



#### Application

Solenoid valve to control pneumatic actuators with NAMUR interface according to VDI/VDE 3845, with integral attachment according to VDI/VDE 3847 or with NAMUR rib according to IEC 60534

Intrinsically safe, low-power binary signals issued by automation equipment or fieldbus systems can be used for controlling purposes. Different nominal signals and connection types allow the solenoid valve to be optimally adapted for the specific task.

#### Special features

- No air consumption
- High level of operational reliability due to the solenoid with armature and poppet valve with ball/seat
- Standard version for nominal signals 14 to 24 V DC
- Types of protection: Ex ia (intrinsic safety) and Ex ec or Ex nA (non-sparking)
- Certification according to ATEX and IECEx
- Power consumption: 71 mW
- Electrical connection using M20x1.5 cable gland
- Corrosion-resistant aluminum enclosure with degree of protection IP 65
- Pilot supply 1.4 to 10 bar
- Ambient temperature  $-45$  to  $+80$  °C, depending on type of protection, temperature class and seals
- Use with safety shut-off valves, certification for safety-instrumented systems according to IEC 61508 (SIL), optional
- Captive screws and cover

#### Version

- 3/2-way solenoid valve with  $K_{VS}$  0.3 and NAMUR interface according to VDI/VDE 3845 and VDI/VDE 3847
- Attachment to actuators with NAMUR interface, with integral attachment or with NAMUR rib
- Restrictor plate with exhaust air or supply restrictor (optional)
- 3/2-way poppet valve with  $K_{VS}$  2.0 and 4.3 and NAMUR interface according to VDI/VDE 3845 (optional)
- Enclosure material and poppet valve material: aluminum

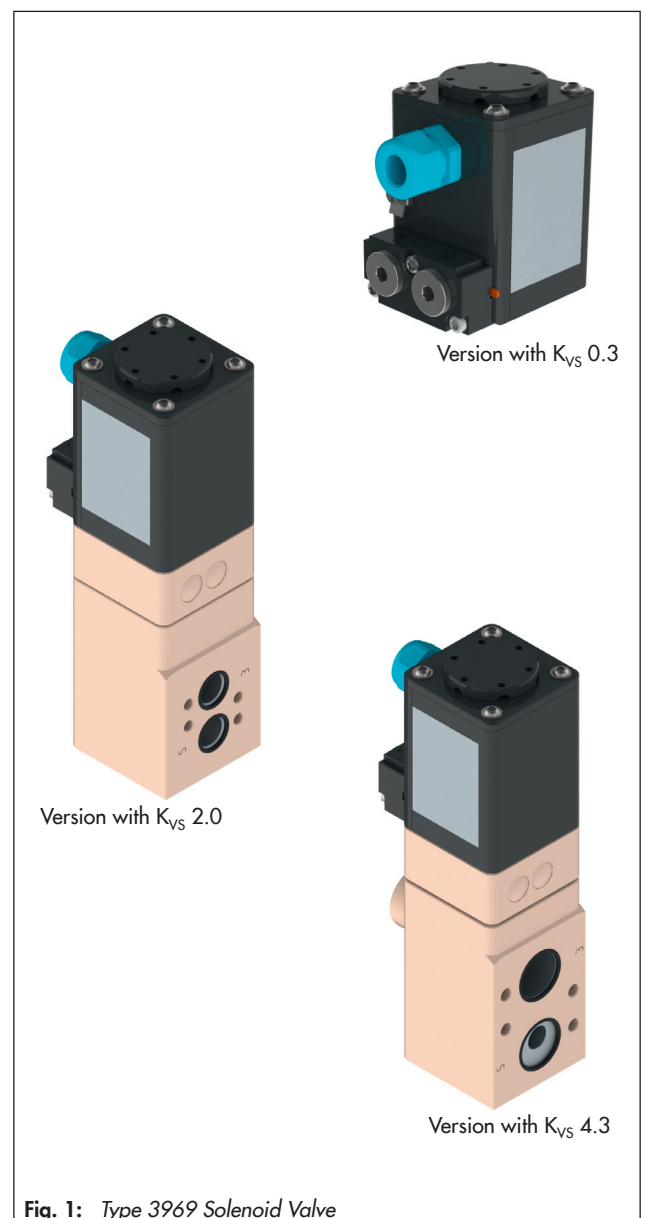
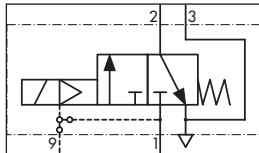
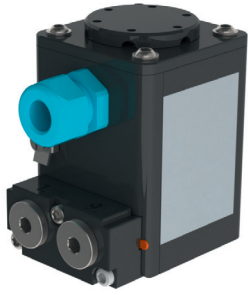
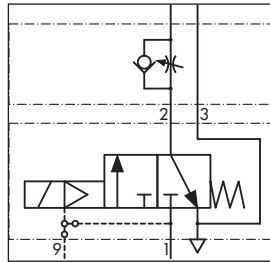
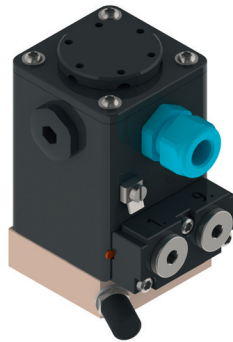


Fig. 1: Type 3969 Solenoid Valve

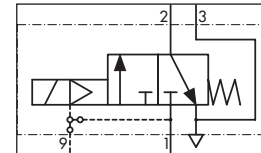
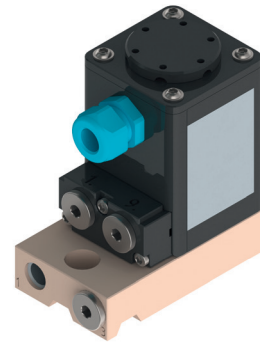
**K<sub>vS</sub> 0.3**



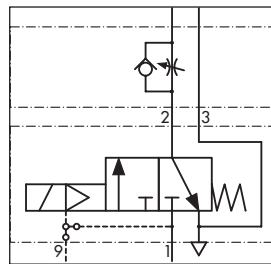
3/2-way function  
NAMUR interface 1/4



3/2-way function  
NAMUR interface 1/4  
Exhaust air restrictor plate

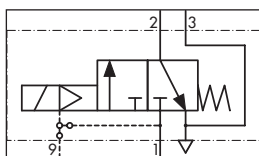
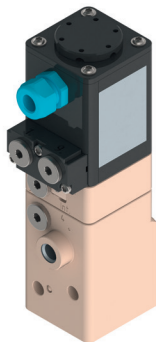


3/2-way function  
Adapter plate for linear actuators with  
NAMUR rib  
Threaded connections 1/4



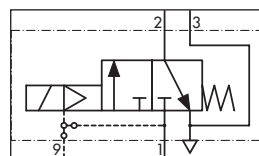
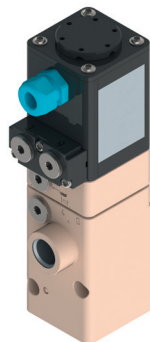
3/2-way function  
NAMUR interface 1/4  
Supply air restrictor plate

**K<sub>vS</sub> 2.0**



3/2-way function  
NAMUR interface 1/4

**K<sub>vS</sub> 4.3**



3/2-way function  
NAMUR interface 1/2

## Function

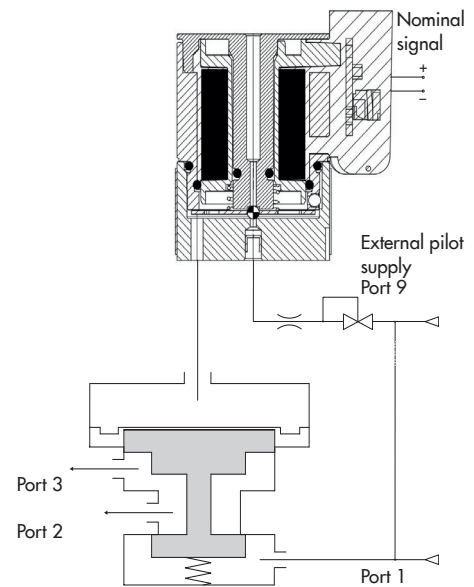
The solenoid valve consists of an electropneumatic binary converter with manual override and integrated poppet valve actuated on one side with return spring.

The pilot supply for the electropneumatic binary converter is fed internally through port 1 or externally through port 9. By turning the turnable gasket, the pilot supply can be changed (see mounting and operating instructions ► EB 3969).

In the idle position, the armature is pressed against the seat of the supply air port by the spring. This causes the ball to close the hole for the pilot supply port and prevents the solenoid valve from consuming air. The solenoid coil is energized by an electric binary signal which causes the armature to be lifted out of the seat of the supply air port against the force of the spring and drawn into the exhaust air port. This causes the pressure to rise above the activation pressure of the integrated poppet valve and switches it to the operating position. After the solenoid coil is de-energized, the integrated poppet valve is switched to the idle position again by a return spring.

Optionally, the solenoid valve can be upgraded to become a pneumatic poppet valve actuated on one side. This results in higher  $K_{VS}$  coefficients (see Data Sheet ► T 3756).

## Functional diagram



**Fig. 2:** Solenoid valve with seat/plug switching element as a poppet valve ( $K_{VS}$  0.3)

## Technical data

General data		
Design	Solenoid with armature and ball/seat valve with return spring	
Degree of protection	IP 65 with filter check valve	
Compliance	<b>CE · RoHS</b>	
Materials	Enclosure	Black anodized aluminum (C35)
	Connecting plate	Black anodized aluminum (C35)
	Adapter plate	Aluminum, powder coated, gray beige RAL 1019
	Screws	Stainless steel A4-70
	Springs	Stainless steel 1.4310
	Seals	Silicone rubber
Environmental conditions according to EN 60721-3	Storage	1K5 (relative humidity $\leq 95\%$ )
	Transport	2K4
	Operation	4K3 -45 to +80 °C
Ambient temperature <sup>1)</sup>	-45 to +80 °C	
Mounting position	Any desired position	
Resistance to vibration	According to EN 60068-2-27 According to EN 60068-2-47 Recommended continuous duty $\leq 150$ m/s <sup>2</sup>	

Electric data			
Nominal signal	$U_N$	14 to 24 V DC <sup>2)</sup>	
Switching point	ON	$U_{80\text{ °C}}$	$\geq 14.1$ V
		$I$	$\geq 6.1$ mA
		$P_{20\text{ °C}}$	$\geq 71.6$ mW
	OFF	$I$	$\leq 0.5$ mA
Input impedance	$R_{20\text{ °C}}$	1.87 k $\Omega$	
Temperature influence	0.39 %/°C		
Type of protection <sup>3)</sup>	Intrinsic safety: II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T85 °C Db  Non-sparking: II 3 G Ex ec IIC T4/T6 Gc or II 3 G nA IIC T4/T6 Gc II 2 D Ex tb IIIC T85 °C Db		
Output voltage <sup>4)</sup>	$U_i$ (V)	28	
Output current <sup>4)</sup>	$I_i$ (mA)	115	
Power dissipation <sup>4)</sup>	$P_i$ (W)	1	
Outer capacitance <sup>4)</sup>	$C_i$ (nF)	Negligibly small	
Outer inductance <sup>4)</sup>	$L_i$ (mH)	Negligibly small	
Ambient temperature <sup>1)</sup>	-45 to +80 °C (temperature class T4)		
Electrical connection	Screw terminal, 2-pole, with cable gland M20x1.5		
Grounding terminal	External ( $A_{\text{max}} = 4$ mm <sup>2</sup> )		

<sup>1)</sup> The maximum permissible ambient temperature depends on the permissible ambient temperature of the components, type of protection and temperature class.

<sup>2)</sup> Maximum permissible value at 100 % duty cycle. The maximum permissible value  $U_i$  applies to explosion-protected versions.

<sup>3)</sup> According to EU type examination certificate and statement of conformity

<sup>4)</sup> Permissible maximum values when connected to a certified intrinsically safe circuit.

Pneumatic data for solenoid valve with $K_{VS}$ 0.3, actuated on one side		
Switching function	3/2-way function with exhaust air feedback	
$K_{VS}$ <sup>1)</sup>	0.3	
Safety approval	SIL <sup>2)</sup>	
Compressed air quality according to ISO 8573-1	Max. particle size and density: Class 4	
	Oil content: Class 3	
	Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected	
Pilot supply	Medium	Instrument air (free from corrosive substances) oil or non-corrosive gases
	Pressure <sup>3)</sup>	1.4 to 10 bar
Operating medium	Instrument air, free from corrosive substances	
Operating pressure	Max. 10 bar	
Switching time	≤60 ms	
Connection	G ¼, ¼ NPT or NAMUR interface ¼ <sup>4)</sup>	
Weight	0.7 kg	
	1.05 kg (with adapter plate)	

<sup>1)</sup> The air flow rate when  $p_1 = 2.4$  bar and  $p_2 = 1.0$  bar is calculated using the following formula:

$$Q = K_{VS} \times 36.22 \text{ in m}^3/\text{h.}$$

<sup>2)</sup> SIL according to IEC 61508

<sup>3)</sup> When using the solenoid valve with an operating pressure of 10 bar, a minimum pilot pressure of 1.9 bar is required.

<sup>4)</sup> NAMUR interface according to VDI/VDE 3845 and VDI/VDE 3847

Poppet valve with NAMUR interface, $K_{VS}$ 2.0 or 4.3, actuated on one side			
Switching function	3/2-way function		
$K_{VS}$ <sup>1)</sup> (direction of flow)	1.1 (4»3)	1.9 (4»3)	
	2.0 (3»5)	4.3 (3»5)	
Safety approval	SIL <sup>2)</sup>		
Design	Poppet valve with diaphragm actuator, soft seated, with return spring		
Material	Enclosure	Aluminum, powder coated, gray beige RAL 1019 or Stainless steel 1.4404	
	Diaphragms	Chloroprene rubber (-20 to +80 °C) or silicone rubber (-45 to +80 °C)	
	Seals	Chloroprene rubber (-20 to +80 °C) or silicone rubber (-45 to +80 °C)	
	Screws	Stainless steel 1.4571	
	Springs	Stainless steel 1.4310	
Operating medium	Instrument air free from corrosive substances or nitrogen <sup>3)</sup> Air containing oil or non-corrosive gases <sup>4)</sup>		
Compressed air quality according to ISO 8573-1	Max. particle size and density: Class 4		
	Oil content: Class 3		
	Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected		
Actuation	With VDI/VDE 3847 interface		
Pilot supply	2.7 to 6 bar <sup>3)</sup>		
	1.4 to 6 bar <sup>4)</sup>		
Max. operating pressure	10.0 bar		
Ambient temperature <sup>5)</sup>	-20 to +80 °C		
	-45 to +80 °C		
Connection	Supply air	G ¼ or ¼ NPT	G ¼ or ¼ NPT
	Exhaust air	G ½ or ½ NPT and NAMUR interface ¼ <sup>6)</sup> with G (NPT) ¾	G ½ or ½ NPT and NAMUR interface ½ <sup>6)</sup>
Approx. weight	1.38 kg	1.5 kg	

<sup>1)</sup> The air flow rate when  $p_1 = 2.4$  bar and  $p_2 = 1.0$  bar is calculated using the following formula:

$$Q = K_{VS} \times 36.22 \text{ in m}^3/\text{h.}$$

<sup>2)</sup> SIL according to IEC 61508

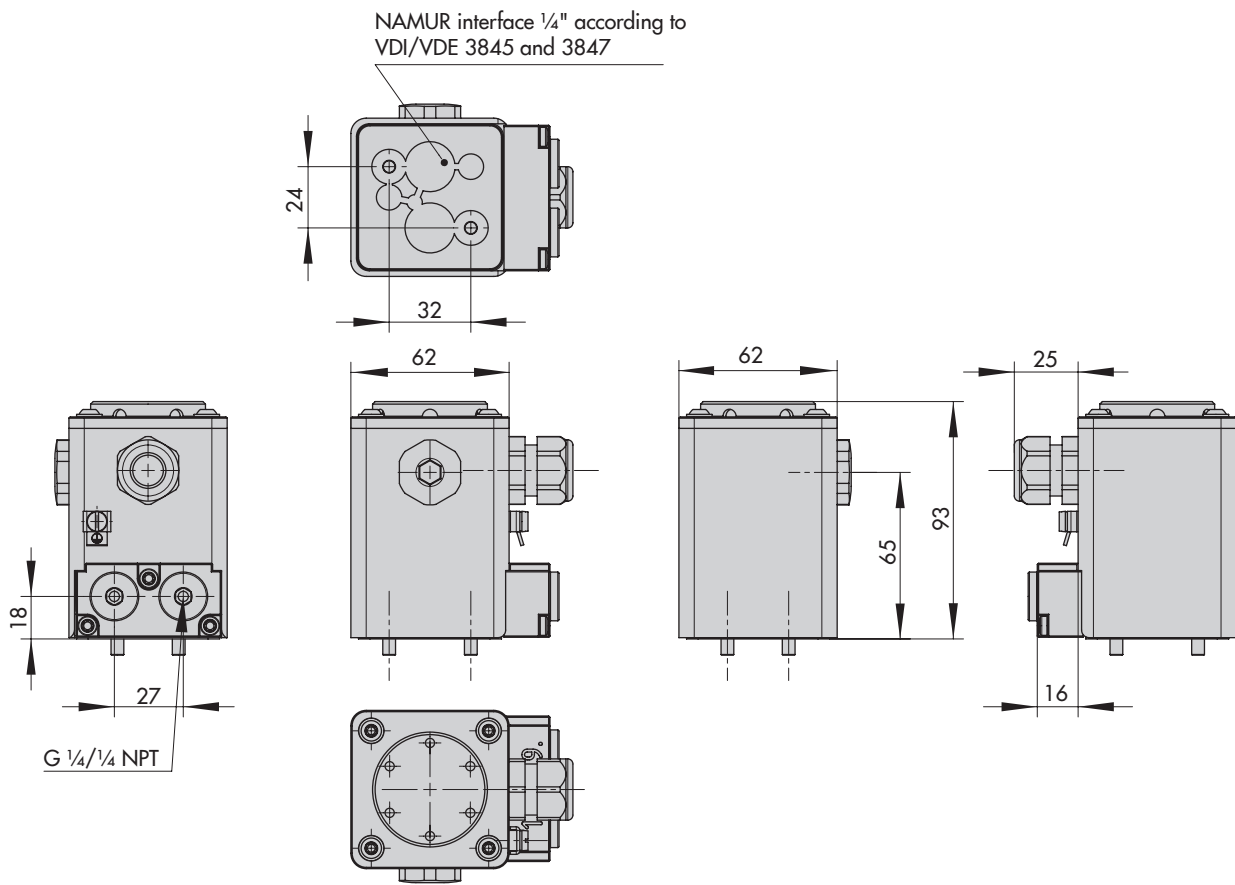
<sup>3)</sup> With internal pilot supply

<sup>4)</sup> With external pilot supply

<sup>5)</sup> The maximum permissible ambient temperature depends on the permissible ambient temperature of the components, type of protection and temperature class.

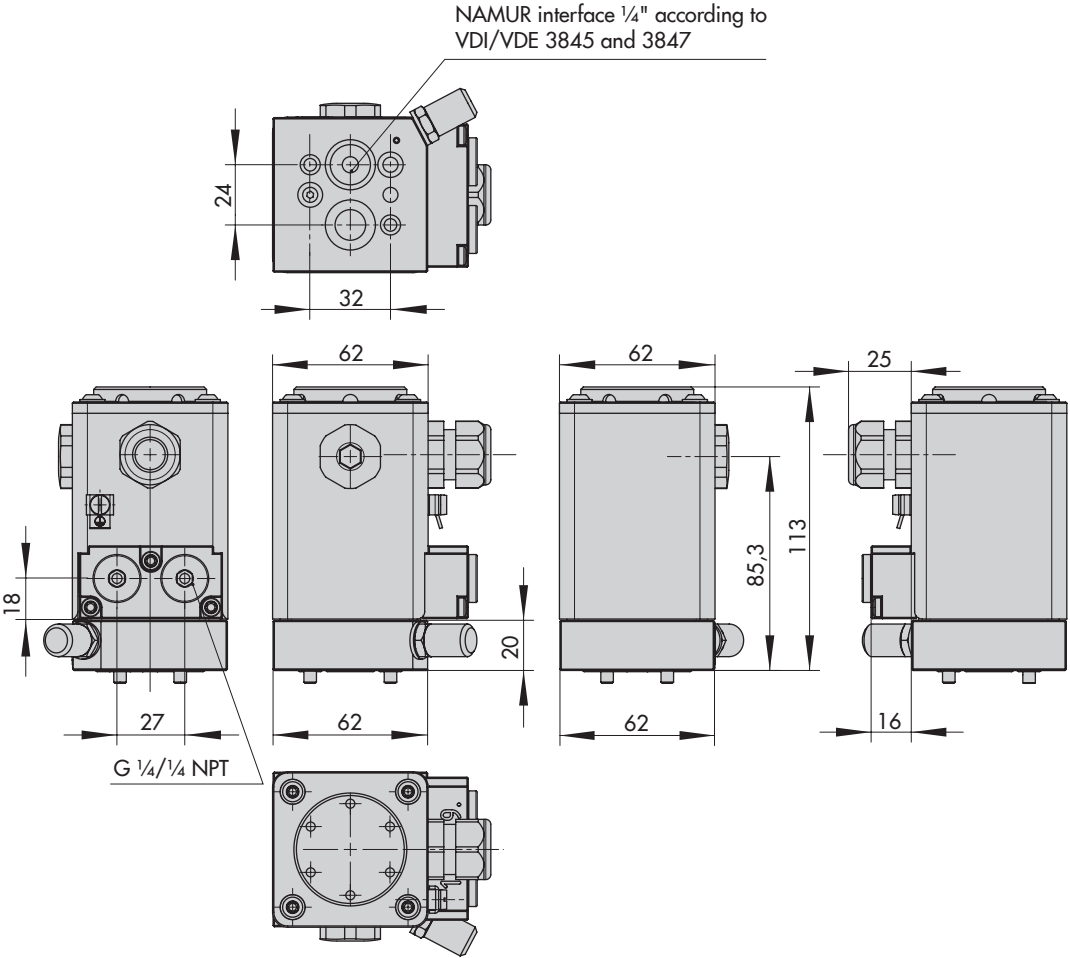
<sup>6)</sup> NAMUR interface according to VDI/VDE 3845

Version with NAMUR interface 1/4" according to VDI/VDE 3845 and direct attachment according to VDI/VDE 3847

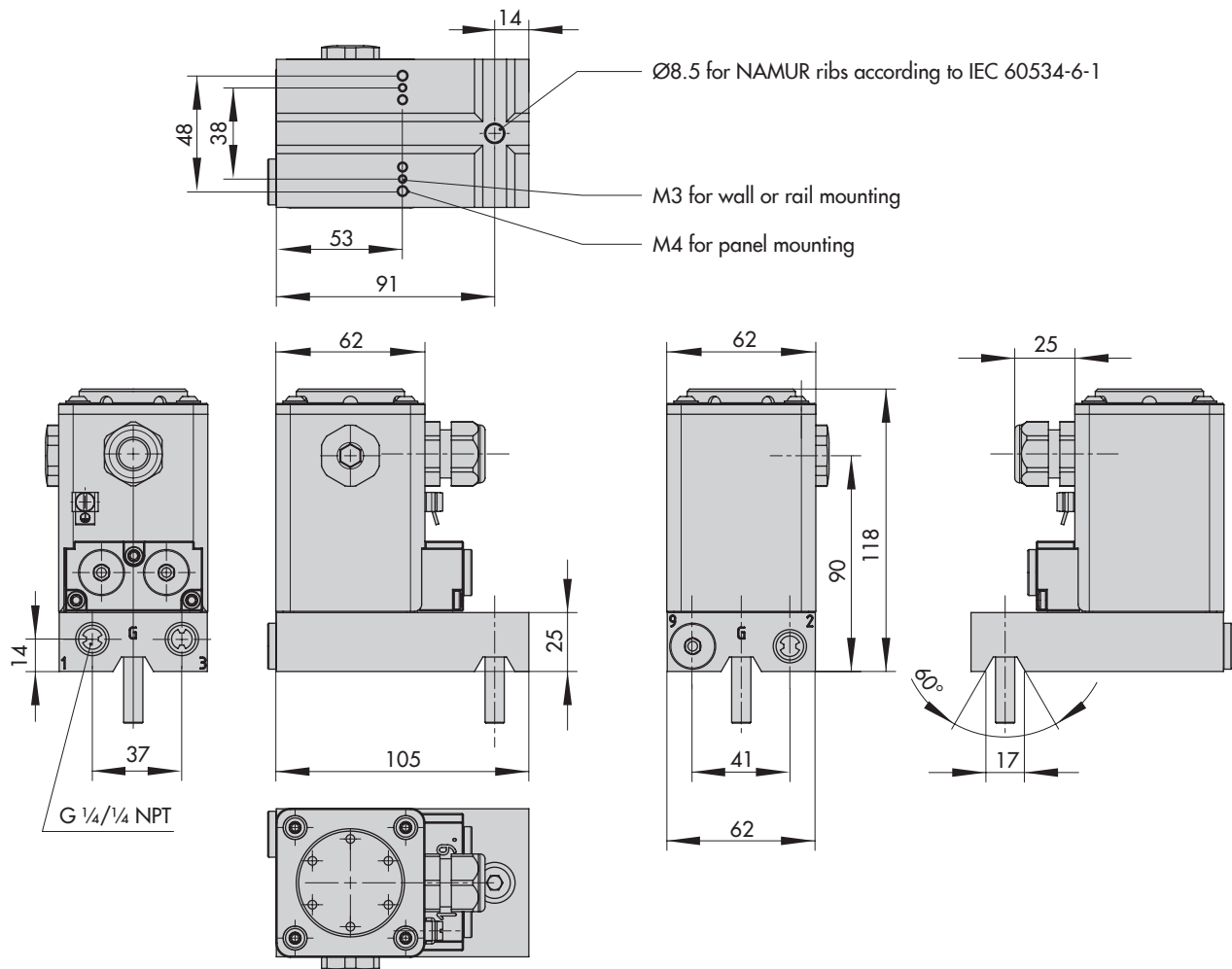


Dimensions (in mm)

Version with NAMUR interface 1/4" according to VDI/VDE 3845 and direct attachment according to VDI/VDE 3847 and restrictor plate



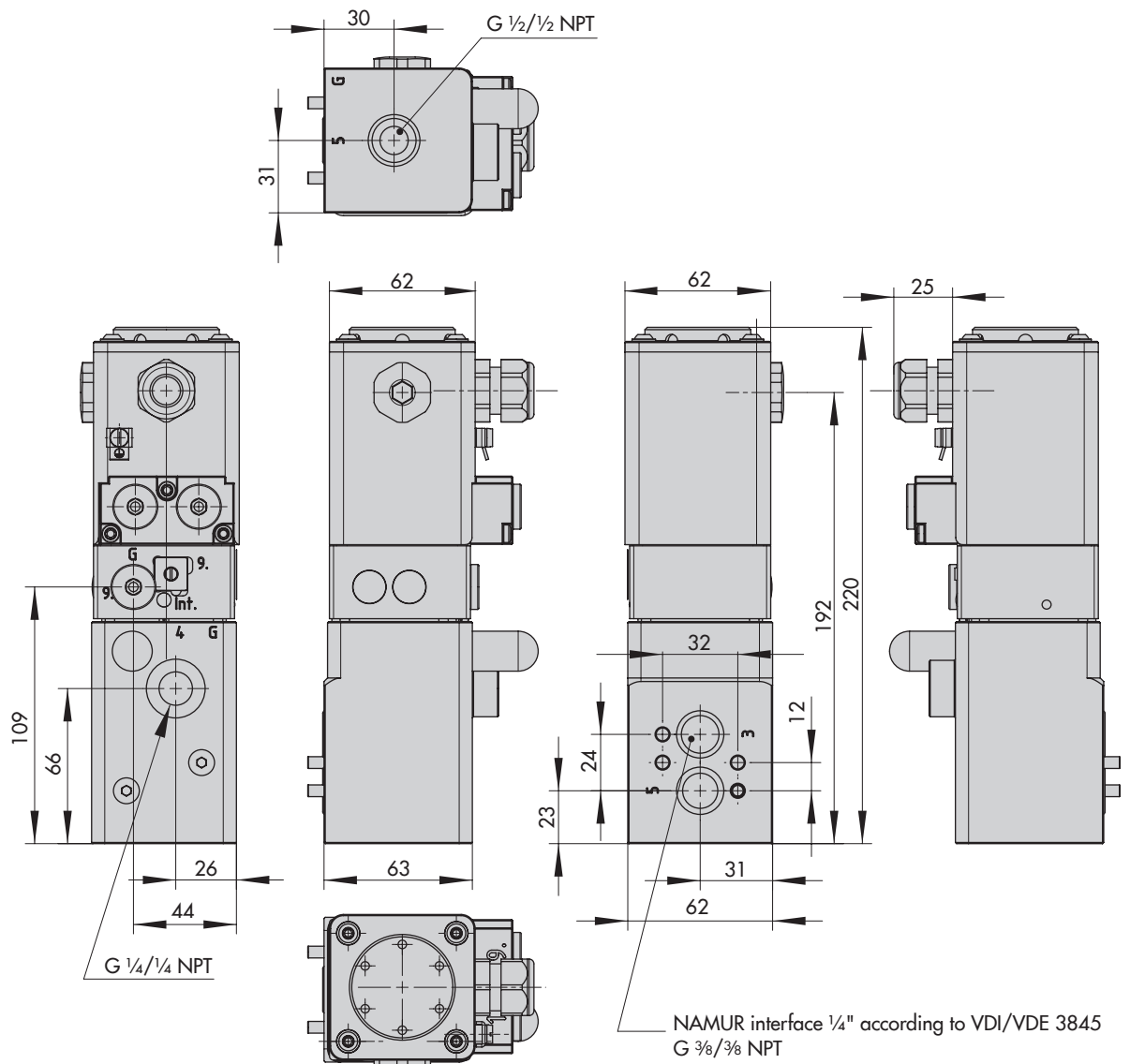
Version with adapter plate for linear actuators with NAMUR rib according to IEC 60531-6-1



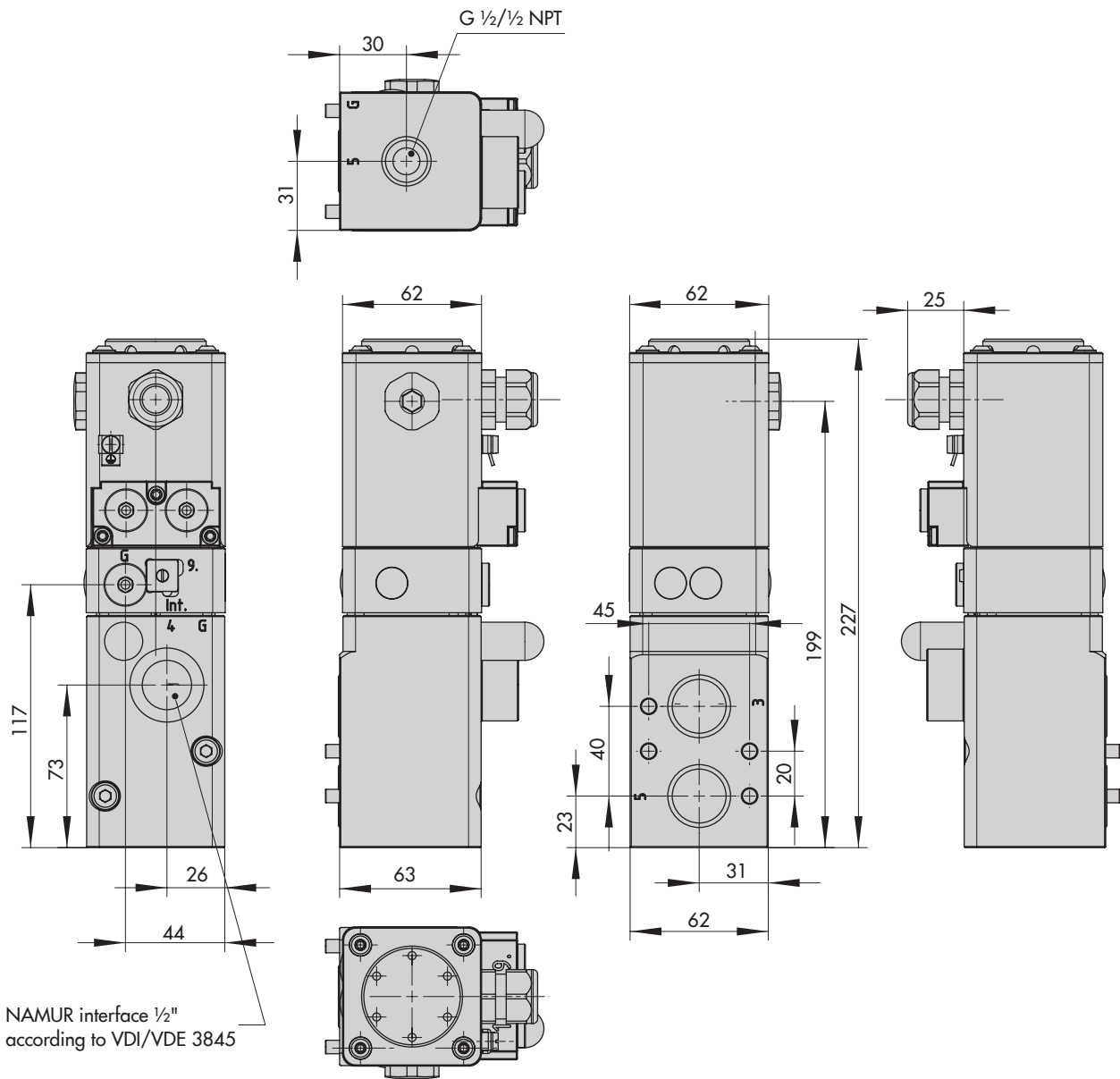


Dimensions (in mm)

Version with poppet valve (K<sub>V5</sub> 2.0)



Version with poppet valve (K<sub>VS</sub> 4.3)







Solenoid valve		Type 3969- x x x x x x x x x x x x x x x x x x x x x x x																		
<b>Degree of protection</b>																				
IP 65		0																		
<b>Ambient temperature <sup>1)</sup></b>																				
-20 to +80 °C		0																		
-45 to +80 °C		1																		
<b>Fail-safe action</b>																				
Without		0																		
SIL <sup>2)</sup>		1																		
<b>Restrictor plate</b>																				
Without													0	0	0					
With exhaust air restrictor plate													1	0	0					
With supply air restrictor plate													2	0	0					
With exhaust air and supply air restrictor plates													3	0	0					

<sup>1)</sup> The maximum permissible ambient temperature depends on the permissible ambient temperature of the components, type of protection and temperature class.

<sup>2)</sup> SIL according to IEC 61508

### Summary of explosion protection approvals

Type	Certification		Type of protection/comments
3969	<b>SIL</b>	Number 968/V 1034.0017	Certification for safety-instrumented systems according to IEC 61508
		Date 2017-04-12	
3969-1	 EU type examination certificate	Number TÜV 17 ATEX 8047 X	II 2G Ex ia IIC T4/T6 Gb II 2 D Ex ia IIIC T85°C Db
		Date 2019-03-12	
3969-1	<b>IECEx</b>	Number IECEx TUR 17.0027X	Ex ia IIC T4/T6 Gb Ex ia IIIC T85°C Db
		Date 2019-03-12	
3969-8	 EU type examination certificate	Number TÜV 17 ATEX 8048 X	II 3 G Ex ec IIC T4/T6 Gc II 3 G Ex nA IIC T4/T6 Gc II 2 D Ex tb IIIC T85°C Db
		Date 2019-03-12	
3969-8	<b>IECEx</b>	Number IECEx TUR 17.0027X	Ex ec (or nA) IIC T4/T6 Gc Ex tb IIIC T85°C Db
		Date 2019-03-12	

**Accessories and spare parts · General**

Designation	Order no.
Enclosure cover	1380-2978
Gasket (for enclosure cover)	0430-3601
Blanking plug G ¼, stainless steel 1.4571 (for threaded connections)	0070-0858
Blanking plug ¼ NPT, stainless steel 1.4571 (for threaded connections)	0070-0862
O-ring 14x1.5 made of nitrile butadiene rubber (for blanking plug)	8421-0070
Turnable gasket (for connecting plate)	0430-3595
Fastening screw (for connecting plate) A4-90, 45x20 (1 pc.)	0180-1523
Fastening screw (for connecting plate) A4-90, 45x35 (2 pcs.)	0180-1524
Filter ¼ (for connecting plate)	0550-0213
Molded seal (for NAMUR interface ¼, K <sub>VS</sub> 0.3)	0430-1883
O-ring 16x2, -20 to +80 °C (for poppet valves with NAMUR interface ¼, K <sub>VS</sub> 2.0)	8421-0364
O-ring 16x2, -45 to +80 °C (for poppet valves with NAMUR interface ¼, K <sub>VS</sub> 2.0)	8421-0368
O-ring 24x2, -20 to +80 °C (for poppet valves with NAMUR interface ½, K <sub>VS</sub> 4.3)	8421-1077
O-ring 24x2, -45 to +80 °C (for poppet valves with NAMUR interface ½, K <sub>VS</sub> 4.3)	8421-0425
Screw M5x60 A4 (for poppet valves with NAMUR interface, K <sub>VS</sub> 2.0)	8333-1303
Spring washer A5-A4 (for poppet valves with NAMUR interface, K <sub>VS</sub> 2.0)	8392-0651
Screw M5x60 A4 (for poppet valves with NAMUR interface, K <sub>VS</sub> 4.3)	8333-0538
Spring washer A5-A4 (for poppet valves with NAMUR interface, K <sub>VS</sub> 4.3)	8392-0658
Cable gland M20x1.5 made of black polyamide, 6 to 12 mm cable diameter	8808-1011
Cable gland M20x1.5 made of blue polyamide, 6 to 12 mm cable diameter	8808-1012
NBR O-ring 18x2 (for cable gland)	8421-0067
Cable gland M20x1.5 made of black polyamide, 5 to 13 mm cable diameter (Ex e, CEAG)	8808-0178
Cable gland M20x1.5 made of blue polyamide, 5 to 13 mm cable diameter	8808-0179
Cable gland M20x1.5, nickel-plated brass, 6 to 12 mm cable diameter	8808-0138
Cable gland M20x1.5, brass, blue, 6 to 12 mm cable diameter	1890-4876
Cable gland M20x1.5, nickel-plated brass, 7 to 12 mm cable diameter (Ex e, CEAG)	8808-2043
Cable gland M20x1.5 made of blue polyamide, 10 to 14 mm cable diameter	8808-2016
Blanking plug M20x1.5, black polyamide (for cable entry)	8808-1025
NBR O-ring 18x2 (for blanking plug)	8421-0067
Blanking plug M20x1.5, nickel-plated brass (Ex e, CEAG) (for cable entry)	8808-3513
Screw plug G ¼ (for pneumatic connection)	0070-0858
Screw plug ¼ NPT (for pneumatic connection)	0070-0862
NBR O-ring 14x1.5 (for screw plug)	8421-0067

### Accessories for K<sub>VS</sub> 0.3

Designation	Order no.
Adapter plate for NAMUR rib according to IEC 60534-6-1, panel, wall or rail mounting, including fastening screw	
Aluminum, powder coated, gray beige RAL 1019, G ¼ connection	1400-9598
Aluminum, powder coated, gray beige RAL 1019, ¼ NPT connection	1400-9599
Stainless steel 1.4404, G ¼ connection	1400-9600
Stainless steel 1.4404, ¼ NPT connection	1400-9601
Mounting base according to EN 60715	
G-profile rail 32 (2 pcs. required)	1400-5930
For 35 mm top-hat rail mounting (2 pcs. required)	1400-5931
Mounting plate for wall mounting including fastening screws	1400-6726
Restrictor plate	
With exhaust air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of aluminum, powder coated, gray beige RAL 1019	1400-9602
With exhaust air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of aluminum, powder coated, gray beige RAL 1019, <b>SIL</b>	1402-0141
With exhaust air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of stainless steel 1.4404	1402-0137
With exhaust air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of stainless steel 1.4404, <b>SIL</b>	1402-0142
With supply air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of aluminum, powder coated, gray beige RAL 1019	1400-9603
With supply air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of aluminum, powder coated, gray beige RAL 1019, <b>SIL</b>	1402-0139
With supply air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of stainless steel 1.4404	1402-0136
With supply air restrictor, K <sub>VS</sub> 0.01 to 0.28, adjustable; made of stainless steel 1.4404, <b>SIL</b>	1402-0140
Adapter plate for NAMUR interface ¼ on NAMUR rib ¼ with external connections	
Aluminum, powder coated, gray beige RAL 1019, G ¼ connection	1402-0695
Aluminum, powder coated, gray beige RAL 1019, ¼ NPT connection	1402-0697
Stainless steel 1.4404, G ¼ connection	1402-0696
Stainless steel 1.4404, ¼ NPT connection	1402-0698
Double-axial adapter	
90°, aluminum, powder coated, gray beige RAL 1019	1993-0089
270°, aluminum, powder coated, gray beige RAL 1019	1993-0220
180°, aluminum, powder coated, gray beige RAL 1019	1402-0280
Adapter plate for NAMUR interface ¼ on NAMUR rib ½	
Aluminum, powder coated, gray beige RAL 1019	1380-1652
Stainless steel 1.4404	1380-1797
Adapter plate with NAMUR interface ¼	
For SAMSON Type 3351	1402-0095
For SAMSON Type 3353 and Type 3354	1409-3001
Hexagon socket head screw M5x6 (required in addition to 1409-3001)	8333-1237
M5 seal (required in addition to 1409-3001)	0790-6118

### Accessories for K<sub>V5</sub> 0.3

Designation	Order no.
Mounting block for SAMSON Type 3277 Pneumatic Actuator	
G ¼ connection	1400-8817
¼ NPT connection	1400-8818
Pressure gauge mounting block, 1x Output and 1x Supply, made of stainless steel/brass (for mounting block)	1400-6950
Piping for actuator with "stem retracts" fail-safe action	
240 cm <sup>2</sup> actuator area, zinc-plated steel	1400-6444
240 cm <sup>2</sup> actuator area, CrNiMo steel	1400-6445
350 cm <sup>2</sup> actuator area, zinc-plated steel	1400-6446
350 cm <sup>2</sup> actuator area, CrNiMo steel	1400-6447
700 cm <sup>2</sup> actuator area, zinc-plated steel	1400-6448
700 cm <sup>2</sup> actuator area, CrNiMo steel	1400-6449

### Accessories for K<sub>V5</sub> 2.0

Designation	Order no.
Adapter plate for NAMUR rib acc. to IEC 60534-6-1	
Aluminum, powder coated, gray beige RAL 1019, G ¼ connection	1400-6751
Aluminum, powder coated, gray beige RAL 1019, ¼ NPT connection	1400-9924
Adapter plate for NAMUR interface ¼ on NAMUR rib ½	
Aluminum, powder coated, gray beige RAL 1019	1380-1652
Stainless steel 1.4404	1380-1797

### Accessories for K<sub>V5</sub> 4.3

Designation	Order no.
Adapter plate for NAMUR interface ½ to thread ½	
Aluminum, powder coated, gray beige RAL 1019, G ½ connection	0360-3945
Aluminum, powder coated, gray beige RAL 1019, ½ NPT connection	0360-3946
Stainless steel 1.4404, G ½ connection	0360-3947
Stainless steel 1.4404, ½ NPT connection	0360-3948
Adapter plate for NAMUR interface ½ on NAMUR rib ½	
Aluminum, powder coated, gray beige RAL 1019	1380-1795
Stainless steel 1.4404	1380-1796
Adapter plate for NAMUR rib acc. to IEC 60534-6-1	
Aluminum, powder coated, gray beige RAL 1019, G ½ connection	1402-0827
Aluminum, powder coated, gray beige RAL 1019, ½ NPT connection	1402-0829
Stainless steel 1.4404, G ½ connection	1402-0828
Stainless steel 1.4404, ½ NPT connection	1402-0830
Double-axial adapter	
90°, aluminum, powder coated, gray beige RAL 1019	1402-0602
90°, stainless steel 1.4404	1402-0603

