# DATA SHEET

**T 3776 EN**

**Type 3776 Limit Switch**

CE Ex certified TÜVRheinland CERTIFIED www.tuv.com ID 0600000000

### Application

Limit switch with inductive or electric limit contacts and solenoid valve for attachment to linear actuators and rotary actuators according to VDI/VDE 3845

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The Type 3776 Limit Switch issues an electric signal when the valve travel exceeds or falls below an adjusted limit. The signal is suitable for switching control signals, issuing visual and audible alarms or for connection to central control or alarm systems. An optional solenoid valve allows the monitored actuator also to be controlled.

### Versions

Numerous different types of limit contacts, switching functions, connection versions and mounting kits allow the Type 3776 Limit Switch to be optimally adapted for the specific task.

### Special features

- Electrical connection using M20x1.5 cable gland to terminals or with connector
- Integrated AS-Interface module with bus connection (optional)
- Corrosion-resistant, rugged enclosure with degree of protection IP 54 or IP 65 for adverse environmental conditions
- Maximum permissible ambient temperature –45 to +80 °C, depending on the components and type of protection
- Mounting kits for linear actuators or rotary actuators with interface according to VDI/VDE 3845

### Limit contacts

- Maximum six limit contacts which are easy and precise to adjust
- Inductive proximity switches, inductive double proximity switch or electric microswitches

### Solenoid valve

- SIL according to IEC 61508 (optional)
- One or two installed solenoid pilot valves to actuate a booster valve on one side or both sides
- Electropneumatic binary converter with flapper/nozzle assembly proven reliable in service a million times over

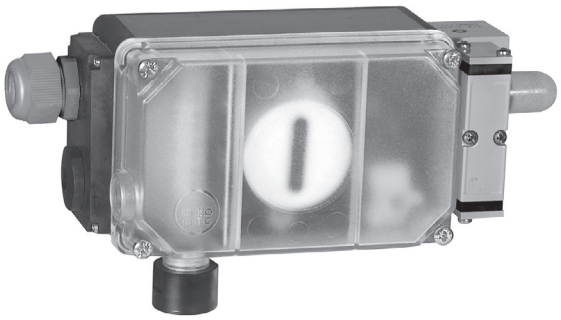


**Fig. 1:** *Type 3776 Limit Switch*

- Type of protection II 2G Ex ia IIC T6 or II 3G Ex nA II T6 (optional)
- Nominal signals 6, 12, 24 V DC or 24, 115, 230 V AC
- 6 to 27 mW or 0.04 to 0.46 VA power consumption (depending on nominal signal)
- Manual override (optional)
- Pilot supply 2.2 to 6.0 bar
- Directly mounted booster valve with switching diaphragm or spool valve
- 3/2-way, 5/2-way or 5/3-way function
- $K_{VS}$ coefficients 0.2 to 0.3
- Restrictors to adjust different closing and opening times (optional)
- Threaded connection G ¼ (¼ NPT)
- Directly mounted connection block to actuate an external Type 3756 Booster Valve G ¼ (¼ NPT)
- Threaded connection G ¼ (¼ NPT)

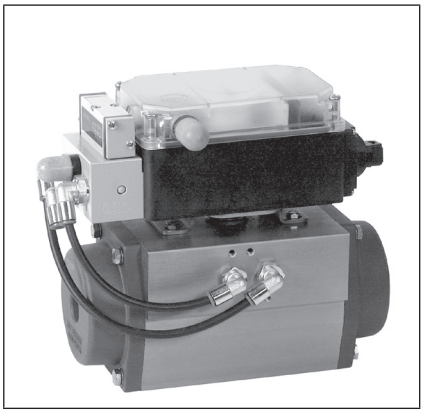
**SAMSON Type 3278 Rotary Actuator**

**Type 3776-03203210127100 Limit Switch**

- No explosion protection
- Two inductive proximity switches SB3,5-E2
- 0 to 100° opening angle
- Solenoid valve 24 V DC
- Manual override
- 3/2-way function with spring-return mechanism
- Without restrictors
- Pneumatic connection G ¼
- Connector
- Degree of protection IP 65
- Ambient temperatures from –25 to +70 °C
- Without safety function

**Mounting kit (order no. 1400-XXXX)**

**Rotary actuator according to VDI/ VDE 3845,** fixing level 1

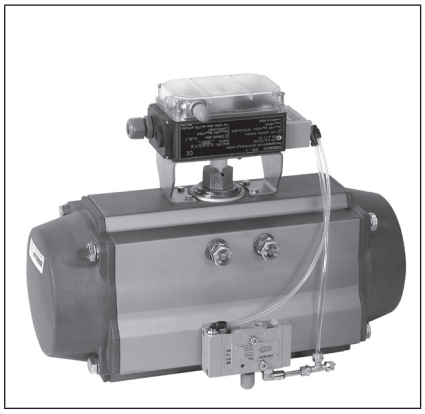


**Type 3776-01203030150000 Limit Switch**

- No explosion protection
- Two inductive proximity switches SC3,5-N0
- 0 to 100° opening angle
- Solenoid valve 24 V DC
- Without manual override
- 5/2-way function with two detent positions
- Without restrictors
- Pneumatic connection G ¼
- AS-Interface module with bus connection
- Degree of protection IP 54
- Ambient temperatures from –20 to +80 °C
- Without safety function

**Mounting kit (order no. 1400-XXXX)**

**Rotary actuator according to VDI/ VDE 3845,** fixing level 2



**Type 3776-12203290112000 Limit Switch**

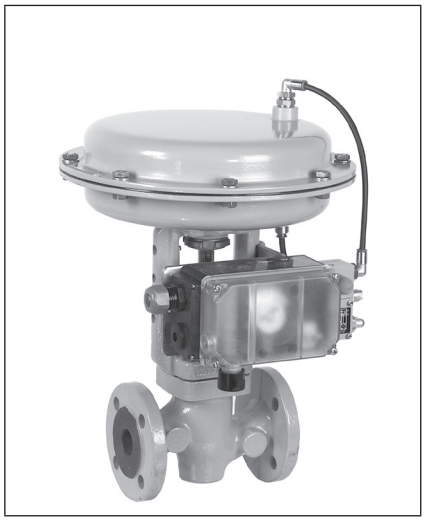
- Type of protection II 2G Ex ia IIC T6
- Two inductive proximity switches SJ3,5-SN
- 0 to 100° opening angle
- Solenoid valve 24 V DC
- Manual override
- Connection block (double)
- Without restrictors
- Pneumatic connection G ¼
- Terminal connection
- Degree of protection IP 54
- Ambient temperatures from –20 to +80 °C
- Without safety function

**External Type 3756-3025 Booster Valve**

- 5/2-way function with two detent positions
- $K_{VS}$ 1.4
- Pneumatic connection G ¼

**Mounting kit (order no. 1400-XXXX)**

**SAMSON Type 3241-1 Control Valve with NAMUR rib according to IEC 60534-6-1**

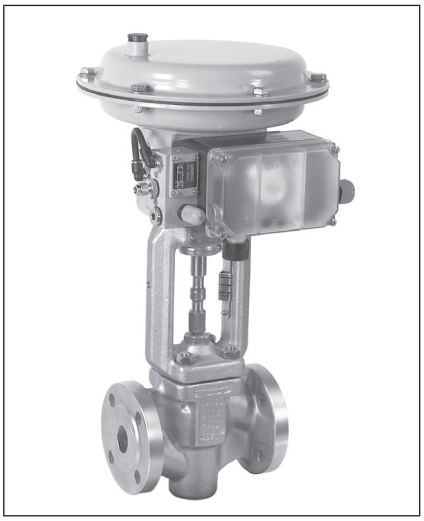


**Type 3776-12203210112100 Limit Switch**

- Type of protection II 2G Ex ia IIC T6
- Two inductive proximity switches SJ3,5-SN
- 0 to 100° opening angle
- Solenoid valve 24 V DC
- Manual override
- 3/2-way function with spring-return mechanism
- Without restrictors
- Pneumatic connection G ¼
- Terminal connection
- Degree of protection IP 65
- Ambient temperatures from –20 to +80 °C
- Without safety function

**Mounting kit (order no. 1400-XXXX)**

**SAMSON Type 3277 Linear Actuator**

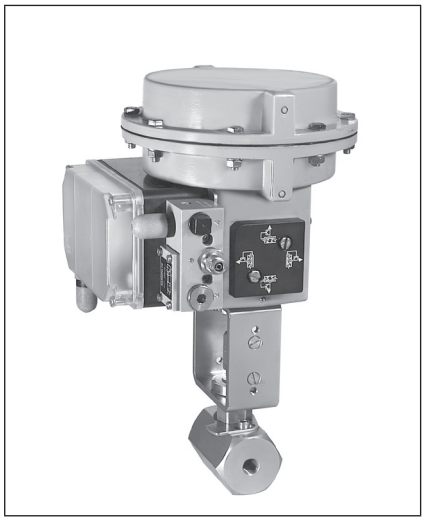


**Type 3776-02203210110100 Limit Switch**

- No explosion protection
- Two inductive proximity switches SJ3,5-SN
- 0 to 100° opening angle
- Solenoid valve 24 V DC
- Manual override
- 3/2-way function with spring-return mechanism
- Without restrictors
- Pneumatic connection G ¼
- Terminal connection
- Degree of protection IP 65
- Ambient temperatures from –20 to +80 °C
- Without safety function

**Mounting kit (order no. 1400-XXXX)**

**SAMSON Type 3277-5 Linear Actuator with internal signal pressure routing**



**Type 3776-12203210112000 Limit Switch**

- Type of protection II 2G Ex ia IIC T6
- Two inductive proximity switches SJ3,5-SN
- 0 to 100° opening angle
- Solenoid valve 24 V DC
- Manual override
- 3/2-way function with spring-return mechanism
- Without restrictors
- Pneumatic connection G ¼
- Terminal connection
- Degree of protection IP 54
- Ambient temperatures from –20 to +80 °C
- Without safety function

**Mounting kit (order no. 1400-XXXX)**

## Principle of operation

**Limit contacts**

The limit switch is equipped with a maximum of three inductive proximity switches, one double proximity switch or three electric microswitches.

For most applications, the limit contacts are adjusted to issue a signal when the actuator has reached one of its end positions. The switching point can be adjusted to any position within the opening angle or travel range to signalize intermediate positions (▶ EB 3776).

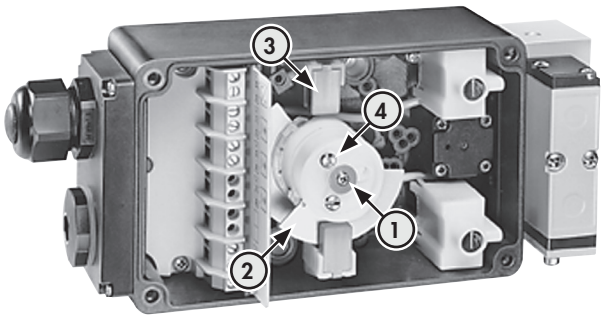
The limit switch's shaft is placed on the shaft trunnion of a rotary actuator or connected to a linear actuator using a lever. The shaft has a maximum of three metal tags or cam disks and an indicator cap used to indicate the position of a rotary actuator. The indicator cap is not used for linear actuators as the position is indicated at the actuator stem of these actuators.

The limit switch with inductive proximity switches (Fig. 2) has a maximum of three adjustable metal tags (2) on the shaft (1). When the tag is inside the magnetic field of the proximity switch (3), the proximity switch is attenuated and the output has a high impedance (switching function “Contact open”). When the tag (2) leaves the magnetic field, the proximity switch (3) is unattenuated and the output has a low impedance (switching function "Contact closed"). The tags can be adjusted to a switching point between 0 and 180° at the adjustment screws (4).

The limit switch with inductive double proximity switch (Fig. 3) is a cost-effective version for use with rotary actuators only.

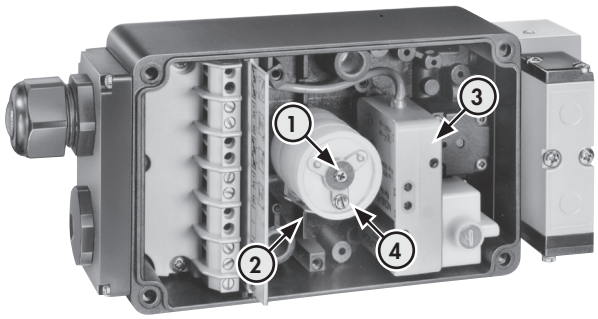
The limit switch has an adjustable metal tag (2) on the shaft (1). When the tag is inside the magnetic field of the proximity switch (3), the proximity switch is attenuated and the output has a high impedance (switching function “Contact open”). When the tag (2) leaves the magnetic field, the proximity switch (3) is unattenuated and the output has a low impedance (switching function "Contact closed"). The tag can be adjusted to a switching point distance of 70 or 90° at the adjustment screw (4).

The limit switch with electric microswitches (Fig. 4) has a maximum of three adjustable cam disks (2) on the shaft (1). The cam disk activates the electric microswitch (3) over the roller on the switch lever (5). The cam disks can be adjusted to a switching point between 0 and 180° at the adjustment screws (4).



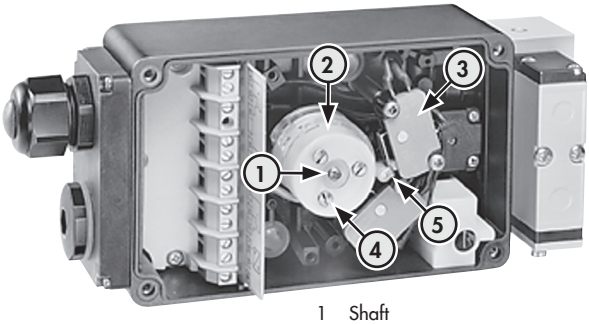

1 Shaft
2 Metal tag
3 Inductive proximity switch
4 Adjustment screw

**Fig. 2:** *Inductive proximity switches*




1 Shaft
2 Metal tag
3 Inductive double proximity switch
4 Adjustment screw

**Fig. 3:** *Inductive double proximity switch*




1 Shaft
2 Cam disk
3 Electric microswitch
4 Adjustment screw
5 Switch lever

**Fig. 4:** *Electric microswitches*

**Solenoid valve**

The limit switch can be fitted with an optional solenoid valve to actuate the actuator. In this case, the binary signal issued by electric control equipment is converted into a binary pressure signal to open or close the control valve (Fig. 5 and Fig. 6, see Fig. 7 on page 5 for logic symbols).

The solenoid valve consists of one or two solenoid pilot valves and a booster valve actuated on one side or both sides. The solenoid pilot valves are installed in the solenoid valve in a protected space and the booster valve is directly mounted onto the enclosure. Alternatively, an external Type 3756 Booster Valve G ¼ (¼ NPT) can be mounted to the actuator. The pneumatic signal is connected over a connection block directly mounted onto the enclosure.

The limit switch with one solenoid pilot valve consists of an electropneumatic binary converter (A) with manual override (B) and a 3/2-way or 5/2-way booster valve (C) actuated on one side with return spring. The pilot supply for the electropneumatic binary converter (A) is routed internally from the port (9) through the pressure reducer (5) and the restrictor (6).

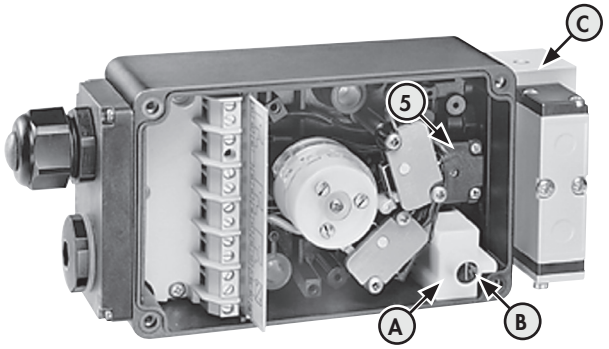
In the idle position, the flapper (2) is lifted off the outlet nozzle (1) by the spring (3). As a result, a pressure lower than the deactivation pressure of the booster valve (C) builds up in the pressure divider, which consists of the restrictor (6) and outlet nozzle (1). When the solenoid coil (4) is energized by an electric binary signal, the outlet nozzle (1) is closed by the flapper (2) against the force of the spring (3). This causes the pressure in the pressure divider to rise above the activation pressure of the booster valve, switching it to the operating position. After the solenoid coil is de-energized, the booster valve is switched to the neutral position again by a return spring.

The limit switch with two pilot valves consists of two electropneumatic binary converters (A) with manual override (B) and a 5/2-way booster valve (C) actuated on both sides with two detent positions or a 5/3-way booster valve (C) with spring-centered mid-position. The pilot supply for the electropneumatic binary converter (A) is routed internally from the ports (9) through the pressure reducers (5) and the restrictors (6).

In the idle position, the flapper (2) is lifted off the outlet nozzle (1) by the spring (3). As a result, a pressure lower than the switchover pressure of the booster valve (C) builds up in the pressure divider, which consists of the restrictor (6) and outlet nozzle (1). When the solenoid coil (4) is energized by an electric binary signal, the outlet nozzle (1) is closed by the flapper (2) against the force of the spring (3). This causes the pressure in the pressure divider to rise above the switchover pressure of the booster valve, switching it to the operating position. After the solenoid coil is de-energized, the operating position of the detented booster valve is kept until the opposing signal is received. The spring-centered booster valve is switched over to the mid-position by return springs.

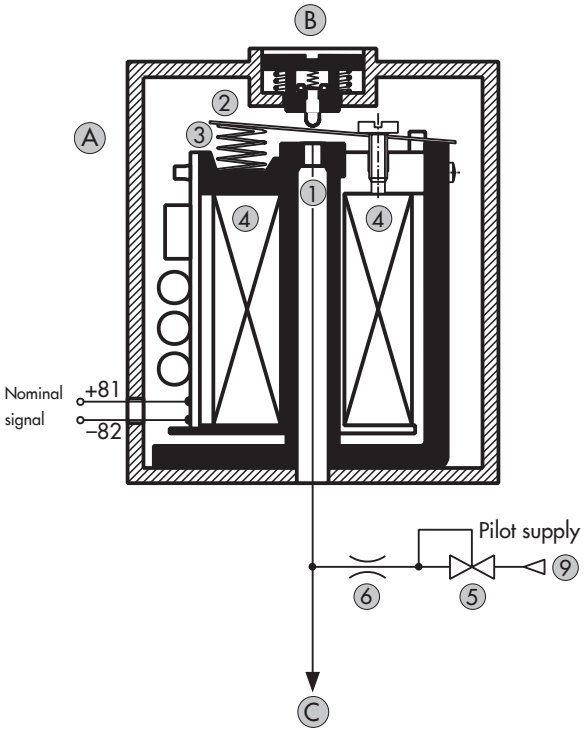
**i** ***Note***

*Use of the solenoid valve in the limit switch is possible on observing the requirements of IEC 61511 and the required hardware fault tolerance in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/ HFT = 1). See Certificate V60.09/14 rev. 01.*




A Electropneumatic binary converter
B Manual override (optional)
C Booster valve
5 Pressure reducer

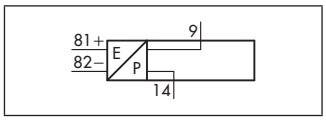
**Fig. 5:** *Solenoid valve*



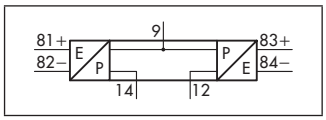

A Electropneumatic binary converter
1 Outlet nozzle
2 Flapper plate
3 Spring
4 Solenoid
5 Pressure reducer
6 Restrictor
B Manual override (optional)
C Booster valve

**Fig. 6:** *Solenoid valve design*

**1**

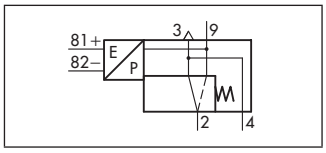



**3776-XXXXXX80**



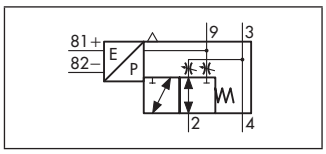

**3776-XXXXXX90**

**2**



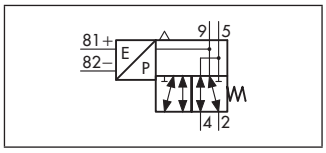

**3776-XXXXXX10**

**3**




**3776-XXXXXX12**

**4**

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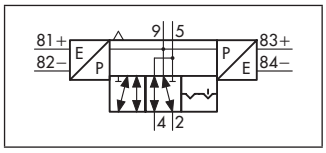


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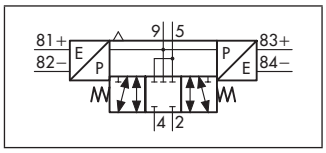


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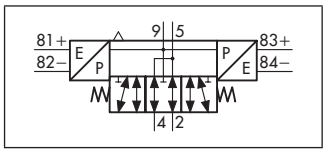


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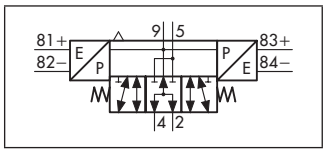
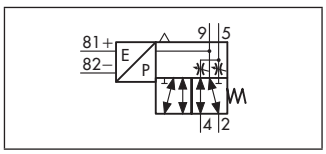



**3776-XXXXXX70**

**5**

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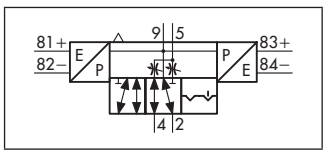


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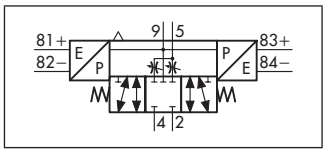


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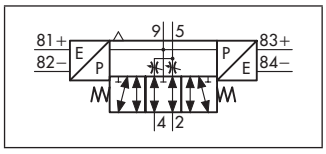


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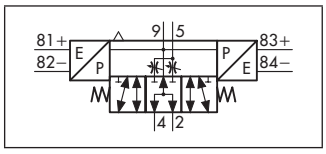



**3776-XXXXXX71**

| **Connection block** | | **Order no.** |
|---|---|---|
| **1** | Connection block (single) | 3776-XXXXXX80 |
| | Connection block (double) | 3776-XXXXXX90 |
| **Booster valve** | | **Order no.** |
| **2** | 3/2-way function with spring-return mechanism | 3776-XXXXXX10 |
| **3** | 3/2-way function with spring-return mechanism, one supply air/one exhaust air restrictor | 3776-XXXXXX12 |
| **4** | 5/2-way function with spring-return mechanism | 3776-XXXXXX30 |
| | 5/2-way function with two detent positions | 3776-XXXXXX40 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 closed) | 3776-XXXXXX50 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 vented) | 3776-XXXXXX60 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 supplied with air) | 3776-XXXXXX70 |
| **5** | 5/2-way function with spring-return mechanism, two exhaust air restrictors | 3776-XXXXXX31 |
| | 5/2-way function with two detent positions, two exhaust air restrictors | 3776-XXXXXX41 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 closed), two exhaust air restrictors | 3776-XXXXXX51 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 vented), two exhaust air restrictors | 3776-XXXXXX61 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 supplied with air), two exhaust air restrictors | 3776-XXXXXX71 |

**Fig. 7:** *Logic symbols*

# Technical data

| General data | | |
|---|---|---|
| **Type 3776** | | |
| Range of rotation | Adjustable: 0 to 100° or 0 to 180° | |
| Travel range | 7.5 to 120 mm when mounted on linear actuators (e.g. SAMSON Type 327X) | |
| Material | | |
| Enclosure | Polyamide PA6-3-T, black | |
| Enclosure cover | Polycarbonate 2807 (transparent) | |
| Follower shaft | Polyoxymethylene | |
| Filter | Filter made of polyethylene, filter check valve made of polyamide or stainless steel 1.4305 | |
| Screws | Stainless steel 1.4301 | |
| Degree of protection | IP 54 with filter, IP 65 with filter check valve | |
| Mounting orientation | Defined mounting position (▶ EB 3776) | |
| Ambient temperature depending on the components and type of protection | **No explosion protection** | **Permissible components** |
| | –20 to +80 °C | All components;<br>Inductive proximity switch SB3,5-E2 (max. 70 °C) |
| | –40 to +80 °C | Inductive proximity switch SC3,5-N0;<br>Inductive proximity switch SJ3,5-SN;<br>Electric microswitch;<br>Solenoid pilot valve AC/DC;<br>Adapter ½ NPT (aluminum);<br>Brass cable gland;<br>Device connector (Harting), made of aluminum;<br>Filter check valve made of stainless steel 1.4305 |
| | –45 to +80 °C | Inductive proximity switch SJ3,5-SN;<br>Solenoid pilot valve AC/DC;<br>Adapter ½ NPT (aluminum);<br>Brass cable gland;<br>Device connector (Harting), made of aluminum;<br>Filter check valve made of stainless steel 1.4305 |
| | **Type of protection Ex ia IIC** [1] | **Permissible components** |
| | –20 to +60 °C (temperature class T6)<br>–20 to +70 °C (temperature class T5)<br>–20 to +80 °C (temperature class T4) | Inductive proximity switch SC3,5-N0;<br>Inductive proximity switch SJ3,5-SN;<br>Inductive double proximity switch NCN3-F24R-N4;<br>Electric microswitch;<br>Solenoid pilot valve DC;<br>All electric connection options;<br>All filter options |
| | –45 to +60 °C (temperature class T6)<br>–45 to +70 °C (temperature class T5)<br>–45 to +80 °C (temperature class T4) | Inductive proximity switch SC3,5-N0;<br>Inductive proximity switch SJ3,5-SN;<br>Solenoid pilot valve DC;<br>Adapter ½ NPT (aluminum);<br>Brass cable gland;<br>Device connector (Harting), made of aluminum;<br>Filter check valve made of stainless steel 1.4305 |
| | **Type of protection Ex nA II** [2] | **Permissible components** |
| | –45 to +60 °C (temperature class T6)<br>–45 to +70 °C (temperature class T5)<br>–45 to +80 °C (temperature class T4) | Inductive proximity switch SC3,5-N0;<br>Inductive proximity switch SJ3,5-SN;<br>Electric microswitch;<br>Solenoid pilot valve DC;<br>Adapter ½ NPT (aluminum);<br>Brass cable gland;<br>Device connector (Harting), made of aluminum;<br>Filter check valve made of stainless steel 1.4305 |
| Electrical connection | Terminal connection, connector or integrated AS-Interface module with bus connection<br>(see article code on page 14) | |
| Weight | Approx. 450 g (without connection block/booster valve) | |

[1] II 2G Ex ia IIC T6 according to EC type examination certificate PTB 98 ATEX 2072
[2] II 3G Ex nA II T6 according to statement of conformity PTB 02 ATEX 2007 X

| **Limit contact** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type 3776** | | **-X1** | | **-X2** | **-03** | **-X5** | **-X6** |
| Version | | Inductive proximity switch | | | | Electric microswitch | |
| | | SC3,5-N0, with yellow LED | | SJ3,5-SN | SB3,5-E2, with yellow LED | Silver contact | Gold contact |
| Switching function | | NAMUR NC contact | | NAMUR NC contact | NO contact (PNP) | Changeover contact (SPDT) | |
| Switching accuracy | | 0.03 to 0.2 mm | | ≤ 0.03 mm | 0.4 to 0.6 mm | Approx. 0.3 mm | |
| Opening angle | | ≤4.0° | | ≤1.1° | ≤1.7° | ≤2.0° | |
| Travel | | ≤ 1.8 mm | | ≤ 0.5 mm | ≤ 0.75 mm | ≤ 0.9 mm | |
| Switching point shift | | | | | | | |
| Angle of rotation $_{\Delta 50\,K}$ | | ≤2.5° | | ≤0.5° | ≤1.0° | ≤0.5° | |
| Travel $_{\Delta 50\,K}$ | | ≤ 1.0 mm | | ≤ 0.2 mm | ≤ 0.4 mm | ≤ 0.2 mm | |
| Nominal voltage<br>Operating voltage<br>Max. contact load | $U_0$<br>$U_B$ | 8 V DC | | 8 V DC | 10 to 30 V DC | 42 V AC/5.5 A<br>42 V DC/0.25 A<br>20 V DC/5.5 A | |
| Current draw | | | | | | | |
| Metal tag not detected | | 3 mA (LED on) | | 3 mA | 3 mA (LED off) | – | |
| Metal tag detected | | 1 mA (LED off) | | 1 mA | 1 mA (LED on) | | |
| Service life of the integrated solenoid valve | | >2,000,000 switching cycles [5] | | | | | |
| Ambient temperature | | −40 to +80 °C | | −45 to +80 °C | −25 to +70 °C | −40 to +80 °C | |
| Safety approval [4] | | SIL capability | | SIL capability | – | – | |
| **Limit contact in type of protection Ex ia IIC [1] for use in hazardous areas (Zone 1)** | | | | | | | |
| **Type 3776** | | **-11** | | **-12** | **–** | **-15** | **-16** |
| Maximum values when connected to a certified intrinsically safe circuit | | | | | | | |
| Input voltage | $U_i$ | 16 V | | 16 V | | 45 V | |
| Input current | $I_i$ | 25 mA | 52 mA | 25 mA | 52 mA | – | |
| Power input | $P_i$ | 64 mW | 169 mW | 64 mW | 169 mW | 2 W | |
| Inner capacitance | $C_i$ | 150 nF | | 30 nF | | ≈ 0 | |
| Inner inductance | $L_i$ | 150 µH | | 100 µH | | ≈ 0 | |
| Ambient temperature in temperature class | | | | | | | |
| $I_i$ = 52 mA [3]<br>$P_i$ = 169 mW [3] | T6 | −45 to +45 °C | | −45 to +45 °C | | T6 | −20 to +60 °C |
| | T5 | −45 to +60 °C | | −45 to +60 °C | | | |
| | T4 | −45 to +80 °C | | −45 to +80 °C | | T5 | −20 to +70 °C |
| $I_i$ = 25 mA [3]<br>$P_i$ = 64 mW [3] | T6 | −45 to +65 °C | | −45 to +65 °C | | | |
| | T5 | −45 to +80 °C | | −45 to +80 °C | | T4 | −20 to +80 °C |
| | T4 | −45 to +100 °C | | −45 to +100 °C | | | |
| **Limit contact in type of protection Ex nA II [2] for use in hazardous areas (Zone 2)** | | | | | | | |
| **Type 3776** | | **-81** | | **-82** | **–** | **-85** | **-86** |
| Ambient temperature in temperature class | | | | | | | |
| | T6 | −45 to +60 °C | | −45 to +60 °C | | −45 to +60 °C | |
| | T5 | −45 to +70 °C | | −45 to +70 °C | | −45 to +70 °C | |
| | T4 | −45 to +80 °C | | −45 to +80 °C | | −45 to +80 °C | |

1) II 2G Ex ia IIC T6 according to EC type examination certificate PTB 98 ATEX 2072
2) II 3G Ex nA II T6 according to statement of conformity PTB 02 ATEX 2007 X
3) Permissible maximum values of an upstream isolating switch amplifier
4) The permissible ambient temperature depends on the permissible ambient temperature of the components, type of protection and temperature class. A restricted temperature range may arise for SIL applications.
5) The number of actually achievable switching cycles depends on the prevailing operating conditions.

| **Solenoid pilot valve** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Electric data** | | | | | | | |
| **Type 3776** | | **-XXXX1** | **-XXXX2** | **-XXXX3** | **-0XXX6** | **-0XXX5** | |
| Nominal signal | $U_N$ | 6 V DC<br>Max. 27 V [1] | 12 V DC<br>Max. 25 V [1] | 24 V DC<br>Max. 32 V [1] | 115 V AC<br>Max. 130 V [1] | 230 V AC<br>Max. 255 V [1] | |
| | $f_N$ | – | – | – | 48 to 62 Hz | | |
| Switching point | $U_{+80\,°C}$ | ≥4.8 V | ≥9.6 V | ≥18 V | 82 to 130 V | 183 to 255 V | |
| ON | $I_{+20\,°C}$ | ≥1.41 mA | ≥1.52 mA | ≥1.57 mA | ≥2.2 mA | ≥2.6 mA | |
| | $P_{+20\,°C}$ | ≥5.47 mW | ≥13.05 mW | ≥26.71 mW | ≥0.17 VA | ≥0.46 VA | |
| OFF | $U_{-25\,°C}$ | ≤1.0 V | ≤2.4 V | ≤4.7 V | ≤18 V | ≤36 V | |
| Impedance | $R_{+20\,°C}$ | 2.6 kΩ | 5.5 kΩ | 10.7 kΩ | Approx. 40 kΩ | Approx. 80 kΩ | |
| Effect of temperature | | 0.4 %/°C | 0.2 %/°C | 0.1 %/°C | 0.05 %/°C | 0.03 %/°C | |
| Ambient temperature | | –45 to +80 °C | | | | | |
| **Solenoid pilot valve in type of protection Ex ia IIC [2] for use in hazardous areas (Zone 1)** | | | | | | | |
| **Type 3776** | | **-1XXX1** | **-1XXX2** | **-1XXX3** | **–** | **–** | |
| Maximum values when connected to a certified intrinsically safe circuit | | | | | | | |
| Output voltage [4] | $U_i$ | 25 V | 27 V | 28 V | 30 V | 32 V | – – |
| Output current [4] | $I_i$ | 150 mA | 125 mA | 115 mA | 100 mA | 85 mA | |
| Power dissipation | $P_i$ | 250 mW | No restrictions | | | | |
| Outer capacitance | $C_i$ | ≈0 | | | | | |
| Outer inductance | $L_i$ | ≈0 | | | | | |
| Ambient temperature in temperature class | | | | | | | |
| | T6 | –45 to +60 °C | | | – | – | |
| | T5 | –45 to +70 °C | | | | | |
| | T4 | –45 to +80 °C | | | | | |
| **Solenoid pilot valve in type of protection Ex nA IIC [3] for use in hazardous areas (Zone 2)** | | | | | | | |
| **Type 3776** | | **-8XXX1** | **-8XXX2** | **-8XXX3** | **–** | **–** | |
| Ambient temperature in temperature class | | | | | | | |
| | T6 | –45 to +60 °C | | | – | – | |
| | T5 | –45 to +70 °C | | | | | |
| | T4 | –45 to +80 °C | | | | | |
| **Pneumatic data** | | | | | | | |
| **Type 3776** | | **-XXXX1** | **-XXXX2** | **-XXXX3** | **-0XXX6** | **-0XXX5** | |
| $K_{VS}$ [5] | | 0.01 | | | | | |
| Pilot supply | Medium | Instrument air, free from corrosive substances | | | | | |
| | Pressure | 2.2 to 6.0 bar | | | | | |
| Output signal | | 1.5 to 2.5 bar | | | | | |
| Air consumption | ON | ≤10 l/h with 1.4 bar supply | | | | | |
| | OFF | ≤60 l/h with 1.4 bar supply | | | | | |
| Switching time | | ≤50 ms | | | | | |
| Effect of temperature | | 0.4 %/°C | | | | | |

[1] Maximum permissible value at 100 % duty cycle. The maximum permissible value $U_i$ applies to explosion-protected versions.
[2] II 2G Ex ia IIC T6 according to EC type examination certificate PTB 98 ATEX 2072
[3] II 3G Ex nA II T6 according to statement of conformity PTB 02 ATEX 2007 X
[4] Pairs of values $U_i/I_i$ apply to 6, 12, 24 V DC nominal signals.
[5] The air flow rate when $p_1$ = 2.4 bar and $p_2$ = 1.0 bar is calculated using the following formula:
$Q = K_{VS} \times 36.22$ in m³/h.

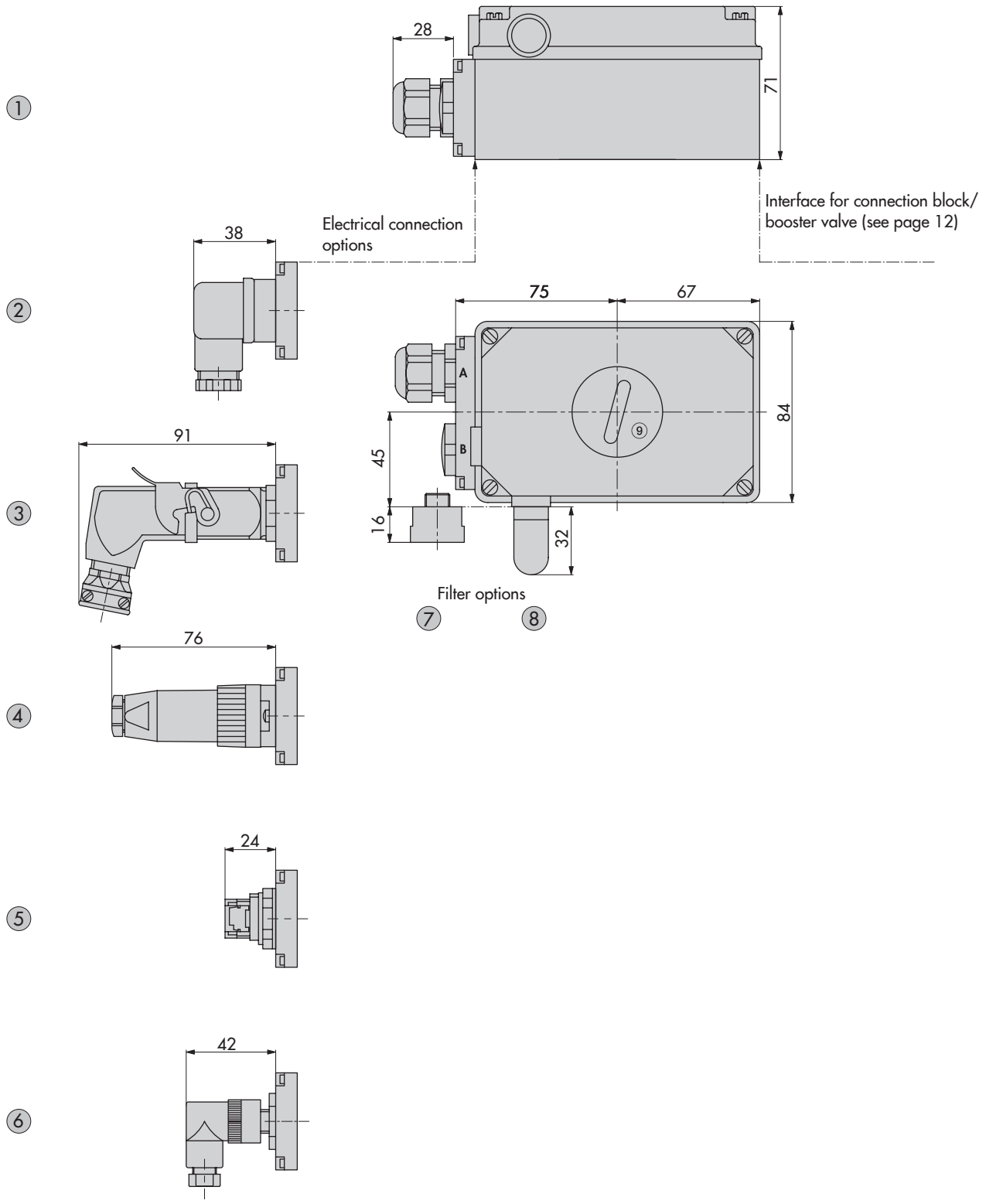
| Booster valve | | | | | | |
|---|---|---|---|---|---|---|
| **Type 3776** | **-XXXXXX10** | **-XXXXXX12** | **-XXXXXX30** | **-XXXXXX4X** | **-XXXXXX5X** | **-XXXXXX6X** |
| Switching function | 3/2-way function | | 5/2-way function | | 5/3-way function | |
| | With spring-return mechanism | With spring-return mechanism | With spring-return mechanism | With two detent positions | With spring-centered mid-position | |
| | | | | | Ports 2 and 4 sealed | Ports 2 and 4 vented |
| $K_{VS}$ [1] | 0.20 | – | 0.20 | 0.30 | | |
| With restrictors | – | 0.01 to 0.18 | – | 0.01 to 0.23 | | |
| Design | Poppet valve, soft seated | | | Spool valve, metal-to-metal seat, zero overlap | | |
| Safety function | SIL [2] | | – | | | |
| Material | | | | | | |
| Enclosure | GD AlSi 12, powder coated, gray beige RAL 1019 | | | | | |
| Seals | Silicone rubber | | Perbunan, nitrile butadiene rubber | | | |
| Filter | Polyethylene | | | | | |
| Screws | Stainless steel 1.4571 | | | | | |
| Actuation [3] | One side | | | Both sides | | |
| Operating medium | Instrument air free from corrosive substances or nitrogen | | | | | |
| Operating pressure | 2.2 to 6.0 bar | | | | | |
| Ambient temperature | –45 to +80 °C | | | | | |
| Connection | G ¼ · ¼ NPT | | | | | |
| Approx. weight | 175 g | | 375 g | 175 g | | |

1) The air flow rate when $p_1$ = 2.4 bar and $p_2$ = 1.0 bar is calculated using the following formula:
$Q = K_{VS} \times 36.22$ in m³/h.
2) SIL according to IEC 61508 (certificate no. DE V 60.09/14 rev. 01)
3) Actuation with one or two solenoid pilot valves

| Connection block | | |
|---|---|---|
| **Type 3776** | **-XXXXXX80** | **-XXXXXX90** |
| Version | Single [1] | Double [2] |
| Safety function | SIL [3] | |
| $K_{VS}$ [4] | 0.01 | |
| Material | | |
| Enclosure | GD AlSi 12, powder coated, gray beige RAL 1019 | |
| Seals | Perbunan | |
| Screws | Stainless steel 1.4571 | |
| Ambient temperature | –45 to +80 °C | |
| Connection | G ¼ · ¼ NPT | |
| Approx. weight | 150 g | |

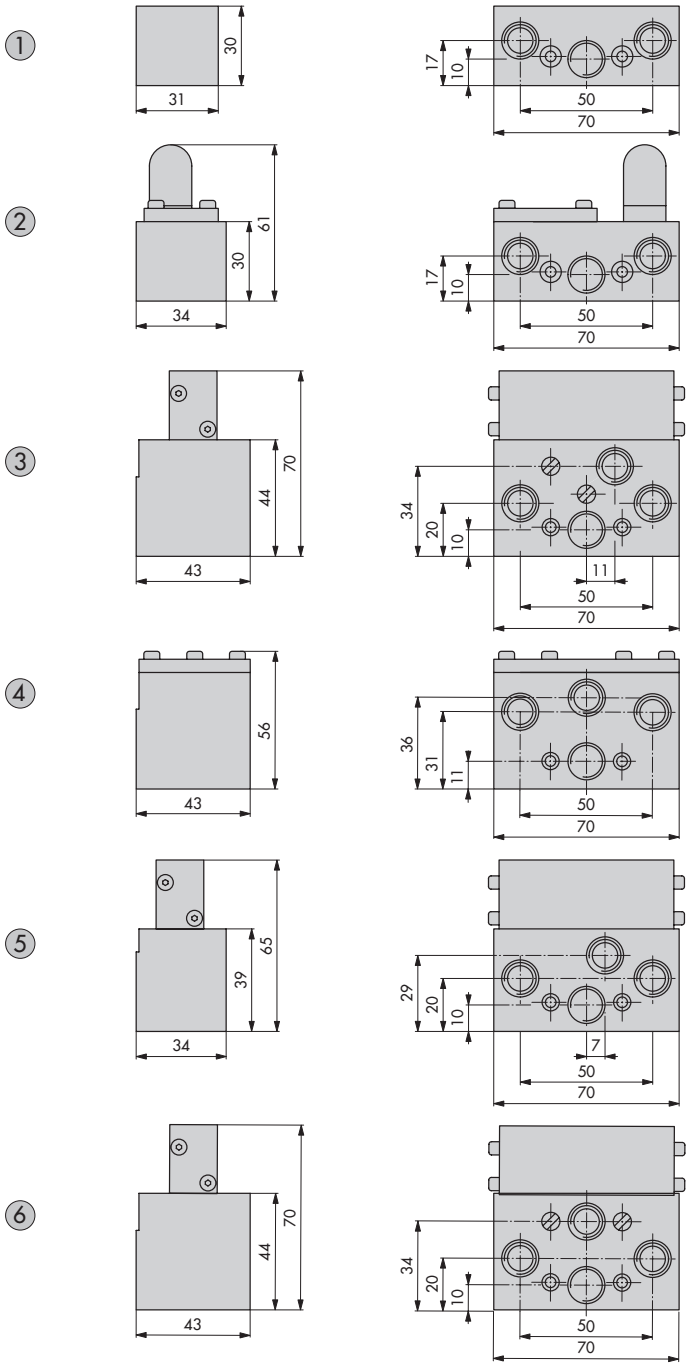
1) For pneumatic actuation on one side of an external 3/2-way or 5/2-way Type 3756 Booster Valve, G ¼/¼ NPT
2) For pneumatic actuation on both sides of an external 5/2-way or 5/3-way Type 3756 Booster Valve, G ¼/¼ NPT
3) SIL according to IEC 61508 (certificate no. DE V 60.09/14 rev. 01)
4) The air flow rate when $p_1$ = 2.4 bar and $p_2$ = 1.0 bar is calculated using the following formula:
$Q = K_{VS} \times 36.22$ in m³/h.

| **AS-Interface module (specification 2.1)** | | |
|---|---|---|
| Description | | Integrated AS-Interface module for use in safe areas<br>(▶ EB 3776);<br>Transmission of auxiliary power and binary signals using a common two-wire line;<br>Connection of a maximum of two inductive proximity switches or one double proximity switch and a pilot valve;<br>Wire breakage or short-circuit monitoring |
| Slave type | | A/B slave |
| LED status indication | | |
| AS-Interface Module | | LED 1 illuminates green: auxiliary power connected<br>LED 1 illuminates red: communication error or address 0<br>LED 1 blinks green/red: wire breakage or short circuit |
| Inputs | | LED 2, illuminates yellow: input IN 1 ON<br>LED 3, illuminates yellow: input IN 2 ON |
| Operating voltage | | 26.5 to 31.6 V DC from AS-Interface |
| Operating current | | ≤40 mA (without proximity switches), max. 150 mA |
| Inputs | | |
| Quantity | | Two inputs (for connection of two inductive proximity switches SC3,5-N0 or SJ3,5-SN or an inductive double proximity switch NCN3-F24R-N4) |
| Supply | | From AS-Interface |
| Input voltage | | 8 V DC |
| Input current | | 8 mA (limited) |
| Switching point | ON | ≥2.1 mA |
| | OFF | ≤1.2 mA |
| Output | | |
| Quantity | | One output (negative switching), overload and short-circuit protection, wire breakage or short-circuit monitoring (for connection of a pilot valve) |
| Supply | | From AS-Interface |
| Output voltage | | 21 to 31 V DC |
| Output current | | Max. 100 mA |
| Ambient temperature | | –25 to +60 °C |
| Connection | | Cable adapter for AS-i flat-ribbon cable, two-wire, black polyamide<br>or M12x1 round connector, 4-pole, nickel-plated brass [1)] |



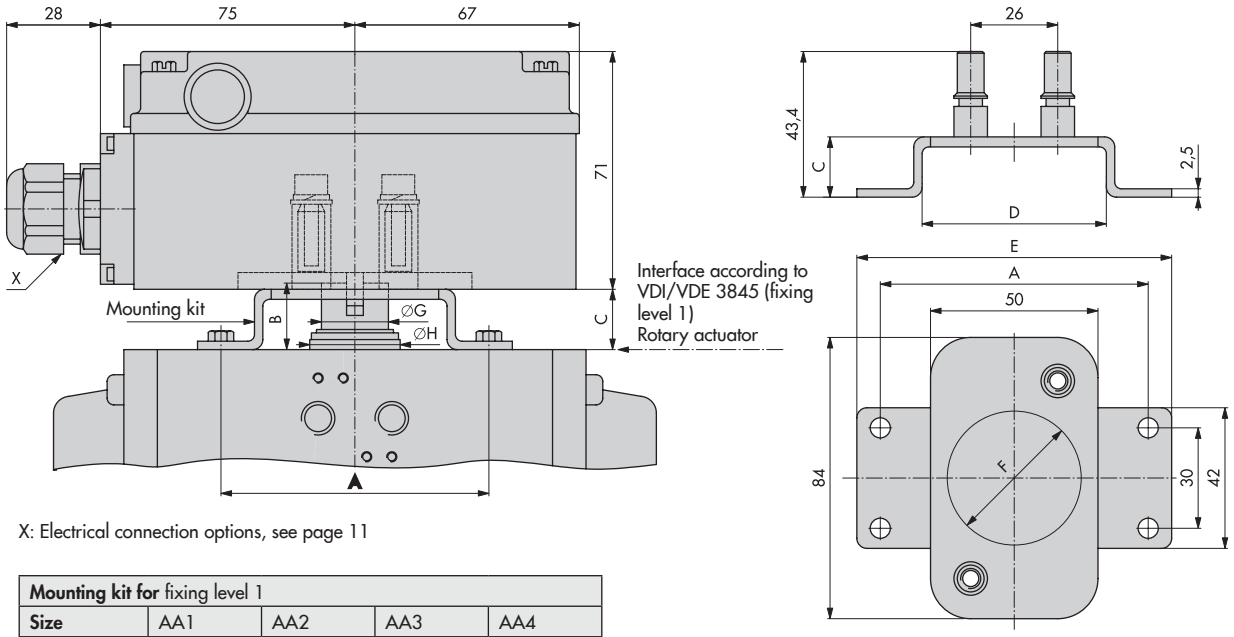

1 Cable gland M20x1.5
2 Connector according to EN 175301-803
3 Harting plug connector
4 Binder plug connector
5 Cable adapter for AS-i flat-ribbon cable
6 Round connector M12x1
7 Filter check valve
8 Filter
9 Indicator cap (not required for linear actuators)

**Dimensions in mm · Connection block/booster valve** (all connections with G ¼/¼ NPT thread)




| Connection block | | Order no. |
|---|---|---|
| 1 | Connection block (single) | 3776-XXXXXX80 |
| | Connection block (double) | 3776-XXXXXX90 |
| **Booster valve** | | **Order no.** |
| 2 | 3/2-way function with spring-return mechanism | 3776-XXXXXX10 |
| 3 | 3/2-way function with spring-return mechanism, one supply air/one exhaust air restrictor | 3776-XXXXXX12 |
| 4 | 5/2-way function with spring-return mechanism | 3776-XXXXXX30 |
| 5 | 5/2-way function with two detent positions | 3776-XXXXXX40 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 closed) | 3776-XXXXXX50 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 vented) | 3776-XXXXXX60 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 supplied with air) | 3776-XXXXXX70 |
| 6 | 5/2-way function with spring-return mechanism, two exhaust air restrictors | 3776-XXXXXX31 |
| | 5/2-way function with two detent positions, two exhaust air restrictors | 3776-XXXXXX41 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 closed), two exhaust air restrictors | 3776-XXXXXX51 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 vented), two exhaust air restrictors | 3776-XXXXXX61 |
| | 5/3-way function with spring-centered mid-position (ports 2 and 4 supplied with air), two exhaust air restrictors | 3776-XXXXXX71 |

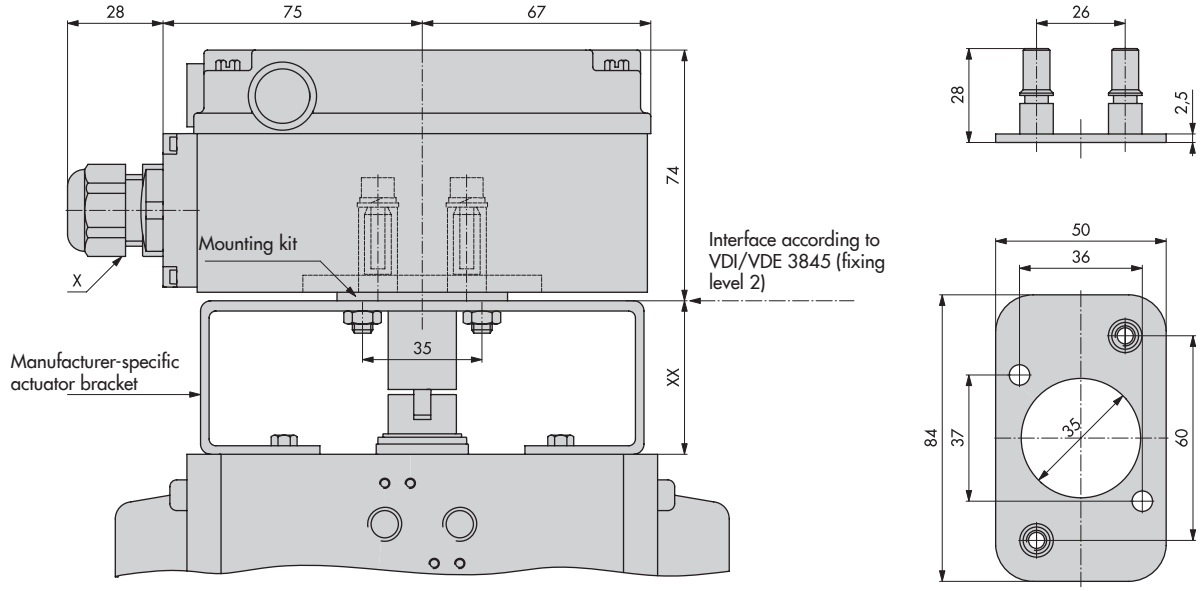
## Dimensions in mm · Attachment to rotary actuators according to VDI/VDE 3845, fixing level 1




X: Electrical connection options, see page 11

| **Mounting kit for** fixing level 1 | | | | |
|---|---|---|---|---|
| **Size** | AA1 | AA2 | AA3 | AA4 |
| **Order no.** | **1400-7043** | **1400-7186** | **1400-7212** | **1400-7210** |
| Dimension A | 80 | 80 | 130 | 130 |
| Dimension B | 20 | 30 | 30 | 50 |
| Dimension C | 18 | 28 | 28 | 48 |
| Dimension D | 55 | 55 | 105 | 105 |
| Dimension E | 94 | 94 | 144 | 144 |
| Dimension F | 40 | 40 | 48 | 48 |
| Dimension G | ≤ (F – 1) | | | |
| Dimension H | ≤ (D – 1) | | | |

## Dimensions in mm · Attachment to rotary actuators according to VDI/VDE 3845, fixing level 2




X: Electrical connection options, see page 11
XX: Manufacturer-specific dimension

| **Designation** | **Order no.** |
|---|---|
| Mounting kit for fixing level 2 | 1400-7041 |

## Article code

| Limit switch | Type 3776- | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type of protection** | | | | | | | | | | | | | | | | | |
| No explosion protection | | 0 | | | | | | | | | | | | | | | |
| II 2G Ex ia IIC T6, ATEX [1] (max. 60/70/80 °C in T6/T5/T4) | | 1 | | | | | | | | | | | | | | | |
| Ex ia FM [2] (max. 60°C in T6/T5) | | 3 | | | | | | | | | | | | | | | |
| II 3G Ex nA II T6, ATEX [3] (max. 60/70/80 °C in T6/T5/T4) | | 8 | | | | | | | | | | | | | | | |
| **Limit contact** | | | | | | | | | | | | | | | | | |
| Version | | | | | | | | | | | | | | | | | |
| Inductive proximity switch SC3,5-N0, two-wire (–40 to +80 °C) | | | 1 | | | | | | | | | | | | | | |
| Inductive proximity switch SJ3,5 SN, two-wire (–45 to +80 °C) | | | 2 | | | | | | | | | | | | | | |
| Inductive double proximity switch SB3,5 E2, three-wire [3], without explosion protection and AS-i (–20 to +70 °C) | | | 3 | | | | | | | | | | | | | | |
| Electric microswitch, three-wire [3], SPDT with silver contact without AS-i (–40 to +80 °C) | | | 5 | | | | | | | | | | | | | | |
| Electric microswitch, three-wire [3], SPDT with gold contact without AS-i (–40 to +80 °C) | | | 6 | | | | | | | | | | | | | | |
| Special version | | | 9 | | | | | | | | | | | | | | |
| Quantity [4] | | | | | | | | | | | | | | | | | |
| 1 limit contact | | | | 1 | | | | | | | | | | | | | |
| 2 limit contacts | | | | 2 | | | | | | | | | | | | | |
| 3 limit contacts | | | | 3 | | | | | | | | | | | | | |
| 4 limit contacts | | | | 4 | | | | | | | | | | | | | |
| 6 limit contacts | | | | 6 | | | | | | | | | | | | | |
| Opening angle | | | | | | | | | | | | | | | | | |
| <100°, adjustable | | | | | 0 | | | | | | | | | | | | |
| <180°, adjustable | | | | | 1 | | | | | | | | | | | | |
| Special version | | | | | 9 | | | | | | | | | | | | |
| **Solenoid valve** | | | | | | | | | | | | | | | | | |
| Nominal signal | | | | | | | | | | | | | | | | | |
| Without solenoid valve | | | | | | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| 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 | | | | | | | | | | | |
| Manual override | | | | | | | | | | | | | | | | | |
| Without, **SIL** | | | | | | | 0 | | | | | | | | | | |
| With pushbutton underneath the enclosure cover, **SIL** | | | | | | | 1 | | | | | | | | | | |
| Pushbutton/switch underneath the enclosure cover | | | | | | | 2 | | | | | | | | | | |
| Switching function | | | | | | | | | | | | | | | | | |
| Without switching function (without integrated solenoid valve) | | | | | | | | 0 | | | | | | | | | |
| 3/2-way function with spring-return mechanism, $K_{VS}$ 0.2, **SIL** | | | | | | | | 1 | | | | | | | | | |
| 5/2-way function with spring-return mechanism, $K_{VS}$ 0.3 | | | | | | | | 3 | 0 | | | | | | | | |
| 5/2-way, detent mechanism, $K_{VS}$ 0.3 | | | | | | | | 4 | | | | | | | | | |
| 5/3-way, 2 + 4 closed, $K_{VS}$ 0.3 | | | | | | | | 5 | | | | | | | | | |
| 5/3-way, 2 + 4 vented, $K_{VS}$ 0.3 | | | | | | | | 6 | | | | | | | | | |
| Connection block with one solenoid pilot valve [5] | | | | | | | | 8 | 0 | | | | | | | | |
| Connection block with two solenoid pilot valves [4] [6] | | | | | | | | 9 | 0 | | | | | | | | |
| Restrictors | | | | | | | | | | | | | | | | | |
| Without, **SIL** | | | | | | | | | 0 | | | | | | | | |
| 2 exhaust air restrictors, $K_{VS}$ 0.01 to 0.18, adjustable (optional with 5/2-way or 5/3-way function) | | | | | | | | | 1 | | | | | | | | |
| 1 supply air/1 exhaust air restrictor, $K_{VS}$ 0.01 to 0.18, adjustable (optional with 3/2-way function) | | | | | | | | | 2 | | | | | | | | |
| Pneumatic connection | | | | | | | | | | | | | | | | | |
| Without, (without integrated solenoid valve) | | | | | | | | | | 0 | | | | | | | |
| G ¼ | | | | | | | | | | 1 | | | | | | | |

| Limit switch | Type 3776- x x x x x x x x x x x x x x x x x x |
|---|---|
| ¼ NPT | 2 |
| **Electrical connection** | |
| 12-pole terminal block, M20x1.5 threaded connection | |
| 1 black cable gland M20x1.5, polyamide, min. –20 °C | 1 0 |
| 2 black cable glands M20x1.5, polyamide, min. –20 °C | 1 1 |
| 1 blue cable gland M20x1.5, polyamide, min. –20 °C | 1 2 |
| 2 blue cable glands M20x1.5, polyamide, min. –20 °C | 1 3 |
| 1 adapter M20x1.5 to ½ NPT, aluminum, min. –45 °C | 1 4 |
| 2 adapters M20x1.5 to ½ NPT, aluminum, min. –45 °C | 1 5 |
| 1 black CEAG cable gland M20x1.5, polyamide, min. –20 °C | 1 6 |
| 2 black CEAG cable glands M20x1.5, polyamide, min. –20 °C | 1 7 |
| 1 cable gland M20x1.5, brass, min. –45 °C | 1 8 |
| 2 cable glands M20x1.5, brass, min. –45 °C | 1 9 |
| Connector | |
| 1 Harting device connector, 8-pole, max. 50 V AC, aluminum, silver gray [7], min –40 °C | 2 1 |
| 2 Harting device connectors, 7+7-pole, max. 50 V AC, aluminum, silver gray [7], min –40 °C | 2 2 |
| 1 device connector, type A according to DIN EN 175301-803, 4-pole, black polyamide [7], min. –20 °C | 2 5 |
| 2 device connectors, type A according to DIN EN 175301-803, 4+4-pole, black polyamide [8], min. –20 °C | 2 6 |
| 1 Binder round connector, 7-pole, black polyamide [7], min. –20 °C | 2 7 |
| 2 Binder round connectors, 7+6-pole, black polyamide [8], min. –20 °C | 2 8 |
| AS-Interface module with bus connection | |
| Cable adapter for AS-i flat-ribbon cable, two-wire, black polyamide, without explosion protection, –25 to +60 °C | 5 2 |
| Round connector M12x1, 4-pole, brass, without explosion protection [7], –25 to +60 °C | 5 3 |
| **Degree of protection** | |
| IP 54, polyethylene filter (min. –20 °C) | 0 |
| IP 65, filter check valve made of polyamide (min. –20 °C) | 1 |
| IP 65, filter check valve made of stainless steel 1.4305 (min. –45 °C) | 2 |
| **Ambient temperature** | |
| The permissible ambient temperature of the limit switch depends on the permissible ambient temperature of the components, type of protection and temperature class. | x |
| **Safety approval** | |
| Without | 0 |
| SIL [9] | 1 |
| **Special version** | |
| Inductive proximity switch SJ3,5 S1N, two-wire, NAMUR NO contact, with explosion protection and SIL capability (–25 to +80 °C) | 0 0 4 |
| EAC Ex: on request | 0 1 1 |
| EAC Ex: on request | 0 1 5 |
| STCC: II 2G Ex ia IIC T6 (on request) | 0 1 6 |
| STCC: II 3G Ex nA II T6 (on request) | 0 1 7 |
| Further special versions on request | x x x |

1) According to EC type examination certificate PTB 98 ATEX 2072
2) According to FM certificate of conformity 3026958
3) According to statement of conformity PTB 02 ATEX 2007 X (II 3G Ex nA II T6)
4) A maximum of two three-wire limit contacts can be used when a solenoid valve is actuated on both sides.
5) For pneumatic actuation on one side of an external 3/2-way or 5/2-way Type 3756 Booster Valve, G ¼/¼ NPT
6) For pneumatic actuation on both sides of an external 5/2-way or 5/3-way Type 3756 Booster Valve, G ¼/¼ NPT
7) The cable socket is not included in the scope of delivery (see page 17).
8) The cable sockets are included in the scope of delivery (see page 17).
9) SIL according to IEC 61508 (certificate no. DE V 60.09/14 rev. 01)

**Summary of explosion protection approvals**

| Type 3776 | Certification | | Type of protection |
|---|---|---|---|
| -1 | **ATEX** | Number PTB 98 ATEX 2072<br>Date 2006-08-25 | II 2G Ex ia IIC T6 |
| | **EAC** | Number RU C-DE.HA65.B.00615/20<br>Date 2020-06-08<br>Valid until 2025-05-13 | 1Ex ia IIC T6...T4 Gb X |
| | **STCC** | On request | |
| | **CCoE** | Number A/P/HQ/MH/104/1794<br>Date 2016-11-12<br>Valid until 2021-11-11 | Ex ia IIC T6 |
| -3 | **FM** | Number 3026958<br>Date 2006-10-16 | Class I, Zone 0 AEx ia IIC<br>Class I,Div.1, Groups A,B,C,D.<br>Class I, Div. 2, Groups A, B, C, D;<br>Class I, Zone 2,IIC |
| -8 | **ATEX** | Number PTB 02 ATEX 2007 X<br>Date 2002-03-07 | II 3G Ex nA II T6 |
| | **EAC** | On request | |
| | **STCC** | On request | |

## Spare parts and accessories

| Designation | Order no. |
|---|---|
| Cable socket according to EN 175301-803, form A, made of polyamide, black | 0790-6658 |
| Cable socket (Harting), 8-pole, made of aluminum, silver gray | 1400-8298 |
| Sensor connecting lead, two-wire, 3 m, blue, with angle connector M12 x 1, 4-pole, nickel-plated brass | 8801-2810 |
| Cable socket (Binder), 7-pole, made of PBT GV, black | 8831-0716 |
| Cable socket M12x1, 4-pole, angled design, made of polyamide, black | 8831-0865 |
| Cable gland M20x1.5, nickel-plated brass | 1890-4875 |
| Ex cable gland M20x1.5 (CEAG) made of black polyamide | 8808-0178 |
| Cable gland M20x1.5 made of black polyamide | 8808-1011 |
| Cable gland M20x1.5 made of blue polyamide | 8808-1012 |
| Adapter ½ NPT made of aluminum, powder coated, gray beige RAL 1019 | 0310-2149 |
| Cover made of transparent polycarbonate, with G ¼ connection for filter/filter check valve | 1089-1159 |
| Indicator cap | 0209-0018 |
| Printed circuit board for AS-Interface module (2011 version) | 1380-1892 |
| Cable breakage protection in enclosure for 35 mm rail mounting, degree of protection IP 20 (for Type 3776-XXXX1 with 6 V DC solenoid valve) | 3994-0158 |
| Filter check valve made of 1.4305, G ¼ connection, degree of protection IP 65 | 1790-7253 |
| Filter check valve made of polyamide, G ¼ connection, degree of protection IP 65 | 1790-7408 |
| Filter made of polyethylene, G ¼ connection, degree of protection IP 54 | 8504-0066 |
| **Mounting kits** | |
| **Designation** | **Order no.** |
| Mounting kit made of 1.4301 for Type 3278 Rotary Actuator, 160 cm² diaphragm area | 1400-7216 |
| Mounting kit made of 1.4301 for Type 3278 Rotary Actuator, 320 cm² diaphragm area | 1400-7217 |
| Mounting kit made of 1.4301 for rotary actuators according to VDI/VDE 3845, fixing level 1 | |
| AA1 size, hole spacing A = 80 mm, shaft trunnion length B = 20 mm | 1400-7043 |
| AA2 size, hole spacing A = 80 mm, shaft trunnion length B = 30 mm | 1400-7186 |
| AA3 size, hole spacing A = 130 mm, shaft trunnion length B = 30 mm | 1400-7212 |
| AA4 size, hole spacing A = 130 mm, shaft trunnion length B = 50 mm | 1400-7210 |
| Mounting kit made of 1.4301 for rotary actuators according to VDI/VDE 3845, fixing level 2 | 1400-7041 |
| Follower clamp for mounting kit with fixing level 2 | 0469-0017 |
| Mounting kit made of 1.4301 for Type 3277 Linear Actuator, 175, 240 and 350 cm² diaphragm areas | 1400-7220 |
| Mounting kit made of 1.4301 for Type 3277 Linear Actuator, 355, 700 and 750 cm² diaphragm areas | 1400-7221 |
| Mounting kit made of 1.4301 for Type 3277-5 Linear Actuator (external) | 1400-7219 |
| Mounting kit made of 1.4301 for Type 3277-5 Linear Actuator (internal), G ¼ connection | 1400-7222 |
| Mounting kit made of 1.4301 for Type 3277-5 Linear Actuator (internal), ¼ NPT connection | 1400-7223 |
| Seal for attachment to Type 3277-5 Linear Actuator (internal) | 0430-1544 |
| Mounting kit made of 1.4301 for Type 3241 Valve, DN 15 to 100 | 1400-7730 |
| Mounting kit made of 1.4301 for Type 3351 Valve, DN 15 to 50 | 1400-7735 |
| Mounting kit made of 1.4301 for Type 3351 Valve, DN 65 to 80 | 1400-7736 |
| Mounting kit made of 1.4301 for Type 3351 Valve, DN 100 | 1400-7737 |
| Mounting kit made of 1.4301 for valves with rod-type yoke, DN 15 to 150 | On request |
| Mounting kit made of 1.4301 for Series 250 and 280 Valves with NAMUR rib, DN 15 to 400 | On request |
| Mounting kit made of 1.4301 for Type 324x Valve, DN 200 to 300 | On request |