

Application

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



Low power binary signals issued by automation equipment or fieldbus systems can be used for controlling purposes. Intrinsically safe versions can also be implemented.

Features

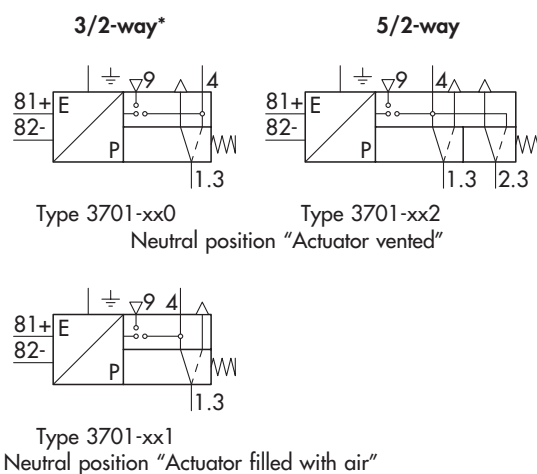
- High level of operational reliability owing to the flapper/nozzle assembly and booster valve with a diaphragm actuator
- Standard version for nominal signals 6, 12, 24 V DC, 24, 48, 115 or 230 V AC
- Type of protection "Intrinsic safety" Ex II 2 G EEx ia IIC T6, "non-sparking" Ex II 3 G EEx nA II T6 according to ATEX, CSA and FM, for nominal signals of 6, 12 or 24 V DC
- 6 to 27 mW or 0.04 to 0.46 VA power consumption, depending on nominal signal
- Electrical connection over M20 x 1.5 cable gland or optionally with plug connector
- Corrosion-resistant housing in degree of protection IP 54 or IP 65
- Versions compatible with paint/free of silicone on request
- Air supply 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
- Typetesting performed by TÜV Rheinland for safety-related applications according to DIN 3393 Part 1, DIN EN 161, DIN 32 725 and optionally according to DIN 32 730
- Suitable for safety shut-off valves up to SIL 4 according to IEC 61508 (optional)
- Cable breakage protection available

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 available on request



Fig. 1 · Type 3701 Solenoid Valve



* Versions for rotary actuators contain an internal exhaust air feedback

Fig. 2 · Switching symbols for 3/2-way and 5/2-way solenoid valves

Table 1 · Technical data for Type 3701 Solenoid Valve

General data									
Construction		Solenoid with flapper/nozzle assembly and diaphragm switching elements							
Degree of protection		IP 54 with filter · IP 65 with filter check valve							
Material	Enclosure	Al Mg, powder-coated, grayish beige RAL 1019							
	NAMUR adapter plate	Al Mg, powder-coated, grayish beige RAL 1019							
	Screws	1.4571							
	Springs	1.4310							
	Seals	Silicone rubber, Perbunan							
	Diaphragm	Chloroprene rubber 57 Cr 868 (-20 ... +80 °C) · Silicone rubber (-45 ... +80 °C)							
Ambient temperature		See "Electrical data"							
Mounting position		Any position							
Weight		Approx. 450 g							
Electrical data									
Nominal signal	U _n	6 V DC	12 V DC	24 V DC	24 V AC	48 V AC	115 V AC	230 V AC	
	U _{max}	27 V	25 V	32 V	36 V	80 V	130 V	255 V	
	f	–			48 ... 62 Hz				
Switching point	On	U _{80 °C}	≥ 4.8 V	≥ 9.6 V	≥ 18 V	≥ 19...36 V	≥ 42...80 V	≥ 82...130 V	≥ 183...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 _{-25 °C}	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	Appr. 10 kΩ	Appr. 24 kΩ	Appr. 40 kΩ	Appr. 80 kΩ
Temperature effect			0.4 %/°C	0.2 %/°C	0.1 %/°C	0.1 %/°C	0.1 %/°C	0.05 %/°C	0.03 %/°C
Type of protection ¹⁾		"Intrinsic safety" Ⓢ II 2 G EEx ia IIC T6 "Non-sparking" Ⓢ II 3 G EEx nA II T6			Without explosion protection				
Output voltage ²⁾		U _i [V]	25 · 27 · 28 · 30 · 32			–			
Output current ²⁾		I _i [mA]	150 · 125 · 115 · 100 · 85			–			
Power dissipation		P _i	250 mW	No limitation		–			
External inductance ²⁾		L _i	Negligible			–			
External capacitance ²⁾		C _i	Negligible			–			
Ambient temperature ⁷⁾			-20 ... +60 °C (temperature class T6) -20 ... +70 °C (temperature class T5) -20 ... +80 °C (temperature class T4)			-45 ... +80 °C			
Connection		See "Article code"							
Pneumatic data									
Type 3701		-xx0 / -xx1				-xx2			
Safety function		TÜV ³⁾ · SIL 4 ⁴⁾							
Version		3/2-way function				5/2-way function			
K _{vs} ⁴⁾		0.25				0.25			
Air supply	Medium	Instrument air, free of corrosive particles and nitrogen							
	Pressure	1.4 ... 6 bar							
Operating medium		Instrument air, free of corrosive particles ⁵⁾ · Air containing oil, nitrogen, non-corrosive gases ⁶⁾							
Operating pressure		Max. 6 bar							
Output signal		Operating pressure							
Air consumption		≤ 80 l _n /h at 1.4 bar, supply air in neutral position ≤ 10 l _n /h at 1.4 bar, supply air in operating position							
Switching time ⁷⁾		≤ 65 ms							
Service life		≥ 2 × 10 ⁷ switching cycles (at -20 ... +80 °C) ≥ 2 × 10 ⁶ switching cycles (at -45 ... +80 °C)							
Connection		G 1/4 (1/4 NPT)							

¹⁾ EC Type Examination Certificate PTB 01 ATEX 2178 and Statement of Conformity PTB 02 ATEX 2014 X

²⁾ Permissible maximum specifications when connected to a certified intrinsically safe circuits

³⁾ Report No. S 63/00 (mounted on control valves as per DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730); Report No. V 64/2004, part 1 (SIL 4 according to IEC 61508).

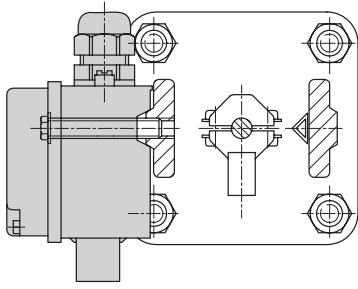
⁴⁾ Air flow at p₁ = 2.4 bar and p₂ = 1.0 bar can be calculated according to the equation: Q = K_{vs} × 36.22 in m³/h.

⁵⁾ With internal air supply (delivered status).

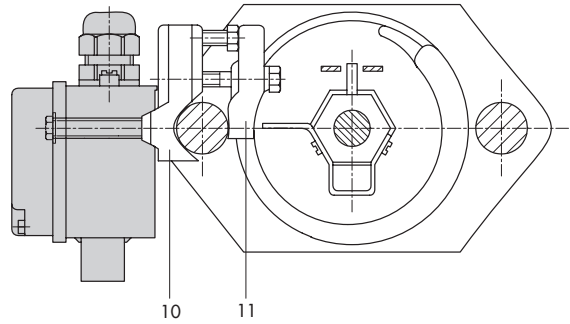
⁶⁾ With external air supply (see mounting and operating instructions).

⁷⁾ Permissible ambient temperature -45 °C with diaphragm and seals made of silicone rubber and metal cable gland.

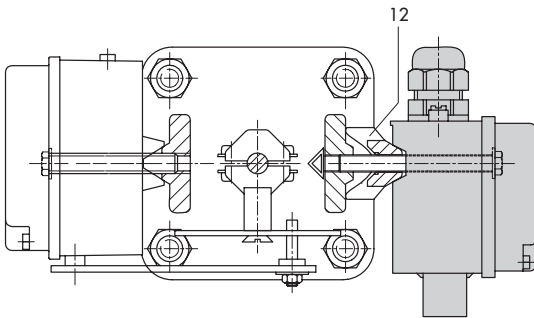
Attachment and dimensions (in mm) of the Type 3701 Solenoid Valve



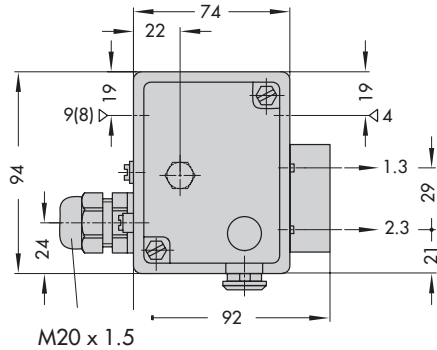
Attachment acc. NAMUR, e.g. to Series 240, 250 valves



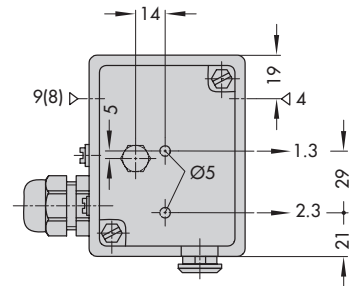
Attachment with clamping plate to valves with rod-type yoke (10, 11 - Support with clamping plate, order no. 1400-5742)



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



Dimensions for attachment according to NAMUR



Dimensions for attachment to adapter plate

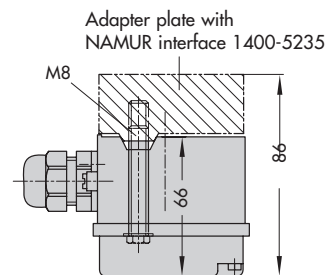
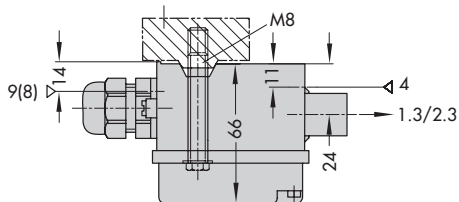


Table 2 · Article code

Solenoid valve	Type 3701-	x	x	x	x	x	x	x	x	x	x
Type of protection											
Without explosion protection	0										
⊕ II 2 G EEx ia IIC T6, Zone 1 acc. to ATEX	1										
CSA/FM EEx ia	3										
⊕ II 3 G EEx nA II T6, Zone 2 acc. to ATEX	8										
Nominal signal											
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										
Switching function											
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										
Attachment											
NAMUR interface for rotary actuators (incl. adapter plate 1400-5235)	0										
NAMUR rib for linear actuators	1										
For rotary actuators additionally requiring a NAMUR adapter plate 1400-5235	2										
Threaded connection											
G ¼	0										
¼ NPT	1										
Electrical connection											
Without cable gland, fitted with blanking cap	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 ½ 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 Form A acc. to DIN EN 175 301-803, without cable socket	2	3									
Binder connector, without cable socket	2	4									
Degree of protection											
IP 54									0		
IP 65, with filter check valve made of polyamide									1		
IP 65, with filter check valve made of 1.4571									2		
IP 20									3		
Ambient temperature											
-20 ... 80 °C										0	
-45 ... 80 °C										2	
Safety approval											
None											0
SIL 4 (only for 3/2-way function)											1
TÜV (only for 3/2-way function)											2

List of approvals

Type of approval	Certificate number	Date	Type of connection / Comment
EC Type Examination Certificate	PTB 01 ATEX 2178	2001-11-29	⊕ II 2 G EEx ia IIC T6; Type 3701-1
Statement of Conformity	PTB 02 ATEX 2014 X	2002-03-07	⊕ II 3 G EEx nA II T6, Zone 2; Type 3701-8
TÜV approval	St 1947	1987-04-15	Without explosion protection, DC and AC voltage; Type 3701-1
GOST approval	2002.C303	2002-12-26	Valid until 2008-01-01; Type 3701-1
FM approval	J.I. 3020228	2005-02-28	Cl. I, II, III, Div. 1, Gr. A, B, C, D, E, F, G Cl. I, Zone 0 AEx ia IIC T6 Cl. I, Div. 2, Gr. A, B, C, D Cl. II, Div. 2, Gr. F, G; Cl. III; NEMA 3R; Type 3701-3
CSA approval	LR 54227-3 LR 54227-33	1988-10-25 1998-10-15	Cl. I, Div. 1, Gr. A, B, C, D; Type 3 Enclosure Cl. I, Div. 2, Gr. A, B, C, D; coil 1079-22; Type 3701-3
TÜV	S63/00	2000-09-06	Mounted on control valves acc. to DIN 3394-1, DIN EN 161, DIN 32 725, DIN EN 264 and DIN 32 730
SIL 4	V 60 2004 T1	2004-07-05	Safety integrity level according to IEC 60 508

Accessories

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

Specifications subject to change without notice.

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