

## Application

Solenoid valve for controlling pneumatic linear actuators with NAMUR rib according to IEC 60534 or pneumatic rotary actuators with NAMUR interface according to VDI/VDE 3845



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

## Special features

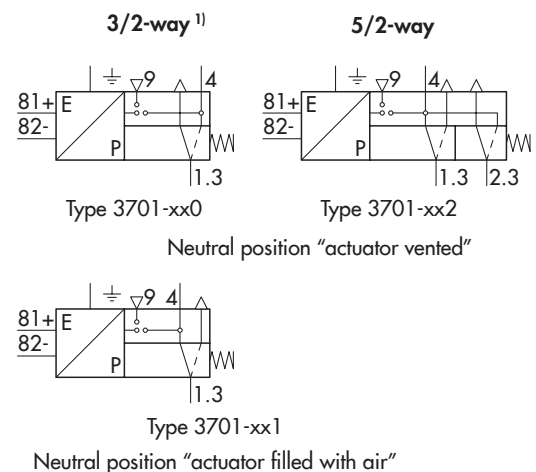
- High level of operational reliability due to the flapper/nozzle assembly and booster valve with a diaphragm actuator
- Standard version for nominal signals 6, 12, 24 V DC or 24, 48, 115, 230 V AC
- Type of protection: intrinsic safety  $\text{Ex}$  II 2G Ex ia IIC T6
- Non-sparking  $\text{Ex}$  II 3G Ex nA II T6 according to ATEX
- Nominal signals 6, 12 or 24 V DC for CSA and FM
- Power consumption from 6 to 27 mW or 0.04 to 0.46 VA (depending on nominal signal)
- Electrical connection using M20 x 1.5 cable gland or with optional connector
- Corrosion-resistant enclosure with degree of protection IP 54 or IP 65
- Version compatible with paint or free of silicone on request
- Supply air 1.4 to 6 bar
- Service life: more than 20 million switching cycles
- Ambient temperature  $-45$  to  $80$  °C, depending on type of protection, temperature class and seals
- EC type examination performed by TÜV Rheinland for safety-instrumented systems according to DIN 3394 Part 1, DIN EN 161, DIN 32725 and optionally according to DIN 32730
- Use with safety shut-off valves, certification for safety-instrumented systems according to IEC 61508 (SIL), optional
- Cable break protection (accessories)

## Versions

- 3/2-way or 5/2-way solenoid valve with  $K_{VS} = 0.25$
- Special switching functions on request
- The actuator can be vented or alternatively filled with air in the neutral position of the 3/2-way solenoid valve
- Attachment to linear actuators with NAMUR rib or rod-type yoke as well as to rotary actuators with NAMUR interface
- Interfaces for special attachment on request



Fig. 1: Type 3701 Solenoid Valve



<sup>1)</sup> Version for rotary actuators with an internal exhaust air feedback

Fig. 2: Logic symbols for 3/2-way and 5/2-way solenoid valves

**Table 1: Technical data of Type 3701 Solenoid Valve**

General data		
Version	Solenoid with flapper/nozzle assembly and diaphragm switching elements	
Degree of protection	IP 54 with Filter · IP 65 with filter check valve	
Compliance	<b>CE · ENEC</b>	
Material	Enclosure	AlMg, powder coated, gray beige RAL 1019
	NAMUR adapter plate	AlMg, powder coated, gray beige RAL 1019
	Screws	1.4571
	Springs	1.4310
	Seals	Silicone rubber, Perbunan
Diaphragms	Chloroprene rubber 57 Cr 868 (-20 to +80 °C) · Silicone rubber (-45 to +80 °C)	
Ambient temperature	See Electric data	
Mounting position	Any desired position	
Weight	Approx. 450 g	

Electric data									
Nominal signal	$U_n$	<b>6 V DC</b>	<b>12 V DC</b>	<b>24 V DC</b>	<b>24 V AC</b>	<b>48 V AC</b>	<b>115 V AC</b>	<b>230 V AC</b>	
	$U_{max}$	27 V	25 V	32 V	36 V	80 V	130 V	255 V	
	f	-			48 to 62 Hz				
Switching point	On	$U_{80 °C}$	≥ 4.8 V	≥ 9.6 V	≥ 18 V	≥ 19 to 36 V	≥ 42 to 80 V	≥ 82 to 130 V	≥ 183 to 255 V
		$I_{20 °C}$	≥ 1.41 mA	≥ 1.52 mA	≥ 1.57 mA	≥ 1.9 mA	≥ 1.9 mA	≥ 2.2 mA	≥ 2.6 mA
	$P_{20 °C}$	≥ 5.47 mW	≥ 13.05 mW	≥ 26.71 mW	≥ 0.04 VA	≥ 0.07 VA	≥ 0.17 VA	≥ 0.46 VA	
	Off <sub>-25 °C</sub>	U	≤ 1.0 V	≤ 2.4 V	≤ 4.7 V	≤ 4.5 V	≤ 9 V	≤ 18 V	≤ 36 V
Input impedance	R	2.6 kΩ	5.5 kΩ	10.7 kΩ	Approx. 10 kΩ	Approx. 24 kΩ	Approx. 40 kΩ	Approx. 80 kΩ	
Temperature influence		0.4 %/K	0.2 %/K	0.1 %/K	0.1 %/K	0.1 %/K	0.05 %/K	0.03 %/K	
Type of protection <sup>1)</sup>		Intrinsic safety II 2G Ex ia IIC T6 Non-sparking II 3G Ex nA II T6			No explosion protection				
Output voltage <sup>2)</sup>	$U_i$ (V)	25 · 27 · 28 · 30 · 32			-				
Output current <sup>2)</sup>	$I_i$ (mA)	150 · 125 · 115 · 100 · 85			-				
Power dissipation	$P_i$ (mW)	250	No restrictions			-			
Outer inductivity <sup>2)</sup>	$L_i$	Negligibly small			-				
Outer capacitance <sup>2)</sup>	$C_i$	Negligibly small			-				
Ambient temperature <sup>7)</sup>		-45 to +60 °C (temperature class T6) -45 to +70 °C (temperature class T5) -45 to +80 °C (temperature class T4)			-				
Connection		See article code on page 4							

Pneumatic data			
<b>Type 3701</b>		<b>-xx0 / -xx1</b>	<b>-xx2</b>
Fail-safe action		TÜV <sup>3)</sup> /SIL <sup>3)</sup>	-
Version		3/2-way function	5/2-way function
$K_{VS}$ coefficient <sup>4)</sup>		0.25	0.25
Supply air	Medium	Instrument air, free from corrosive substances and nitrogen	
	Pressure	1.4 to 6 bar	
Operating medium		Instrument air, free from corrosive substances <sup>5)</sup> · Air containing oil, nitrogen, non-corrosive gases <sup>6)</sup>	
Operating pressure		Max. 6 bar	
Output signal		Operating pressure	
Air consumption		≤ 80 l <sub>n</sub> /h at 1.4 bar supply air in neutral position ≤ 10 l <sub>n</sub> /h at 1.4 bar supply air in operating position	
Switching time <sup>7)</sup>		≤ 65 ms	
Service life		≥ 2 × 10 <sup>7</sup> switching cycles (at -20 to +80 °C) ≥ 2 × 10 <sup>6</sup> switching cycles (at -45 to +80 °C)	
Connection		G ¼ (¼ NPT)	

<sup>1)</sup> EC type examination certificate PTB 01 ATEX 2178 and statement of conformity PTB 02 ATEX 2014 X

<sup>2)</sup> Permissible maximum values when connected to a certified intrinsically safe circuit.

<sup>3)</sup> Report no. S 384 2013 E2 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730); Report no. V 60.09/14 rev. 01 (certification for safety-instrumented systems according to IEC 61508/SIL).

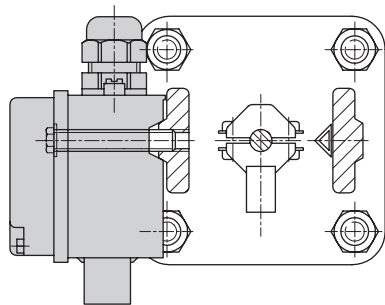
<sup>4)</sup> The air flow rate when  $p_1 = 2.4$  bar and  $p_2 = 1.0$  can be calculated using the following formula:  $Q = K_{VS} \times 36.22$  in m<sup>3</sup>/h.

<sup>5)</sup> With internal air supply (delivered status).

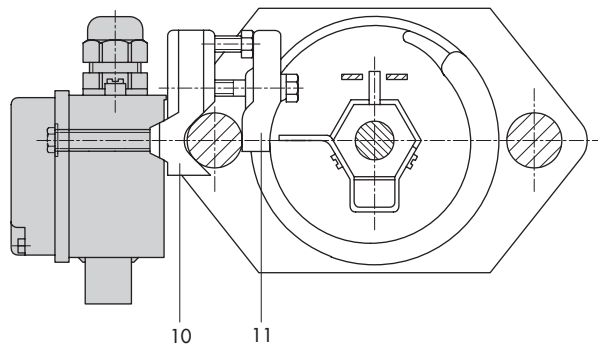
<sup>6)</sup> With external air supply (see mounting and operating instructions).

<sup>7)</sup> Permissible ambient temperature -45 °C only applicable with diaphragm and seals made of silicone rubber and metal cable gland.

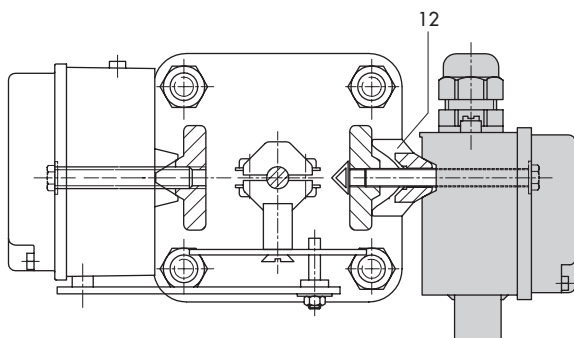
Attachment and dimensions of the Type 3701 Solenoid Valve · All dimensions in mm



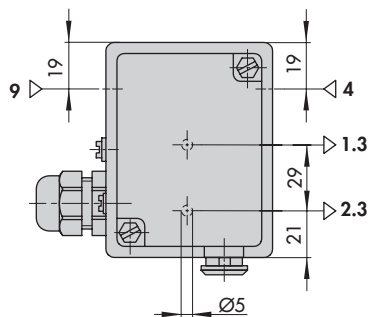
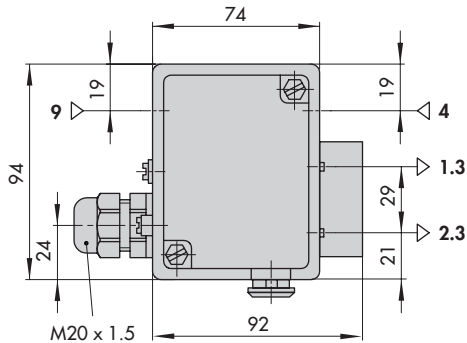
Attachment according to NAMUR, e.g. to Series 240 and 250 Valves



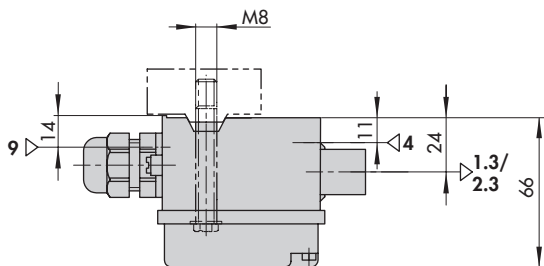
Attachment with clamping plate to valves with rod-type yoke (10, 11: support with clamping plate, order no. 1400-5432)



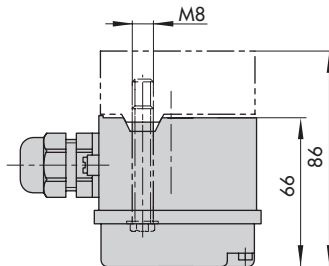
Attachment to valves in DN 15 to 80 with positioner (12: distance piece, order no. 1400-5905)



Adapter plate with NAMUR interface



Dimensions for attachment according to NAMUR









Dimensions for attachment to adapter plate

Fig. 3: Dimensions

## Article code

Solenoid valve	Type 3701-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
<b>Explosion protection</b>																
Without	0															
II 2G Ex ia II C T6/II 2D Ex tb IIIC T 80 °C IP65 ATEX	1															
Ex ia CSA/FM	3															
II 3G Ex nA II T6/ic IIC T6/II 3D Ex tc IIIC T 80 °C IP65 ATEX	8															
<b>Nominal signal</b>																
6 V DC	1															
12 V DC	2															
24 V DC	3															
230 V AC (without explosion protection)	5															
115 V AC (without explosion protection)	6															
48 V AC (without explosion protection)	7															
24 V AC (without explosion protection)	8															
<b>Switching function</b>																
3/2-way, NC, $K_{VS} = 0.25$ , circuit 1	0															
3/2-way, NO, $K_{VS} = 0.25$ , circuit 2	1															
5/2-way, $K_{VS} = 0.25$	2															
<b>Attachment</b>																
NAMUR interface for rotary actuators including adapter plate (1400-5235)	0															
NAMUR rib for linear actuators	1															
For rotary actuators additionally requiring a NAMUR adapter plate (1400-5235)	2															
<b>Threaded connection</b>																
G 1/4	0															
1/4 NPT	1															
<b>Electrical connection</b>																
Without cable gland, fitted with blanking plug	0	0														
Black cable gland M20 x 1.5	0	1														
Blue cable gland M20 x 1.5	1	1														
Adapter M20 x 1.5 to 1/2 NPT	1	2														
Black CEAG cable gland M20 x 1.5	1	3														
Cable gland M20 x 1.5, brass	1	4														
Harting connector, without cable socket	2	1														
Connector M12 x 1, nickel-plated brass, without cable socket	2	2														
Connector type A according to DIN EN 175301-803, without cable socket	2	3														
Binder connector, without cable socket	2	4														
<b>Degree of protection</b>																
IP 54								0								
IP 65, with filter check valve made of polyamide								1								
IP 65, with filter check valve made of stainless steel								2								
IP 20								3								
<b>Ambient temperature</b>																
-20 to +80 °C								0								
-45 to +80 °C								2								
<b>Safety approval</b>																
Without										0						
SIL (only with 3/2-way function)										1						
TÜV (only with 3/2-way function)										2						
<b>Special version</b>																
Without												0	0	0		
Output 1.3 sealed by a stainless steel M8 blanking plug												0	0	1		
GOST approval Ex ia (see product list 1120-3010)												0	1	1		

## Summary of explosion protection approvals

Type	Certification			Type of protection/comments
3701	SIL	No.	V 60.09/14 rev. 01	Certification for safety-instrumented systems according to IEC 61508
		Date	2006-02-22	
3701-1	TÜV	No.	S 284 2013 E2	Mounted on control valves according to DIN 3394-1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730
		Date	2014-01-16	
3701-1	 EC type examination certificate	No.	PTB 01 ATEX 2178	II 2G Ex ia IIC T6 II 2D Ex tb IIIC T80°C IP65
		Date	2006-02-22	
3701-3		No.	RU C DE 08.B.00764	1Ex ia IIC T6/T5/T4/ Gb X
		Date	2015-02-10	
		Valid until	2020-02-09	
3701-3		No.	1607252	Ex ia IIC T6: Class I, Zone 0 Class I, Div.1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups E, F, G
		Date	2005-09-16	
3701-3		No.	3020228	Class I, Zone 0 AEx ia IIC Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G Class I, Div. 2, Groups A, B, C, D Class II, Div. 2 Groups F, G; Class III Type 3R
		Date	2011-06-06	
3701-8	 EC type examination certificate	No.	PTB 02 ATEX 2014 X	II 3G Ex nA II T6 II 3G Ex ic IIC T6 II 3D Ex tc IIIC T80°C IP65
		Date	2006-02-22	
3701-8		No.	RU C DE 08.B.00764	2Ex nA IIC T6/T5/T4 Gc X 2Ex ic IIC T6/T5/T4 Gc X
		Date	2015-02-10	
		Valid until	2020-02-09	

## Accessories

Designation	Order no.
Adapter plate for rotary actuators with NAMUR interface according to VDI/VDE 3845	1400-5235
Mounting parts for valves with rod-type yokes according to NAMUR	1400-5342
Mounting parts for Series 240 in DN 15 to 80, in case positioner and/or limit switch is to be mounted as well	1400-5905
Cable socket according to EN 175301-803, Form A, made of polyamide, black, degree of protection IP 65	0790-6658
Cable socket (Harting), 7-pole, made of aluminum, silver, degree of protection IP 65	1400-8298
Cable socket (Binder), 7-pole, made of PBT GV, black, degree of protection IP 67	8831-0716
Cable socket M12 x 1, 4-pole, angled design, made of polyamide, black, degree of protection IP 67	8831-0865
Sensor connecting lead, two-wire, 3 m, blue, with angle connector M12 x 1, 4-pole	8801-2810
Polyethylene filter, connection G ¼, degree of protection IP 54 Filter check valve made of polyamide or 1.4571, degree of protection IP 65 or NEMA 4. Refer to Data Sheet Z 900-7	8504-0066





Specifications subject to change without notice.



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