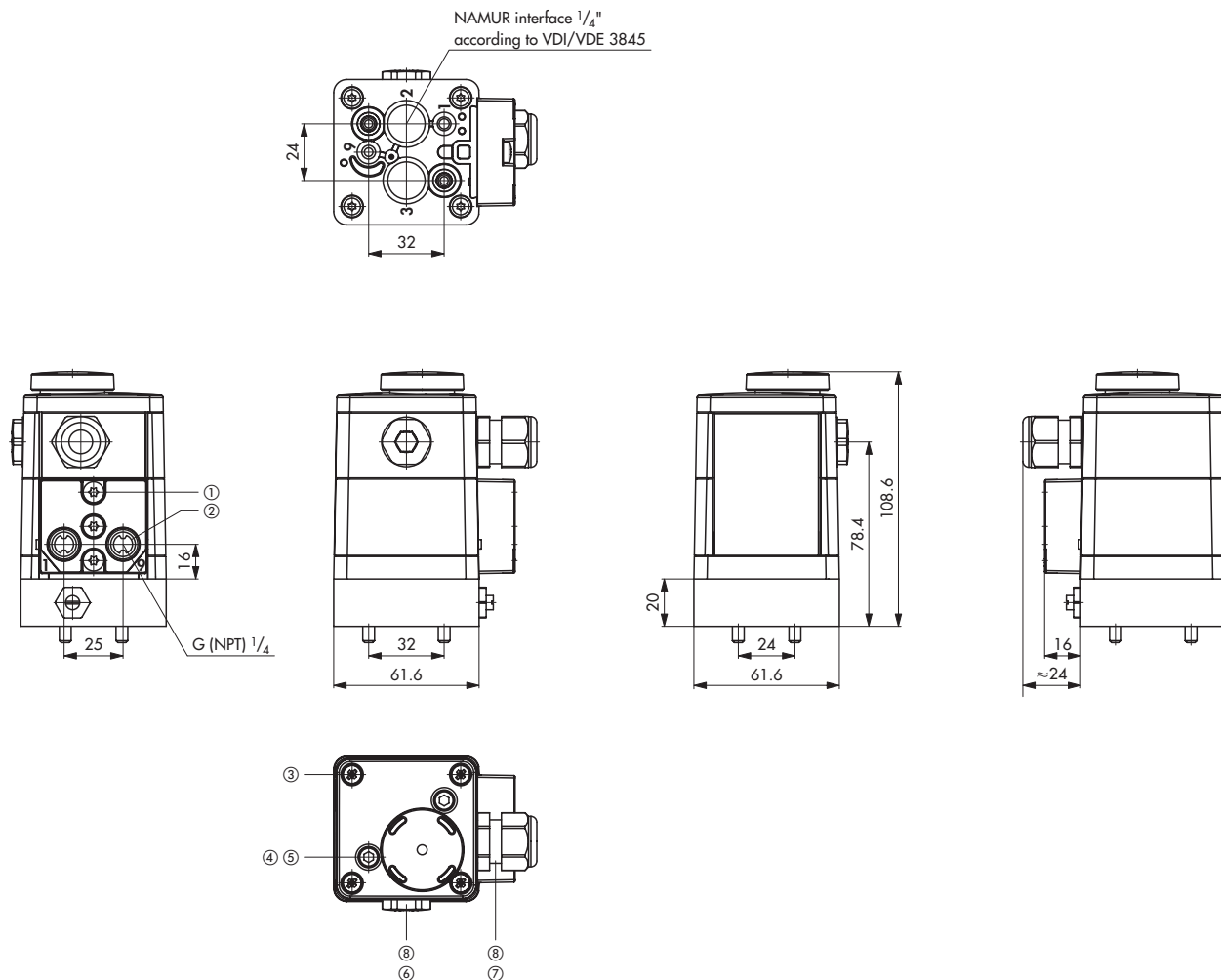
Version with NAMUR interface $\frac{1}{4}$ " according to VDI/VDE 3845



- ① 3 × Self-tapping screw DIN 7964 – M 5 × 20
- ② 2 × Filter $\frac{1}{4}$ "
- ③ 4 × Screw ISO 3506-1 – M 4 × 18
- ④ 2 × Hexagon socket head screw ISO 4762 – M 5 × 80
- ⑤ 2 × Split washer DIN 127 – form B 5
- ⑥ 1 × Blanking plug M 16 × 1.5
- ⑦ 1 × Cable gland M 16 × 1.5
- ⑧ 2 × O-ring 14 × 1.5

Fig. 3 · Dimensions in mm

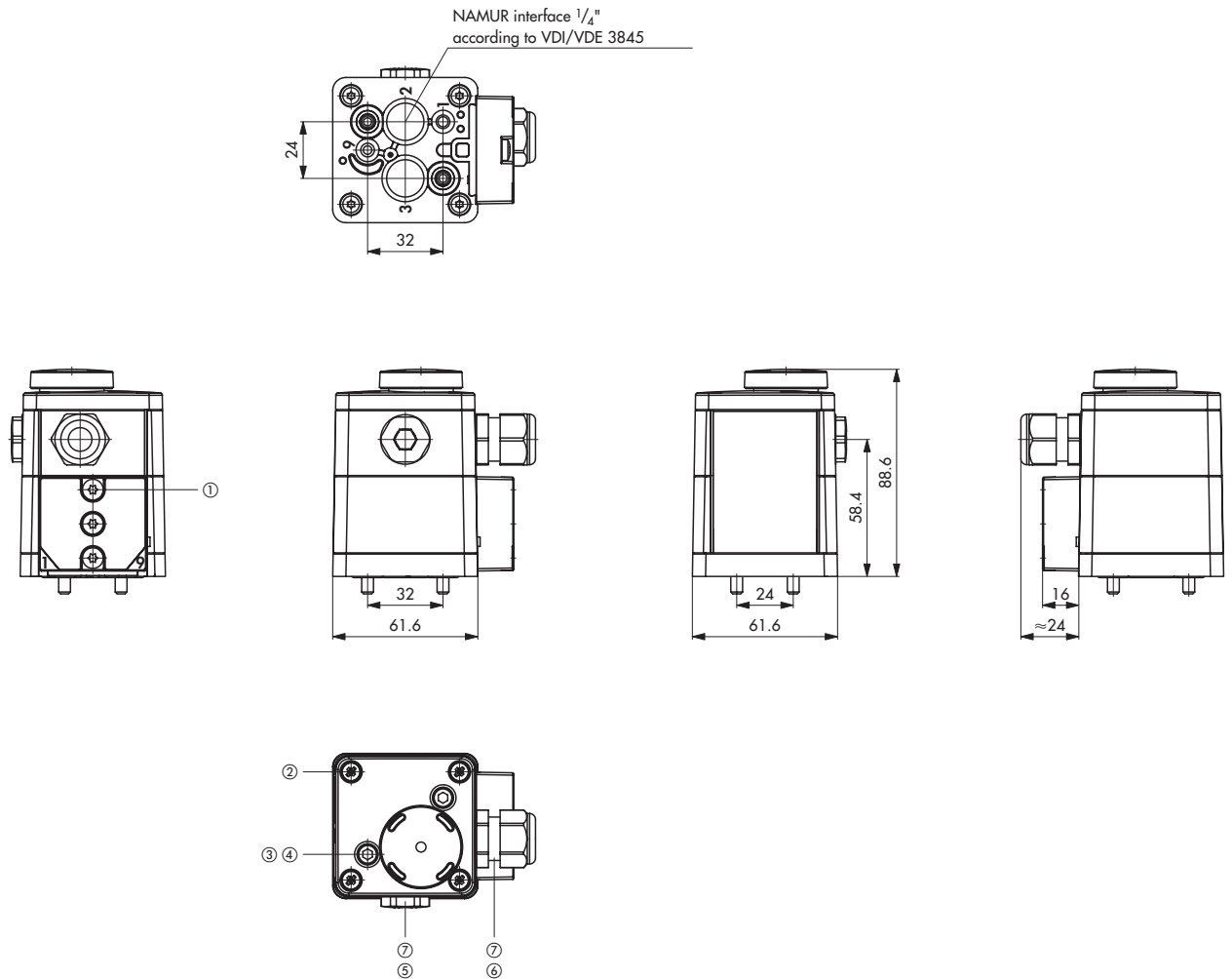
Version with NAMUR interface $\frac{1}{4}$ " according to VDI/VDE 3845 and restrictor plate



- ① 3 × Self-tapping screw DIN 7964 – M 5 × 20
- ② 2 × Filter $\frac{1}{4}$ "
- ③ 4 × Screw ISO 3506-1 – M 4 × 18
- ④ 2 × Hexagon socket head screw ISO 4762 – M 5 × 80
- ⑤ 2 × Split washer DIN 127 – form B 5
- ⑥ 1 × Blanking plug M 16 × 1.5
- ⑦ 1 × Cable gland M 16 × 1.5
- ⑧ 2 × O-ring 14 × 1.5

Fig. 4 · Dimensions in mm

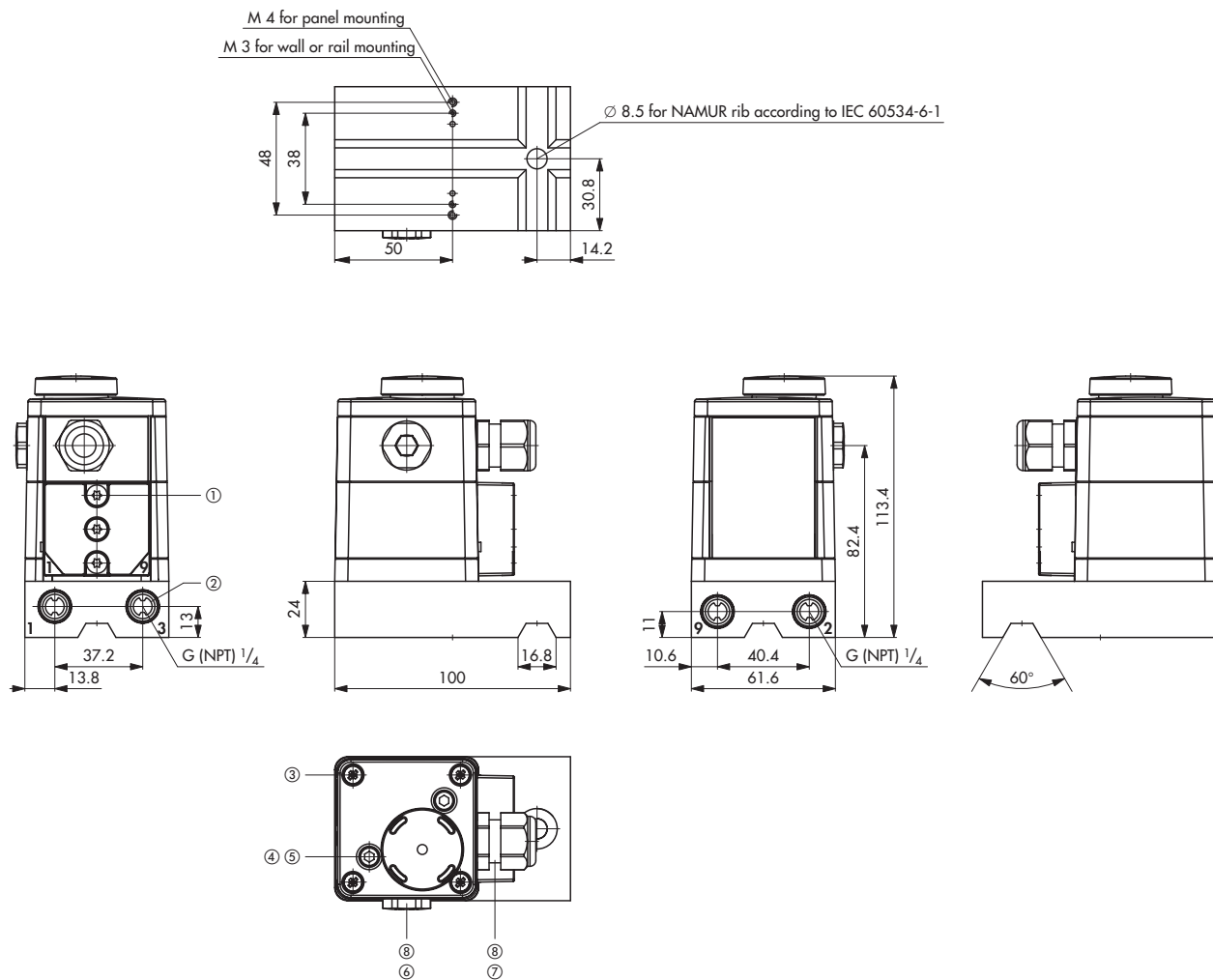
Version with NAMUR interface $\frac{1}{4}$ " according to VDI/VDE 3845 for connection block with positioner



- ① 3 × Self-tapping screw DIN 7964 – M 5 × 20
- ② 4 × Screw ISO 3506-1 – M 4 × 18
- ③ 2 × Hexagon socket head screw ISO 4762 – M 5 × 80
- ④ 2 × Split washer DIN 127 – form B 5
- ⑤ 1 × Blanking plug M 16 × 1.5
- ⑥ 1 × Cable gland M 16 × 1.5
- ⑦ 2 × O-ring 14 × 1.5

Fig. 5 · Dimensions in mm

Version with adapter plate for linear actuators with NAMUR rib according to IEC 60534-6-1, panel, wall or rail mounting



- ① 3 × Screw DIN 7964 – M 5 × 20
- ② 4 × Filter 1/4"
- ③ 4 × Screw ISO 3506-1 – M 4 × 18
- ④ 2 × Hexagon socket head screw ISO 4762 – M 5 × 80
- ⑤ 2 × Split washer DIN 127 – form B 5
- ⑥ 1 × Blanking plug M 16 × 1.5
- ⑦ 1 × Cable gland M 16 × 1.5
- ⑧ 2 × O-ring 14 × 1.5

Fig. 6 · Dimensions in mm

Spare parts and accessories

Spare parts	
Order no.	Designation
1089-1527	Enclosure cover complete, with pushbutton
1089-1528	Enclosure cover complete, with pushbutton switch
1099-6236	Enclosure cover complete
0430-1941	Gasket (for enclosure cover)
8320-1163	Screw ISO 3506-1 – M 4 × 18 (for enclosure cover)
0070-0808	Venting plug
0520-1370	Diaphragm (for venting plug)
8336-0769	Cross head screw ISO 3506 – 3 × 10 (for venting plug)
0070-0799	Blanking plug G 1/4 made of stainless steel 1.4571 (for connection 9)
8421-0070	O-ring 14 × 1.5 made of nitrile butadiene rubber (for blanking plug G 1/4)
0550-0213	Filter 1/4" (for threaded connections)
0430-1884	Reversible gasket (for connection plate and blind plate)
8336-9013	Screw DIN 7964 – M 5 × 20 (for connection plate and blind plate)
0430-1883	Molded gasket (for NAMUR interface 1/4")
8333-1318	Hexagon socket head screw ISO 4762 – M 5 × 80 (for mounting the device)
0270-2758	Split washer DIN 127 – B 5 (for locking the hexagon socket head screw)

Accessories	
Order no.	Designation
8808-1010	Cable gland M 16 × 1.5 made of polyamide, black, cable Ø 5 ... 10 mm
8808-2007	Cable gland M 16 × 1.5 made of polyamide, black, cable Ø 5.5 ... 10 mm (Ex e, manufactured by CEAG)
8808-2008	Cable gland M 16 × 1.5 made of polyamide, blue, cable Ø 4 ... 8 mm
8808-2009	Cable gland M 16 × 1.5 made of brass, nickel-plated, cable Ø 4 ... 8 mm
1991-6471	Cable gland M 16 × 1.5 made of brass, blue, cable Ø 4 ... 8 mm
8808-2011	Enlargement gland M 16 × 1.5 to M 20 made of polyamide, blue (–20 ... +70 °C)
8808-1024	Plug M 16 × 1.5 made of polyamide, black (for cable entry)
8421-0070	O-ring 14 × 1.5 made of nitrile butadiene rubber (for cable gland and blanking plug)
1400-9598	Adapter plate for NAMUR rib according to IEC 60534-6-1, panel, wall or rail mounting, with hexagon socket head screw ISO 4762 – M 8 × 35 and split washer DIN 127 – form B 8, made of AlMgSiPb, powder-coated, grayish beige RAL 1019, connection G 1/4
1400-9599	made of AlMgSiPb, powder-coated, grayish beige RAL 1019, connection 1/4 NPT
1400-9600	made of stainless steel 1.4404, connection G 1/4
1400-9601	made of stainless steel 1.4404, connection 1/4 NPT
1400-5930	Mounting base according to EN 60715 with slotted cheese head screw ISO 1207 – M 3 × 8 for G profile G 32 (2 pcs. required!)
1400-5931	for top hat rail TH 35 (2 pcs. required!)
1400-6726	Mounting plate for wall mounting with 2 hexagon socket head screws ISO 4762 – M 3 × 8
1400-9602	Restrictor plate made of AlMgSiPb, powder-coated, grayish beige RAL 1019, with two threaded bolts M 5, with exhaust air restrictor, K _{V5} value 0.23 ... 0.32, adjustable
1400-9603	with supply air restrictor, K _{V5} value 0.23 ... 0.32, adjustable
3994-0158	Cable break protection device with enclosure for top hat rail TH 35 according to EN 60715, IP 20 (for Type 3967-XXX1)

Connection blocks and accessories for SAMSON Type 3277 Linear Actuators

Order no.	Designation
1400-8813	Connection block for SAMSON Type 3277 Linear Actuators, connection G 1/4
1400-8814	connection 1/4 NPT
1400-6950	Pressure gauge build-on block, 1 × "Output" and 1 × "Supply", made of stainless steel/brass (for connection block)
1400-6444	Piping kit for actuator "Stem retracts", actuator size 240 cm ² , made of steel, zinc-coated
1400-6445	actuator size 240 cm ² , made of stainless steel
1400-6446	actuator size 350 cm ² , made of steel, zinc-coated
1400-6447	actuator size 350 cm ² , made of stainless steel
1400-6448	actuator size 700 cm ² , made of steel, zinc-coated
1400-6449	actuator size 700 cm ² , made of stainless steel

(Specifications subject to change without notice.)

SAMSOMATIC GMBH

Weismüllerstraße 20–22
60314 Frankfurt am Main · Germany

Phone: +49 69 4009-0
Fax: +49 69 4009-1644
E-mail: samsomatic@samson.de
Internet: <http://www.samsomatic.de>

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