Inductive Limit Switch
Type 3768

Mounting and Operating Instructions

EB 8356 EN
Edition April 2004
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<td></td>
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<td>24</td>
</tr>
</tbody>
</table>
Assembly, start-up and operation of the device may only be performed by trained and experienced personnel familiar with this product. According to these mounting and operating instructions, trained personnel is referred to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Explosion-protected versions of this device may only be operated by personnel who have undergone special training or instructions or who are authorized to work on explosion-protected devices in hazardous areas (for more details, refer to section 5).

Any hazards which could be caused by the process medium, the signal pressure and moving parts of the control valve are to be prevented by means of appropriate measures. If inadmissible motions or forces are produced in the pneumatic actuator as a result of the level of the supply air pressure, this must be restricted by means of a suitable pressure reducing station.

Proper shipping and appropriate storage are assumed.

Note! The device with a CE marking fulfils the requirements of the Directives 94/9/EC (ATEX) and 89/336/EEC. The declaration of conformity can be viewed and downloaded on the Internet at http://www.samson.de.
1 Design and principle of operation

The Type 3768 Limit Switch is designed for attachment to pneumatic control valves. It is equipped with inductive switching elements that issue a limit signal whenever the valve travel exceeds or falls below a certain preset limit, especially when the valve has reached one of its end positions. The limit signal is transmitted to an alarm or indicating unit.

The limit switch is also available with a solenoid valve which is used to move the control valve to a fail-safe position.

The limit switch is designed for either direct attachment to SAMSON Type 3277 Actuators or for attachment to control valves complying with IEC 60534-6 (NAMUR) by means of an adapter housing.

The valve travel and, hence, the valve position is transmitted via the pin (1.1) to the lever (1), thus converting the linear travel into a rotary motion. The shaft (2) transmits the rotary motion to two adjustable tags (4) which, in return, operate the associated proximity switches (5).

The operation of the inductive limit switches requires that switching amplifiers be connected in the output circuit (see section 3).

Version with solenoid valve

The solenoid valve is used to move the control valve to its fail-safe position regardless of the output signal issued by the control unit. When a control signal which corresponds to the binary signal 0 (OFF) is applied to the input, the signal pressure $p_{st}$ is shut off and the actuator vented. As a result, the springs installed in the actuator force the valve to move to its fail-safe position.

Whereas a control signal corresponding to the binary signal 1 (ON) causes the signal pressure $p_{st}$ to be transmitted to the actuator, resulting in activation of the control valve.

---

**Fig. 2: Functional diagram**

1. Lever
2. Shaft
3. Spring
4. Tag
5. Proximity switch
6. Adjustment screw
7. Pressure regulator
### 1.1 Versions

<table>
<thead>
<tr>
<th>Model</th>
<th>3768-</th>
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<th>0</th>
<th>0</th>
<th>0</th>
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<td>Explosion protection</td>
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<tr>
<td>Ex II 2 G EEx ia IIC T6 acc. ATEX</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Ex ia FM/CSA</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ex II 3 G EEx nA II T6 acc. ATEX</td>
<td>8</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Solenoid valve</td>
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<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 V DC</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 V DC</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V DC</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumatic connections</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4-NPT</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>ISO 288/1-G 1/4</td>
<td>2</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Electrical connections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M20 x 1.5 blue</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M20 x 1.5 black</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plug connector HAN 7D (not with CSA/FM)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### 1.2 Technical data

<table>
<thead>
<tr>
<th>Travel range</th>
<th>Direct attachment: 7.5 to 30 mm; Attachment acc. to IEC 60534-6: 5.5 to 120 mm; angle of rotation: 0-90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 proximity switches</td>
<td>Type SJ 2-SN; Control circuit: values must match the downstream switching amplifiers</td>
</tr>
<tr>
<td>Differential gap</td>
<td>≤1% at rated travel</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 65 w/o solenoid valve, IP 54 with solenoid valve (special version IP 65 w. filter check valve)</td>
</tr>
<tr>
<td>Perm. ambient temp.</td>
<td>−20 to +80 °C</td>
</tr>
<tr>
<td>EMC</td>
<td>Requirements as per EN 50081/50082 are met</td>
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</table>

#### Solenoid valve

<table>
<thead>
<tr>
<th>Nominal signal</th>
<th>6 V DC</th>
<th>12 V DC</th>
<th>24 V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal 0 (no pick-up), DC signal at −25 °C</td>
<td>≤1.2 V</td>
<td>≤2.4 V</td>
<td>≤4.7 V</td>
</tr>
<tr>
<td>Signal 1 (safe pick-up), DC signal at +80 °C</td>
<td>≥5.4 V</td>
<td>≥9.6 V</td>
<td>≥18 V</td>
</tr>
<tr>
<td>Maximum permissible signal</td>
<td>28 V</td>
<td>25 V</td>
<td>32 V</td>
</tr>
<tr>
<td>Coil resistance R; at 20 °C</td>
<td>2909 Ω</td>
<td>5832 Ω</td>
<td>11714 Ω</td>
</tr>
<tr>
<td>Air consumption in steady state, K_s= 0.14 m³/h</td>
<td>&quot;Off&quot; ≤60 l/h; &quot;On&quot; ≤10 l/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing time for</td>
<td>Type 3277 Actuator cm²</td>
<td>120</td>
<td>240</td>
</tr>
<tr>
<td>For rated travel and signal pressure range</td>
<td>0.2 to 1 bar</td>
<td>≤0.5 s</td>
<td>≤1 s</td>
</tr>
<tr>
<td></td>
<td>0.4 to 2 bar</td>
<td>≤2 s</td>
<td>≤2.5 s</td>
</tr>
<tr>
<td></td>
<td>0.6 to 3 bar</td>
<td>≤1 s</td>
<td>≤1.5 s</td>
</tr>
</tbody>
</table>
2 Attachment to control valve

The limit switch can be attached either directly to a SAMSON Type 3277 Actuator or to control valves with cast yokes or rod-type yokes according to IEC 60534-6 (NAMUR). Combined with an intermediate piece, the limit switch can also be mounted on rotary actuators. The standard limit switch is delivered without accessories. The additionally required mounting parts are listed together with their order numbers in the tables on pages 16 and 17. The limit switch may be mounted on the left-hand or right-hand side of the control valve. Any subsequent changes of the mounting position change the switching function of the limit switch. Please also note the instructions in section 4.

2.1 Direct attachment

1. Screw the clamp (1.2) to the actuator stem. Make sure the fastening screw rests in the groove of the actuator stem.
2. Screw the associated lever D1 or D2 to the lever of the limit switch.
3. Secure the distance plate (15) together with the gasket facing towards the actuator yoke.
4. Position the limit switch such that the lever D1 or D2 slides in line over the pin (1.1) of the clamp (1.2).
5. Mount cover (18).

Attachment of versions with solenoid valve

To establish the signal pressure connection to the actuator, use an adapter block or a switchover plate. Both are listed in Table 2 and 3 (page 16).

240 to 700 cm² actuators

1. Make sure that the tip of the gasket (16) projecting from the side of the adapter block (Fig. 3, middle) is positioned to match the actuator symbol for the actuator's fail-safe action "Actuator stem extends" or "Actuator stem retracts". If this is not the case, remove the three fixing screws and the cover. Reposition the gasket (16) turned by 180°. The old connection block version requires the switch plate (13) to be turned such that the corresponding actuator symbol points to the marking.

2. Place the adapter block with its O-rings between the limit switch and the actuator yoke and secure using the fastening screw. For versions "Actuator stem retracts", the ready-to-use signal pressure line must be additionally mounted.

120 cm² actuators

The signal pressure is transmitted to the diaphragm chamber via the switchover plate.

1. Remove the M3 screw plug at the back of the limit switch and insert the plug included in the accessories in the lateral signal pressure output ("output 38").

2. Mount the limit switch so that the bore in the distance plate (15) covers the seal in the bore of the actuator yoke.

3. Align the switchover plate with the corresponding actuator symbol and screw tight.
**Attachment to control valve**

**Type 3277**

*Adapter block only for version with solenoid valve*

**View onto the signal pressure connection**

*Attachment left*

*Attachment right*

**Actuator stem**

*extends*

*retracts*

**Signal pressure connection**

*internal*

*over pipe connection*

**Switch plate (13)**

**Marking**

**Actuator stem**

*extends*

*retracts*

*Symbol for actuator stem extends*

*retracts*

**Tip of gasket**

*(16)*

**Cover plate**

**Symbol for actuator stem extends**

*retracts*

**Switch plate (13)**

*Marking*

**Type 3277-5 with 120 cm²**

**Clamp**

**Signal pressure input for left attachment**

**Switchover plate**

*only for version with solenoid valve*

**Signal pressure input for right attachment**

*Symbol for actuator stem retracts*

*extends*

*Marking*

*Fig. 3 : Direct attachment – Mounting of bracket, signal pressure connection*
2.2 Attachment according to IEC 60534-6

For limit switch attachment according to NA-MUR, you require an adapter housing. The valve travel is transmitted via the lever (18) and shaft (25) to the bracket (28) of the adapter housing and then passed on to the pin (27a) located on the limit switch lever. For the limit switch attachment you require the mounting parts listed in Table 4. The rated travel of the control valve determines which lever must be used. You can attach the limit switch either to the left or to the right of the control valve.

2.2.1 Mounting sequence

Choose the required mounting parts from Tables 4 and 5 on pages 16 and 17.

Control valve with cast yoke:

1. Screw the plate (20) to the stem connector of the actuator and plug stem using the countersunk screws. For 2100 and 2800 cm² actuator versions, use an additional mounting bracket (32).
2. Remove the rubber plug from inside the adapter housing and fasten the housing to the left or right side of the Namur rib using a hexagon screw.

Control valve with rod-type yoke:

1. Screw the plate (20) to the carrier of the plug stem.
2. Screw the studs (29) into the adapter housing.
3. Place the housing with the mounting plate (30) on either the right or left side of the valve stem and screw tight using nuts (31). Make sure that the lever (18) to be mounted subsequently is in horizontal position when the valve is at mid-travel.
4. Screw the pin (19) into the center row of holes on the plate (20) and lock it in a position above the correct lever marking (1 to 2), as indicated in Table 5.
5. Clamp the clip (21) onto the lever (18). Only when connecting versions with solenoid valve and air connection pointing to the front, must the clip be clamped onto the lever with the open side pointing downwards.
6. Attach the lever (18) including clamping plate (22) to the shaft (25). The clip must clasp the pin (19).

2.2.2 Presetting the travel

1. Move the valve to 50 % travel.
2. Adjust the shaft (25) in the adapter housing so that the black pointer (24) meets the cast mark on the adapter housing.
3. Screw the clamping plate (22) tight in this position using the screw (23).
4. Screw in the pin (27a) at the limit switch lever on the side of the press nut and lock with a hex nut (27b) on the other side. Observe the mounting position A or B according to Table 5 and Fig. 4.
Fig. 4: Attachment according to NAMUR (shown for attachment to the left side)
5. Place the limit switch on the adapter housing, observing the operating direction. Make sure that the pin (27a) rests against the bracket (28).

**Caution!**
The pin must not slip out of the bracket once installed.

### 2.3 Attachment to rotary actuators

You have the possibility of attaching the limit switch to rotary actuators according to VDI/VDE 3845. For this purpose, you require the accessories and mounting parts listed in Table 6 on page 17. The rotary motion of these actuators is transferred to the metal tags via the cam disk installed on the actuator shaft and a follower roll on the limit switch lever.

#### 2.3.1 Mounting the follower roll lever

1. Place the follower roll lever (35) on the side where the transmission lever (37) is located (opposite of the press nuts). Secure with the supplied screws (38) and washers.

### 2.3.2 Mounting the intermediate piece

**SAMSON Type 3278 Actuator**

1. Screw the adapter (36) to the free end of the rotary actuator’s shaft.
2. Screw intermediate piece (34) with two screws to the actuator case. For versions with solenoid valve, make sure that you place the intermediate piece in such a manner that the air connections of the limit switch point towards the side of the diaphragm case.
3. Align the cam disk and scale as described in section 2.3.3, and fasten with screws.

**Actuators according to VDI/VDE 3845**

1. Place the entire intermediate piece (34, 42, 44 and 45) onto the mounting bracket included in the scope of actuator delivery (fixing level 1 acc. to VDI/VDE 3845) and screw tight.
2. Align the cam disk (40) and scale as described in section 2.3.3 and fasten with screws.
Attachment to SAMSON Type 3278

33 Limit switch
34 Intermediate piece
35 Lever with follower roll
36 Adapter
37 Transmission lever
38 Screws
39 Scale
40 Cam disk
41 Actuator shaft
42 Disk
43 Mounting bracket
44 Coupling
45 Seal

Attachment acc. to VDI/VDE 3845

Vent plug or filter check valve

Fig. 5 - Attachment to rotary actuators
2.3.3 Adjusting the cam disk

The adjustment of the cam disk depends on the valve’s direction of rotation, i.e. whether it opens clockwise or counterclockwise.

---

**Important!**
Starting position is the closed valve.
The starting point (bore) of the cam must be positioned so that the fulcrum of the cam disk and the 0°-position on the scale as well as the arrow on the inspection glass form a horizontal line.
When aligning the cam disk, the double-sided scale disk must be clipped on the cam disk in such a way that the value on the scale matches the control valve’s direction of rotation. Secure the cam disk using the fastening screw.

---

Securing the aligned cam disk

To additionally prevent the cam disk from being turned, drill a hole into the adapter (36) or the coupling (44) and install a 2 mm dowel pin.
Four bore holes are available on the cam disk, and they are located centrically around the center bore hole. Select the suitable bore to secure.
Follower roll
Starting point

Insert clip and press the tongues outwards

Control valve opens counterclockwise

Starting point

Control valve opens clockwise

Fig. 6 - Adjusting the cam disk
2.3.4 Reversing amplifier for double-acting actuators

Limit switches fitted with solenoid valves which are intended for use with double-acting actuators must be equipped with a reversing amplifier.

The reversing amplifier is listed as an accessory in Table 7 on page 21.

The output signal pressure of the solenoid valve is supplied at output A₁ of the reversing amplifier. An opposing pressure, which equals the required supply pressure when added to the pressure at A₁, is supplied at output A₂. A₁ + A₂ = Z applies.

Assembly

**Important!**
*Remove the sealing plug (1.5) before installing the reversing amplifier. The rubber seal (1.4) must remain installed.*

1. Screw the special nuts (1.3) included in the accessories of the reversing amplifier into the threaded connections of the limit switch.
2. Insert the gasket (1.2) into the recess of the reversing amplifier and push the two hollowed special screws (1.1) into the connecting bore holes A₁ and Z.
3. Place the reversing amplifier onto the limit switch and screw tight using the two special screws (1.1).

Signal pressure connections

A₁: Connect output A₁ to the signal pressure connection on the actuator that opens the valve when the pressure increases.

A₂: Connect output A₂ to the signal pressure connection on the actuator that closes the valve when the pressure increases.
Reversing amplifier for double-acting actuators

Fig. 7 - Mounting a reversing amplifier

1 Reversing amplifier
1.1 Special screws
1.2 Gasket
1.3 Special nuts
1.4 Rubber seal
1.5 Sealing plug
# Mounting parts table

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Direct attachment (Fig. 3)</th>
<th>Actuator size</th>
<th>Attachment kit</th>
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<tbody>
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<td>Required lever with associated clamp and distance plate</td>
<td>cm²</td>
<td>Order no.</td>
<td></td>
</tr>
<tr>
<td>D1 with sealing plug for output (38) for version with solenoid valve</td>
<td>G 1/4</td>
<td>120</td>
<td>1400-6790</td>
</tr>
<tr>
<td></td>
<td>1/4 NPT</td>
<td></td>
<td>1400-6791</td>
</tr>
<tr>
<td>D1 (33 mm long with 17-mm high bracket)</td>
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<td>240 and 350</td>
<td>1400-6370</td>
</tr>
<tr>
<td>D2 (44 mm long with 13-mm high bracket)</td>
<td></td>
<td>700</td>
<td>1400-6371</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2 (only for versions with solenoid valve)</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchover plate for 120 cm² actuators</td>
<td>1400-6819</td>
</tr>
<tr>
<td>Actuator Type 3277-5xxxxxx. <strong>00</strong> (old)</td>
<td></td>
</tr>
<tr>
<td>Switchover plate <strong>new</strong></td>
<td>1400-6822</td>
</tr>
<tr>
<td>Actuator with index <strong>01</strong> or higher (new)</td>
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</tr>
<tr>
<td>Connection plate for additional attachment of, e.g. a solenoid valve</td>
<td>1400-6820</td>
</tr>
<tr>
<td>3277-5xxxxxxx. <strong>00</strong> (old)</td>
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</tr>
<tr>
<td>G 1/8</td>
<td></td>
</tr>
<tr>
<td>1/8 NPT</td>
<td>1400-6821</td>
</tr>
<tr>
<td>Connection plate <strong>new</strong></td>
<td>1400-6823</td>
</tr>
<tr>
<td>Actuator with index <strong>01</strong> or higher (new)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Only new switchover and connecting plates can be used for new actuators (index **01**). Old and new plates are not interchangeable.

| Required connection block for 240, 350 and 700 cm² actuator (including seals and mounting screws) | G 1/4 | 1400-8811 |
| (including seals and mounting screws) | 1/4 NPT | 1400-8812 |

<table>
<thead>
<tr>
<th>Table 3 (only for version with solenoid valve)</th>
<th>Material</th>
<th>Order no.</th>
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<td>Required tube connection including screw joint</td>
<td>Steel</td>
<td>1400-6444</td>
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<tr>
<td>240</td>
<td>Stainless steel</td>
<td>1400-6445</td>
</tr>
<tr>
<td>350</td>
<td>Steel</td>
<td>1400-6446</td>
</tr>
<tr>
<td>350</td>
<td>Stainless steel</td>
<td>1400-6447</td>
</tr>
<tr>
<td>700</td>
<td>Steel</td>
<td>1400-6448</td>
</tr>
<tr>
<td>700</td>
<td>Stainless steel</td>
<td>1400-6449</td>
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**Accessories**

<table>
<thead>
<tr>
<th>Pressure gauge mounting kit for supply air and signal pressure</th>
<th>SS/SS</th>
<th>1400-6951</th>
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</thead>
<tbody>
<tr>
<td>Filter check valve, replaces the vent plug and raises the degree of protection to IP 65</td>
<td>Stainless steel/Br</td>
<td>1790-7408</td>
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### Mounting parts table

#### Table 4  Attachment IEC 60534-6 (Fig. 4)

<table>
<thead>
<tr>
<th>NAMUR attachment kit</th>
<th>Control valve</th>
<th>Travel in mm</th>
<th>With lever</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts, see Fig. 4</td>
<td>Valve with cast yoke</td>
<td>7.5 to 60</td>
<td>N1 (125mm)</td>
<td>1400-6787</td>
</tr>
<tr>
<td></td>
<td>22.5 to 120</td>
<td>N2 (212 mm)</td>
<td></td>
<td>1400-6789</td>
</tr>
<tr>
<td></td>
<td>Valve with rod-type yoke with rod diameter mm</td>
<td>20 to 25</td>
<td>N1</td>
<td>1400-6436</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 to 25</td>
<td>N2</td>
<td>1400-6437</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 to 30</td>
<td>N1</td>
<td>1400-6438</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 to 30</td>
<td>N2</td>
<td>1400-6439</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 to 35</td>
<td>N1</td>
<td>1400-6440</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 to 35</td>
<td>N2</td>
<td>1400-6441</td>
</tr>
</tbody>
</table>

Attachment to Fisher and Masonelian linear actuators (one each of both attachment kits are required per actuator) 1400-6771 and 1400-6787

#### Accessories (w. sol. valve)
- Press. gauge mount. block: G 1/4: 1400-7098 1/4 NPT: 1400-7099
- Press. gauge mount. kit for supply and signal pressure: St. steel/brass: 1400-6950 St. st./st. st.: 1400-6951
- Filter check valve, replaces the vent plug and raises the degree of protection to IP 65 1790-7408

#### Table 5  Attachment acc. to IEC 60534-6

<table>
<thead>
<tr>
<th>Travel in mm *)</th>
<th>Pin on lever marking *)</th>
<th>Distance between pin/lever fulcrum</th>
<th>With lever</th>
<th>Transmission pin (27a) in position</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>1</td>
<td>42</td>
<td>N1 (125 mm long)</td>
<td>A</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>84</td>
<td>N2 (212 mm long)</td>
<td>A</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>42</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
<td>84</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>42</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>60</td>
<td>2</td>
<td>84</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
<td>84</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>120</td>
<td>2</td>
<td>168</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) Interpolate intermediate values

#### Table 6  Rotary actuator for mounting parts (Fig. 5)

<table>
<thead>
<tr>
<th>SAMSON Type 3278 Actuator</th>
<th>160 cm²</th>
<th>320 cm²</th>
<th>VDI/VDE 3845</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order no.</td>
<td>1400-7103</td>
<td>1400-7104</td>
<td>1400-7105</td>
</tr>
<tr>
<td>Attachment Masonelian</td>
<td>Camflex I</td>
<td>Camflex I</td>
<td>Camflex II</td>
</tr>
<tr>
<td>Order no.</td>
<td>1400-7118</td>
<td>1400-7119</td>
<td>1400-7120</td>
</tr>
<tr>
<td>Cam disk with accessories</td>
<td>Cam disk, linear characteristics (0050-0072) angle of rotation 0 to 90°</td>
<td>1400-6664</td>
<td></td>
</tr>
<tr>
<td>Reversing amplifier (Fig. 7) for double-acting springless actuators</td>
<td>G threaded connection</td>
<td>1079-11118</td>
<td></td>
</tr>
<tr>
<td>NPT threaded connection</td>
<td>1079-1119</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories (only for versions with solenoid valves)</td>
<td>Stainless steel/brass</td>
<td>1400-6950</td>
<td></td>
</tr>
<tr>
<td>Press. gauge mount. kit for supply air and signal pressure</td>
<td>Stainless steel/st. steel</td>
<td>1400-6951</td>
<td></td>
</tr>
<tr>
<td>Filter check valve, replaces the vent plug and raises the degree of protection to IP 65</td>
<td>1790-7408</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Electrical connections

⚠️ As far as the electrical installation of the device is concerned, the relevant national regulations governing the installation of electrical equipment and the national accident prevention regulations of the country of destination must be adhered to.

In Germany, these are the VDE regulations and accident prevention regulations of the employer's liability insurance.

For installation in hazardous areas, the following standards apply: EN 60079-14: 1997; VDE 0165 Part 1/8.98 "Electrical apparatus for explosive gas areas" and EN 50281-1-2: VDE 0165 Part 2/11.99 "Electrical apparatus for use in the presence of combustible dust".

For intrinsically safe electrical apparatus that are certified according to the Directive 79/196/EEC, the data specified in the certificate of conformity apply for connection of intrinsically safe circuits.

For intrinsically safe electrical apparatus that are certified according to the Directive 94/9/EC, the data specified in the EC type examination certificate apply for connection of intrinsically safe circuits.

Note: It is absolutely necessary to keep to the terminal plan specified in the certificate. Reversal of the electrical connections may cause the explosion protection to be ineffective! Do not tamper with any painted screws inside or on the case.

Switching amplifier

To operate the inductive limit switches, switching amplifiers complying with EN 60947-5-6 must be connected in the output circuit.

When the limit switch is installed in hazardous areas, you are required to observe the relevant regulations.

Note on the selection of cables and wires!

To run several intrinsically-safe circuits in a multi-core cable, observe paragraph 12 of EN 60079-14; VDE 0165/8.98 standards.

Note especially that for commonly used insulating materials, such as polyethylene, the radial thickness of the conductor insulation must be minimum 0.2 mm. The diameter of a single wire of a flexible conductor must not be smaller than 0.1 mm.

The conductor ends must be protected against unlaying, e.g. by using wire end ferrules. Any unused openings on the limit switch must be closed with plugs.

Devices used in ambient temperatures down to −40 °C must be fitted with metal cable glands.

For the terminal assignment, refer to Fig. 8 or to the label on the terminal strip.
Accessories:
Model code 3768-x...x. 03 and lower
Cable gland PG 13.5:
Black  Order no. 1400-6781
Blue   Order no. 1400-6782
Adapter PG 13.5 on 1/2" NPT:
Metallic Order no. 1400-7109
Blue finish Order no. 1400-7110
Model code 3768-x...x. 04 and higher
Cable gland M20 x 1.5:
Black  Order no. 1400-6985
Blue   Order no. 1400-6986
Nickel-plated brass Order no. 1400-4875
Adapter M20 x 1.5 on 1/2" NPT:
Aluminum powder-coated Order no. 0310-2149

3.1 Pneumatic connections for versions with solenoid valve

The air connections are either 1/4 NPT or G 1/4 tapped holes. The customary screw joints for metal and copper tubes or plastic hoses can be used.

Important! Make sure that the supply air is dehumidified and free of oil and dust. You are required to observe the maintenance instructions for upstream pressure reducing stations.
Thoroughly flush the pneumatic lines prior to installation.

When attaching the Type 3277 Actuator directly, the signal pressure connection is fixed. When using NAMUR attachment, the signal pressure line is connected to either the upper or lower diaphragm chamber of the actuator, depending on the actuator’s fail-safe action, i.e. "Actuator stem retracts" or "Actuator stem extends".

Exhaust air:
Models with the index 3768-x...x. 03 and higher are equipped with a hinged cover without a venting hole. The exhaust air connections for these models are included in the mounting accessories. For direct attachment, the vent plug is located on the plastic cover of the actuator, whereas for NAMUR attachment, it is located on the adapter housing and for attachment to rotary actuators on the intermediate piece.

Note! If you intend to replace older models with model indices 3768-x...x. 02 or lower, the mounting parts need replacing, too.
4 Operation – Adjusting the limit contacts

On the rotary axis, there are two adjustable tags (51) which operate the associated proximity switches (50).
To operate the inductive limit switches, corresponding switching amplifiers must be connected in the output circuit (see section 3).
When the tag (4) is in the inductive field of the switch, the switch assumes a high resistance. When it is no longer in the field, the switch assumes a low resistance.
The limit contacts are usually adjusted to issue a signal for both limit positions. The switches, however, can also be adjusted to signalize intermediate positions.
The assignment of the switches A and B must be determined according to Tables 7 and 8. It depends on the mounting position
of the limit switch and the limit position of the valve (either valve Open or Closed).
The switches A and B are optionally assigned to the terminal pairs 41/42 and 51/52 by turning the associated name plate on the terminal block (see also Fig. 8).

**Important!**
Since the tags of the limit switches cannot be turned by 360°, correct assignment of the switches A and B to the valve positions Open and Closed must be observed, especially when the limit switches are to be connected in fail-safe circuits.

The desired switching function, i.e. whether the output relay must be picked up or released when the tag has entered the field, must be determined by means of jumpers for either working current or closed circuit current at the switching amplifier.
Setting the switching point

Move the valve to the switching position and adjust the tag by turning the adjustment screw (53) so that the switching point is reached and indicated by the LED on the switching amplifier.

To ensure safe switching under any condition, the switching point should be adjusted to stop approx. 2% before the mechanical stop (Open – Closed) is reached.

### Table 7
<table>
<thead>
<tr>
<th>Switch</th>
<th>Tag OUT</th>
<th>Tag IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Open</td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

### Table 8
<table>
<thead>
<tr>
<th>Cable gland points towards</th>
<th>Valve position</th>
<th>Switch Tag</th>
<th>Attachment right</th>
<th>Switch Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OUT</td>
<td>IN</td>
<td>OUT</td>
</tr>
<tr>
<td>Front</td>
<td>Closed</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>A</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Back</td>
<td>Closed</td>
<td>A</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>
5 Servicing explosion-protected versions

In the event that a part of the limit switch on which the explosion protection is based must be serviced, the limit switch must not be operated again, unless an expert has inspected the device according to the explosion protection requirements, issued a certificate stating this, or equipped the device with his mark of conformity.

The inspection by an expert does not have to be carried out, if the manufacturer performs a routine check test on the device prior to taking it into operation again, and the success of the routine check test is documented by attaching a mark of conformity to the device.

Parts used in explosion-protected versions should only be exchanged for original detail inspected parts from the manufacturer.
6 Dimensions in mm

Reversing amplifier (optional)

Fulcrum of the actuator shaft

Pneumatic connection reversing amplifier

Output 1 (A1)

Output 2 (A2)

Supply (Z)
TRANSLATION

EC TYPE EXAMINATION CERTIFICATION


(3) EC Type Examination Certificate Number

PTB 02 ATEX 2077

(4) Equipment: Model 3768-1 Limit Switch

(5) Manufacturer: SAMSON AG, Mess- und Regeltechnik

(6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

(7) This equipment and any acceptable variations thereof are specified in the schedule to this certificate.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102, in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres as specified in Annex II to the Directive.

The examination and test results are recorded in confidential report PTB-Ex 02-22053.

(9) The Essential Health and Safety Requirements are satisfied by compliance with

EN 50014: 1997 + A1 + A2

EN 50020: 1994

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) According to the Directive 94/9/EC, this EC TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

Zertifizierungsstelle Explosionsschutz Braunschweig, 19 July 2002

(Signature) (Seal)

Dr. Ing. U. Johannesmeyer
Regierungsdirektor
EC TYPE EXAMINATION CERTIFICATE No. PTB 02 ATEX 2077

Description of Equipment

There are various versions of the Model 3768-1... Limit Switch with limit contacts and a low-power solenoid valve.

The Limit Switch is suitable for attachment to rotary actuators according to VDE/VDI 3845 and for integral attachment to Model 3277 Linear Actuators with concealed lever system.

The Limit Switch is a passive two-terminal network that may be connected to any certified intrinsically safe circuit, provided the permissible maximum values of Ui, li and Pi are not exceeded.

The device is intended for use inside and outside of hazardous locations.

Inductive limit contact (terminals 41/42 and 51/52)

Type of protection: Intrinsic safety Ex i IIC only for connection to a certified intrinsically safe circuit

Maximum values:

<table>
<thead>
<tr>
<th>Ui</th>
<th>16 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>li</td>
<td>52 mA</td>
</tr>
<tr>
<td>Pi</td>
<td>169 mW</td>
</tr>
<tr>
<td>Ci</td>
<td>30 nF</td>
</tr>
<tr>
<td>Li</td>
<td>100 pH</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Ui</th>
<th>16 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>li</td>
<td>25 mA</td>
</tr>
<tr>
<td>Pi</td>
<td>64 mW</td>
</tr>
<tr>
<td>Ci</td>
<td>30 nF</td>
</tr>
<tr>
<td>Li</td>
<td>100</td>
</tr>
</tbody>
</table>

The correlation between version, temperature classification, permissible ambient temperature ranges, maximum short-circuit currents and power for analysers is shown in the table below:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
<th>Io / Pe</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-45 °C...45 °C</td>
<td>52 mA / 169 mW</td>
</tr>
<tr>
<td>T5</td>
<td>-45 °C...60 °C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T4</td>
<td>-45 °C...75 °C</td>
<td></td>
</tr>
<tr>
<td>T6</td>
<td>-45 °C...65 °C</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>-45 °C...80 °C</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>-45 °C...100 °C</td>
<td></td>
</tr>
</tbody>
</table>

Versions 3768-1.2/-1.3/-1.4. with solenoid valve

Signal circuit, nominal signal Type of protection: Intrinsic safety Ex i IIC

The correlation between version, temperature classification, permissible ambient temperature ranges and maximum power dissipation is shown in the tables below:

<table>
<thead>
<tr>
<th>Version</th>
<th>Un</th>
<th>6V</th>
<th>12V</th>
<th>24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>T6</td>
<td>60°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>-45°C...70°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>80°C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Characteristic linear or rectangular # ##

C, negligible, L, negligible

# The maximum permissible power dissipation Pi of the 6 V version is 250 mW.

## The maximum values for connection to a certified intrinsically safe circuit are shown in the table below:

<table>
<thead>
<tr>
<th>Ui</th>
<th>25 V</th>
<th>27 V</th>
<th>28 V</th>
<th>30 V</th>
<th>32 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>li</td>
<td>150 mA</td>
<td>125 mA</td>
<td>115 mA</td>
<td>100 mA</td>
<td>85 mA</td>
</tr>
<tr>
<td>Pi</td>
<td>no limitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C, negligible, L, negligible
Special conditions for safe use

None

Essential Health and Safety Requirements

In compliance with the standards specified above.

Zertifizierungsstelle Explosionsschutz
Braunschweig, 19. July 2002

By order

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor
(1) Statement of Conformity


(3) EC Type Examination Certificate Number

PTB 03 ATEX 2182 X

(4) Equipment:    Model 3768-8 Limit Switch
(5) Manufacturer:  SAMSON AG
(6) Address:       Weismüllerstr. 3, D-60314 Frankfurt, Germany

(7) This equipment and any acceptable variation therefor are specified in the schedule to this certificate and the documents referred to therein.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report

PTB Ex 03-23303

(9) The Essential Health and Safety Requirements are satisfied by compliance with

EN 50021: 1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) In compliance with the Directive 94/9/EC this Statement of Conformity relates only to the design and construction of the equipment specified. Further requirements of this Directive apply to manufacture and marketing of this equipment.

(12) The marking of the equipment shall include the following:

II 3 G Ex nA II T6

Zertifizierungsstelle Explosionsschutz    Braunschweig, 30 September 2003
By order

(Signature)    (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in its entirety and without any changes, schedule included.
Excerpts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.
Schedule

Statement of Conformity PTB 03 ATEX 2182 X

Description of Equipment

The Model 3768-B... Limit Switch is suitable for attachment to rotary actuators according to VDE/VDI 3845 and intergal attachment to Model 3277 Linear Actuators with concealed lever system.

There are various versions of device with proximity switches and a low-power solenoid valve.

For instrument air non-combustible media are used.

The device is intended for use inside and outside of hazardous areas.

The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-45°C ... 60°C</td>
</tr>
<tr>
<td>T5</td>
<td>-45°C ... 70°C</td>
</tr>
<tr>
<td>T4</td>
<td>-45°C ... 80°C</td>
</tr>
</tbody>
</table>

Electrical data

Inductive proximity switch (terminals 41/42, 51/52) Type of protection: EEx n A II

Solenoid valve module Type of protection: EEx n A II

Test report: PTB Ex 03-23303

Special conditions for safe use

The limit switch shall be mounted in an enclosure providing at least Degree of Protection IP 54 in compliance with the IEC Publication 60529.

This requirement applies also to the cable entries and/or connectors.

The wiring shall be connected in such a manner that the connection facilities are not subjected to pull and twisting.

Schedule of the Statement of Conformity

Basic health and safety requirements

Are satisfied by compliance with the standard specified above.

Zertifizierungsstelle Explosionsschutz Braunschweig, 30 September 2003

By order

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Addendum Page 1


Electrical wiring of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

<table>
<thead>
<tr>
<th>Limit switches (Inductive)</th>
<th>Solenoid valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit No.</td>
<td>1 and 2</td>
</tr>
<tr>
<td>Terminal No.</td>
<td>41/42 and 81/82</td>
</tr>
<tr>
<td>U or Vmax</td>
<td>16V</td>
</tr>
<tr>
<td>I or Imax</td>
<td>25/62mA</td>
</tr>
<tr>
<td>R or Pmax</td>
<td>64/169mW</td>
</tr>
<tr>
<td>G</td>
<td>30mH</td>
</tr>
<tr>
<td>L</td>
<td>100μH</td>
</tr>
</tbody>
</table>

Notes: Entity parameters shall meet the following requirements:
1) So end coil 12V and 24V version Pmax = 250mW
2) So end coil 6V version Pmax = 250mW
3) U or Vc ≤ U or Vmax / I or Fc ≤ I or Imax / |I| or Pmax / G or ≥ G and L or ≥ L

Table 2: CSA - certified barrier parameters of circuit 3

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Supply barrier</th>
<th>Evaluation barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vmax</td>
<td>28V</td>
<td>28V</td>
</tr>
<tr>
<td>I or Imax</td>
<td>≥ 28Q</td>
<td>≥ 28Q</td>
</tr>
<tr>
<td>Circuit 3</td>
<td>28V</td>
<td>28V</td>
</tr>
<tr>
<td>Circuit 3 (##)</td>
<td>28Q</td>
<td>28Q</td>
</tr>
</tbody>
</table>

Circuit 3: 12V and 24V version; (##) = 6V version.

Table 3: The correlation between temperature classification and permissible ambient temperature range is shown in the table below.

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-45°C…60°C</td>
</tr>
<tr>
<td>T5</td>
<td>-45°C…70°C</td>
</tr>
<tr>
<td>T4</td>
<td>-45°C…80°C</td>
</tr>
</tbody>
</table>

Addendum Page 2

Table 4: For the Mode 3768 - 3 Limit Switch the correlation between temperature classification, permissible ambient temperature range and maximum short-circuit current is shown in the table below.

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
<th>Maximum short-circuit current</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-45°C…60°C</td>
<td>63mA</td>
</tr>
<tr>
<td>T5</td>
<td>-45°C…70°C</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>-45°C…80°C</td>
<td>25mA</td>
</tr>
</tbody>
</table>

Intrinsically safe if installed as specified in manufacturer's installation manual.

CSA certified for hazardous locations

Ex ia IIC T6; Class I, Zone 0

Type 4 Enclosure

Class I: Groups A, B, C, D

Class II: Groups E, F, G, Class III

Notes:
1) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the CSA certified apparatus. For maximum values of U or Vmax, I or Imax, R or Pmax, G and L of the various apparatus see Table 1.
2) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the CSA certified intrinsically safe barrier. For barrier selection see Table 2.
3) Each pair of LS wires must be protected by a shield that is grounded at the LS ground. The shield shall extend as close to the termination as possible.
4) Installation shall be in accordance with the Canadian Electrical Code Part 1.
5) Use only supply wires suitable for 5°C above surrounding temperature.

Revisions Control Number 1 May 2005 Addendum to EB 8356 EN
In grounded circuits with only one barrier, the return line must be grounded or included in the potential equalization network of the system.

CSA certified for hazardous locations
Class I: Div 2, Groups A, B, C, D.
Class II: Div 2, Groups E, F + G, Class III

Limit switch with side switch and limit switches.

Notes
1. The installation shall be in accordance with the Canadian Electric Code Part 1.
2. For the maximum values for the individual circuits see Table 1 and 2.
3. The cable shall be protected by conduits.
4. Cable entry on rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T.
Addendum Page 5

Installation drawing Control Relay KHA5-OT1/Ex2, KHA6-OT1/Ex1 or KHA6-OT1/Ex2 with Model SJ-6-N Proximity Sensors

HAZARDOUS LOCATION

SAFE LOCATION

Model designation code Type KHA5 - OT1/Ex2

Terminal 1-2, 3-4, 5-6

a = Supply Voltage type A or B

b = - Supply voltage 2-48 V DC, 0.5-15V AC -10% to +15%

Output type: O/T, I2 t or I5 / 3

c = Number of channels: 1 or 2

 CSA Certified

Model designation code Type KHA6 - OT1/Ex1

Terminal 1-2, 3-4, 5-6

a = Supply Voltage type A or B

b = - Supply voltage 2-48 V DC, 0.5-15V AC -10% to +15%

Output type: O/T, I2 t or I5 / 3

c = Number of channels: 1 or 2

 CSA Certified

System parameters

<table>
<thead>
<tr>
<th>Circuit</th>
<th>Groups</th>
<th>L (mH)</th>
<th>C (pF)</th>
<th>Vcc (V)</th>
<th>Ioc (mA)</th>
<th>Vmax (V)</th>
<th>Rate (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>A + B</td>
<td>0.044</td>
<td>1.275</td>
<td>13.6</td>
<td>17.8</td>
<td>13.6</td>
<td>6.25</td>
</tr>
<tr>
<td>3-4</td>
<td>C + D</td>
<td>0.018</td>
<td>3.85</td>
<td>13.6</td>
<td>17.8</td>
<td>13.6</td>
<td>6.25</td>
</tr>
<tr>
<td>5-6</td>
<td>E + F</td>
<td>0.006</td>
<td>1.036</td>
<td>13.6</td>
<td>17.8</td>
<td>13.6</td>
<td>6.25</td>
</tr>
</tbody>
</table>

Division 2 wiring method shall be in accordance to the Canadian Electrical Code Part 1.

Table 1: Maximum values

<table>
<thead>
<tr>
<th>Limit switches inductive</th>
<th>Solenoid valve</th>
</tr>
</thead>
</table>
| Circuit No. | 1 and 2
| Terminal No. | 41/42 and 51/62
| U or Vmax | 16V
| I or Imax | 25/52 mA
| R or Pmax | 64/169mW
| G | 30mF
| I | 100µH

Notes: Entity parameters must meet the following requirements.
So each valve 12V and 24V version shall be limited to 250mW

Us or Us/Us/Vs ≤ Us or Us/Vs/Vs or Us/Us/Vs ≥ 1 or Imax ≤ I or Imax

Us ≤ I or I ≤ Us and Us ≤ Us ≤ Us

Table 2: FM - approved barrier parameters of circuit 3

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Supply barrier</th>
<th>Evaluation barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit 3 (#)</td>
<td>≤ 28V</td>
<td>≥ 2000Ω</td>
</tr>
<tr>
<td>Circuit 3 (#)</td>
<td>≤ 28V</td>
<td>≥ 760Ω</td>
</tr>
</tbody>
</table>

Revisions Control Number 1 August 2004
Addendum to EB 8356 EN
Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>60°C</td>
</tr>
<tr>
<td>T5</td>
<td>-45°C ≤ ta ≤ 60°C</td>
</tr>
<tr>
<td>T4</td>
<td>80°C</td>
</tr>
</tbody>
</table>

Table 4: For the Mode 3768-3 Limit switch the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
<th>Maximum short-circuit current</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>45°C</td>
<td>53mA</td>
</tr>
<tr>
<td>T5</td>
<td>-45°C ≤ ta ≤ 60°C</td>
<td>28mA</td>
</tr>
<tr>
<td>T4</td>
<td>75°C</td>
<td>28mA</td>
</tr>
</tbody>
</table>

FM+ approved for hazardous locations
Class I, Zone 0 A Ex ia IIC T6
Class II, III Division 1, Groups A, B, C, D, E, F + G
NEMA 4X

Notes:
1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM-approved apparatuses. For maximum values of
U (kV), I (mA), P (W), ta, and d of the various apparatus see Table 1.
2.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM-approved intrinsically safe apparatuses. For barrier section see Table 2.
3.) Intrinsically safe is in accordance with the National Electrical Code ANSI/NFPA 70 and
ANSI/ISA RP 12.04.01

4.) Use only supplies suitable for 5°C above surrounding temperature.

Revisions
Control Number: 1 August 2004
Addendum to EB 8356 EN
Notes:

1. The installation shall be in accordance with the National Electrical Code ANSI/NFPA 70
2. For the maximum values for the individual circuits see Table 1 and 2.
3. The cable shall be protected by conduits.
4. Cable entry on rigid metal conduit according to drawing No. 1050.0547 T and 1050.0540 T

Installation drawing Control Relay Hub - CE with Model SJ-B or N Proximity Sensors

<table>
<thead>
<tr>
<th>Control Relay Terminal No.</th>
<th>Groups</th>
<th>C [mH]</th>
<th>L [mH]</th>
<th>VDC [V]</th>
<th>IEC [mA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3, 2-3, 4-6, 5-6</td>
<td>A-B</td>
<td>0.3</td>
<td>1.37</td>
<td>2.0</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>C-X</td>
<td>0.3</td>
<td>3.0</td>
<td>2.0</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>C-E, D</td>
<td>0.3</td>
<td>10.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model designation code Type KTB - CE

- a = Supply Voltage type A or D
- b = Supply Level
  - 24/28V D.C. 24 V or 30 V AC, 5% ± 5% or
  - 230/400V AC ± 5% ± 10%
- c = Output Type DTL, DTV, DTR, or GPT
- d = Number of Channels
- e = Reverse Phase definition, P, S, or DPI
- f = Optional Model K 1050.0547 or P1 1050.0540