

MOUNTING AND OPERATING INSTRUCTIONS



EB 8356 EN

Translation of original instructions



Type 3768 Inductive Limit Switch

Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

- For the safe and proper use of these instructions, read them carefully and keep them for later reference.
- If you have any questions about these instructions, contact SAMSON's After-sales Service (aftersalesservice@samsongroup.com).



The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at www.samsongroup.com > **Service & Support** > **Downloads** > **Documentation**.

Definition of signal words

DANGER

Hazardous situations which, if not avoided, will result in death or serious injury

WARNING

Hazardous situations which, if not avoided, could result in death or serious injury

NOTICE

Property damage message or malfunction

Note

Additional information

Tip

Recommended action

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1 General safety instructions

For your own safety, follow these instructions concerning the mounting, start-up, and operation of the device:

- The device is to be mounted, started up or operated only by trained and experienced personnel familiar with the product. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- Explosion-protected versions of this device are to be operated only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas. See section 6.
- Any hazards that could be caused in the valve by the process medium and the operating pressure or by moving parts are to be prevented by taking appropriate precautions. If inadmissible motions or forces are produced in the pneumatic actuator as a result of the supply pressure level, it must be restricted using a suitable supply pressure reducing station.

To avoid damage to any equipment, the following also applies:

- Proper shipping and storage are assumed.

i Note

Devices with a CE marking fulfill the requirements of the Directive 2014/34/EU and the Directive 2014/30/EU. The declaration of conformity is included at the end of these instructions.

2 Design and principle of operation

The Type 3768 Limit Switch is designed for attachment to pneumatic control valves. It is fitted with inductive contact limits 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 alarm or indicating equipment.

The limit switch can also be fitted with a solenoid valve to move the valve to its fail-safe position.

The limit switch is designed either for direct attachment to SAMSON Type 3277 Actuators or for attachment to actuators according to IEC 60534-6 (NAMUR) using an adapter housing.

The valve travel is transmitted by the pin (1.1) to the lever (1) and converted into a rotary motion. The shaft (2) transfers this rotary motion to two adjustable metal tags (4).

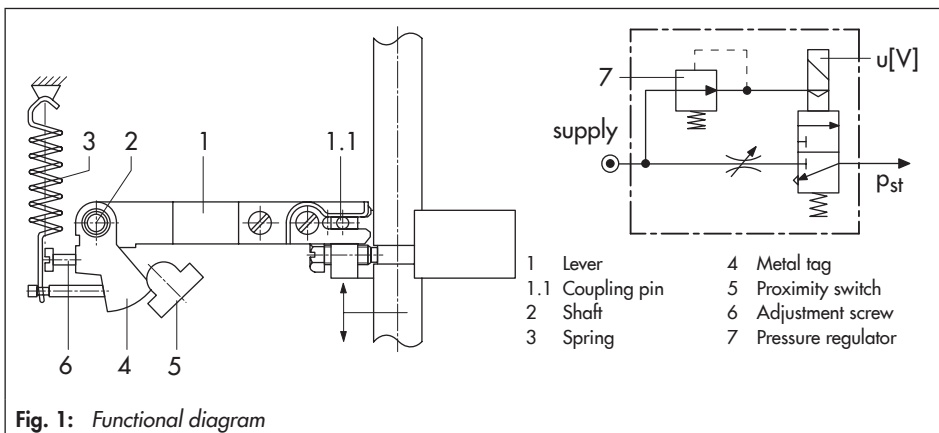
(4) which operate the associated proximity switches (5).

The operation of the inductive limit switches requires switching amplifiers to be connected in the output circuit (see section 4).


Version with solenoid valve

When fitted with a solenoid valve, the control valve can be moved to the fail-safe position, regardless of the control signal issued by the control equipment. If a control signal corresponding to the binary signal '0' (OFF) is applied to the input, the signal pressure p_{st} is shut off and the actuator is vented. The actuator springs move the valve to its fail-safe position.

When a control signal corresponding to the binary signal '1' (ON) is applied to the input, the signal pressure p_{st} is applied to the actuator, allowing the valve to move according to the input signal issued by the control equipment.



2.1 Technical data

Travel range	Direct attachment to Type 3277 Actuator: 7.5 to 30 mm		
	Attachment according to IEC 60534 (NAMUR): 7.5 to 120 mm		
Inductive proximity switches ³⁾	2x SJ2-SN		
Control circuit	Specifications corresponding to connected switching amplifier		
Hysteresis at rated travel	≤ 1 %		
Permissible ambient temperature	-20 to +80 °C with plastic cable gland -45 to +80 °C with metal cable gland The limits in the type examination certificate additionally apply to explosion-protected versions.		
Service life	15 years		
Maximum storage period	24 months		
Solenoid valve			
Supply air	Supply air: 1.4 to 6 bar (20 to 90 psi)		
Input	Binary DC voltage signal		
Nominal signal	6 V DC	12 V DC	24 V DC
Signal '0' (no response) ¹⁾	≤ 1.2 V	≤ 2.4 V	≤ 4.7 V
Signal '1' (response) ²⁾	≥ 5.4 V	≥ 9.6 V	≥ 18.0 V
Coil resistance R _i at 20 °C	2909 Ω	5832 Ω	11714 Ω
K _v coefficient	0.14 m ³ /h		
Air consumption	'OFF' ≤60 I _n /h · 'ON' ≤10 I _n /h		
Degree protection without/with solenoid valve	Without	IP65	
	With	IP65 (IP65 and NEMA 4X, filter check valve, see Table 4 on page 22)	
Conformity			

1) DC voltage signal at -20 °C

2) DC voltage signal at +80 °C

3) For connection to switching amplifiers according to EN 60947-5-6

Materials	
Housing	Die-cast aluminum, chromated and plastic coated
External parts	Stainless steel 1.4571 and 1.4104

2.2 Versions and article code

Limit switch	Type 3768-	x	2	x	0	0	x	x	x	0	0	x	x
Explosion protection													
Without		0						2/7					
⊕ II 2G Ex ia IIC T6 acc. to ATEX		1											
CSA/FM intrinsically safe/non incensive		3											
⊕ II 3G Ex nA II T6 acc. to ATEX		8						2/7					
Solenoid valve													
Without			0										
6 V DC			2										
12 V DC			3										
24 V DC			4										
Pneumatic connections													
Without			0			0							
¼-18 NPT						1							
ISO 221/1-G ¼						2							
Electrical connection													
Plastic cable gland M20x1.5, blue								1					
Plastic cable gland M20x1.5, black								2					
Cable gland M20x1.5, nickel-plated brass								7					
Housing version													
Aluminum								0					
CrNiMo steel ¹⁾								2					
Special versions													
On request		x										x	x

¹⁾ No longer available since April 2020

2.3 Summary of explosion protection approvals

Type	Certification			Type of protection
3768-1	ATEX	Number	PTB 02 ATEX 2077	II 2G Ex ia IIC T6
		Date	2002-07-19	
3768-3	CSA	Number	1607265	Ex ia IIC T6; Class I Zone 0; Class I, II, Div. 1, Groups A, B, C, D, E, F, G; Class I, II, Div. 2, Groups A, B, C, D, E, F, G
		Date	2005-06-19	
	FM	Number	3020228	Class I, Zone 0 AEx ia IIC Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G Class I, Div. 2, Groups A, B, C, D; Class II, Div. 2 Groups F, G; Class III
		Date	2005-02-28	
3768-8	ATEX	Number	PTB 03 ATEX 2182 X	II 3G Ex nA II T6
		Date	2003-09-30	

3 Attachment to the valve

The limit switch can be mounted either directly to SAMSON Type 3277 Actuator or to 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. Any additionally required accessories are listed together with their order numbers in the tables on page 20 onwards.

The limit switch may be mounted on the right-hand or left-hand side of the valve. Any subsequent changes to the mounting position cause the switching function of the limit switch to change as well. See section 5.

3.1 Direct attachment

1. Fasten the clamp (1.2) to the actuator stem, making sure that the fastening screw rests in the groove of the actuator stem.
2. Fasten the associated lever D1 or D2 to the lever of the limit switch.
3. Secure the intermediate plate (15) with the gasket facing towards the yoke.
4. Position and fasten the limit switch onto the intermediate plate, making sure that the lever D1 or D2 slides in line over the pin (1.1) of the clamp (1.2).
5. Mount cover (18).
6. Mount the vent plug suitable for the corresponding degree of protection on the cover (18).

3.1.1 Attachment of version with solenoid valve

To establish the signal pressure connection to the actuator, use a connection block or switchover plate listed in the tables in page 20 onwards. An M3 screw plug is located on the back of this device version.

Actuators with 240 to 700 cm² effective areas

1. Make sure that the tip of the gasket (16) projecting from the side of the connection block (Fig. 2, 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, unscrew the three fastening screws and lift off the cover. Turn the gasket (16) by 180° and re-insert it.
The old connection block version requires the switch plate (13) to be turned to align the actuator symbol with the arrow marking.
2. Place the connection block with the associated gaskets against the limit switch and the yoke. Fasten it using the screw. For actuators with fail-safe action "actuator stem retracts", additionally mount the external signal pressure pipe.

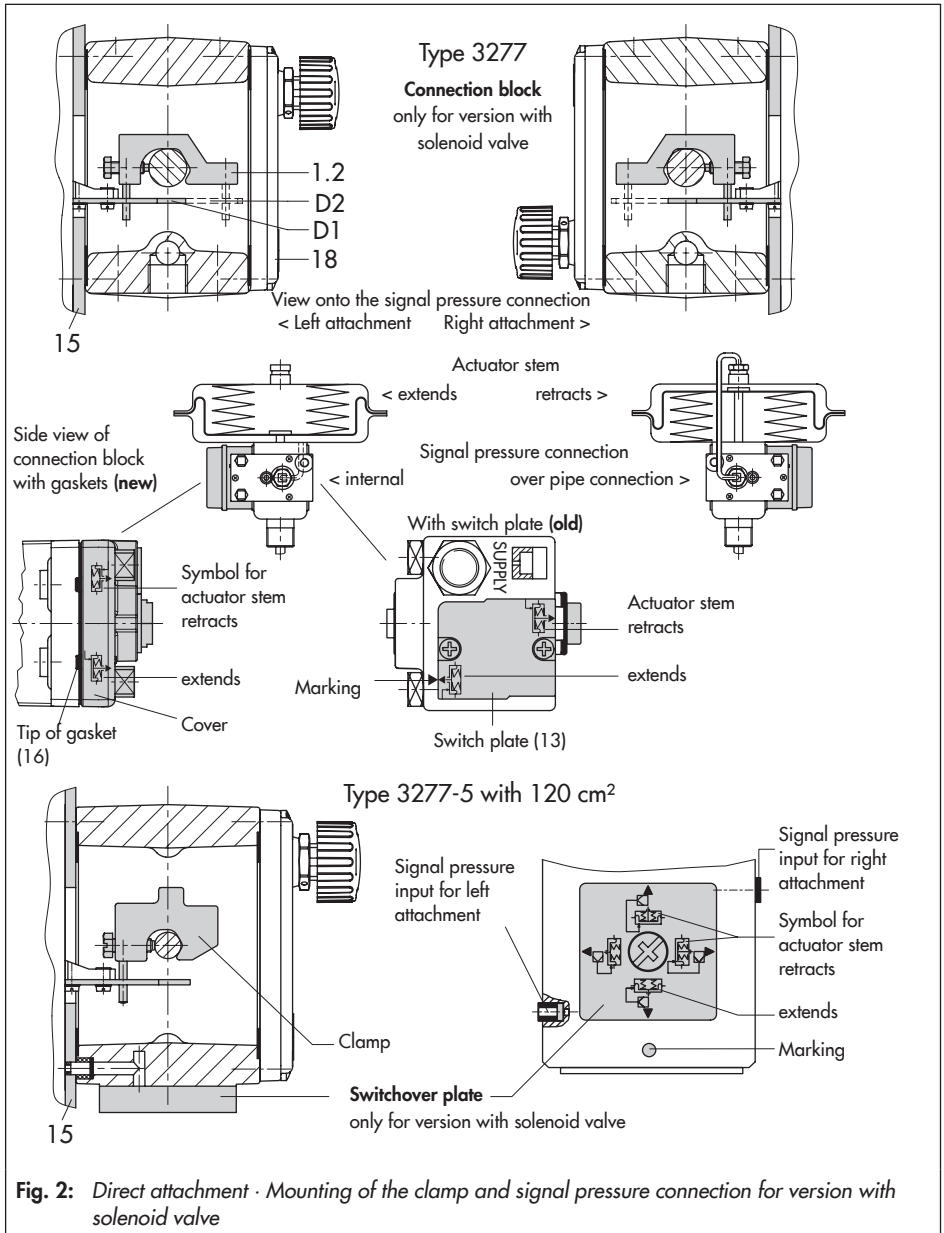


Fig. 2: Direct attachment · Mounting of the clamp and signal pressure connection for version with solenoid valve

Attachment to the valve

Actuator with 120 cm² diaphragm area

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

1. Remove the M3 screw plug at the back of the limit switch and use the blanking plug from the accessories to seal the signal pressure output (Output 38) at the side.
2. Mount the limit switch so that the hole in the intermediate plate (15) covers the seal in the hole of the yoke.
3. Align the switchover plate with the corresponding actuator symbol. Fasten it to the yoke.

3.2 Attachment according to IEC 60534-6

The mounting parts listed in Table 5 are required for limit switch attachment. The rated travel of the valve determines which lever is to be used.

An adapter housing is used for NAMUR attachment. The valve travel is transmitted by the lever (18) and the shaft (25) to the bracket (28) of the adapter housing and then passed on to the pin (27a) on the lever of the limit switch.

To ensure that the pin (27a) is properly located in the bracket (28), fix the spring included in the accessories at the back of the positioner housing as illustrated in Fig. 3.

The limit switch can be mounted either on the left or right side of the valve.

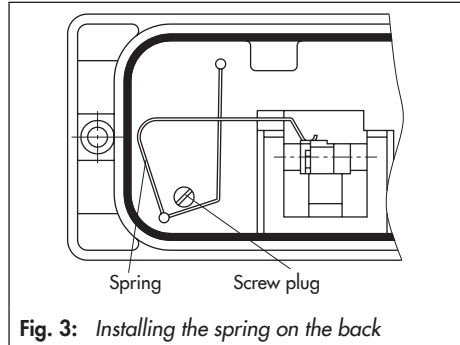


Fig. 3: Installing the spring on the back

3.2.1 Mounting sequence

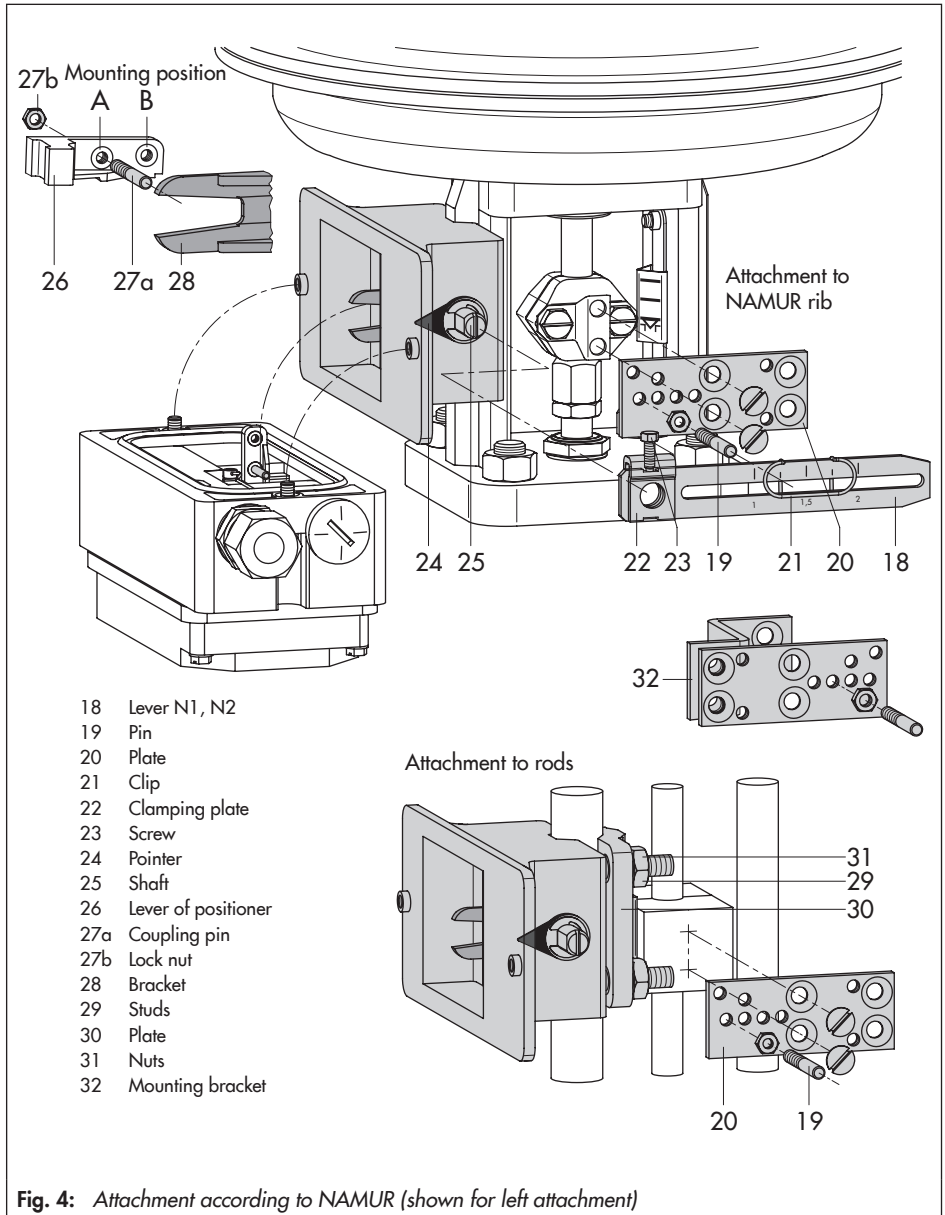
- Select the required mounting parts from the tables on page 20 onwards.

Valve with cast yoke:

1. Screw the plate (20) to the stem connector of the actuator and plug stems using the countersunk screws. Use the additional bracket (32) for 2100 and 2800 cm² actuators.
2. Remove the rubber stopper from the adapter housing and fasten the adapter housing either on the left or right of the NAMUR rib using the hexagon head screw.

Valve with rod-type yoke:

1. Screw the plate (20) to the follower clamp of the plug stem.
2. Screw the studs (29) into the adapter housing.
3. Place the adapter housing with the plate (30) onto either the left or right valve rod and screw tight using the nuts (31). Make sure that the adapter housing is at the



Attachment to the valve

correct height to mount the lever (18) so that it is in a horizontal position when the valve is at mid-travel.

4. Screw the pin (19) into the middle row of holes on the plate (20) and lock it into position over the correct lever marking (1 to 2) as indicated in Table 6.
5. Clamp the clip (21) onto the lever (18). The clip must be clamped onto the lever (18) with the open side facing downward for attachment of the version with solenoid valve and with front air connection.
6. Attach the lever (18) including clamping plate (22) to the shaft (25), making sure that the clip clasps the pin (19).

3.2.2 Initial adjustment of travel

1. Move the valve to 50 % travel.
2. Move the shaft (25) in the adapter housing so that the black pointer (24) matches the cast marking on the adapter housing.
3. Fasten the clamping plate (22) in this position using the screw (23).
4. Screw the pin (27a) into the limit switch lever on the side where the press nut is located. Lock it in position with the hex nut (27b) on the other side, observing the mounting position **A** or **B** according to Table 6 and Fig. 4.
5. Place the limit switch on the adapter housing, taking into account the mounting direction. Fasten it, making sure that

the pin (27a) rests against the bracket (28).

Make sure the pin does not slip out of the bracket once installed.

3.3 Attachment to rotary actuators

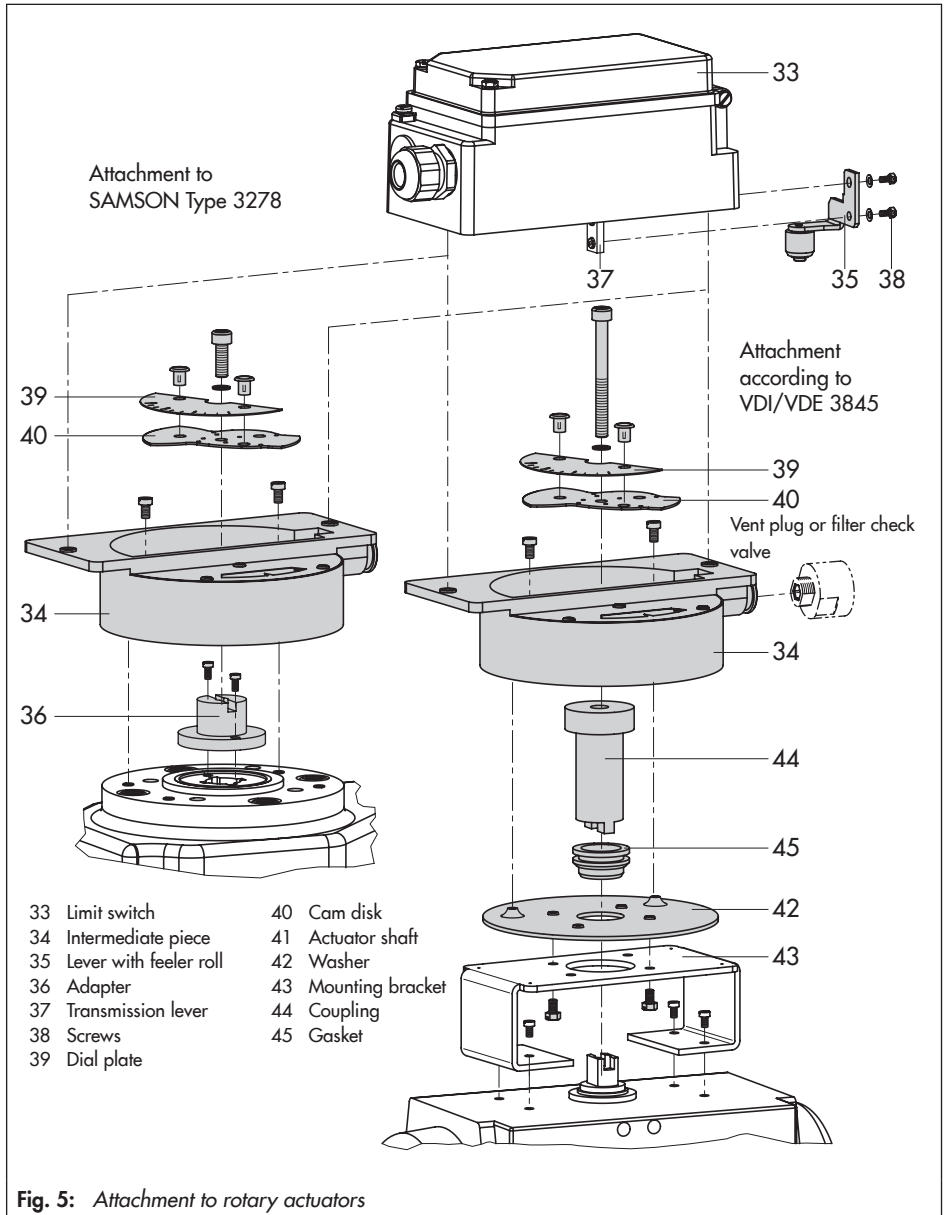
The limit switch can also be mounted on rotary actuators (attachment according to VDI/VDE 3845, September 2010, fixing level 2) using the mounting parts listed in Table 7 on page 23. The rotary motion of the rotary actuator is transferred to the metal tags over the cam disk on the actuator shaft and the feeler roll on the limit switch lever.

i Note

The range spring (1890-4418) from the mounting kit (1400-8815) is not required for this attachment.

3.3.1 Mounting the lever with feeler roll

1. Place the lever with feeler roll (35) on the side of the lever (37) opposite to where the press nuts are located and secure it using the supplied screws (38) and washers.



3.3.2 Mounting the intermediate piece

SAMSON Type 3278 Actuator

1. Fasten the adapter (36) to the free shaft end of the rotary actuator.
2. Fasten the intermediate piece (34) to the actuator housing using two screws.
For the version with solenoid valve, align the intermediate piece so that the air connections of the limit switch point toward the diaphragm case side.
3. Align the cam disk and scale as described in section 3 and fasten.
4. Screw the vent plug (or filter check valve from the accessories) into the intermediate piece.

Actuators according to VDI/VDE 3845

1. Place the assembled intermediate piece (34, 44, 45, and 42) onto the mounting bracket included in the scope of actuator delivery and fasten (attachment according to VDI/VDE 3845, September 2010, fixing level 2).
2. Align the cam disk (40) and scale as described in section 3 and fasten.
3. Screw the vent plug (or filter check valve from the accessories) into the intermediate piece.

3.3.3 Aligning the cam disk

→ Refer to Fig. 6

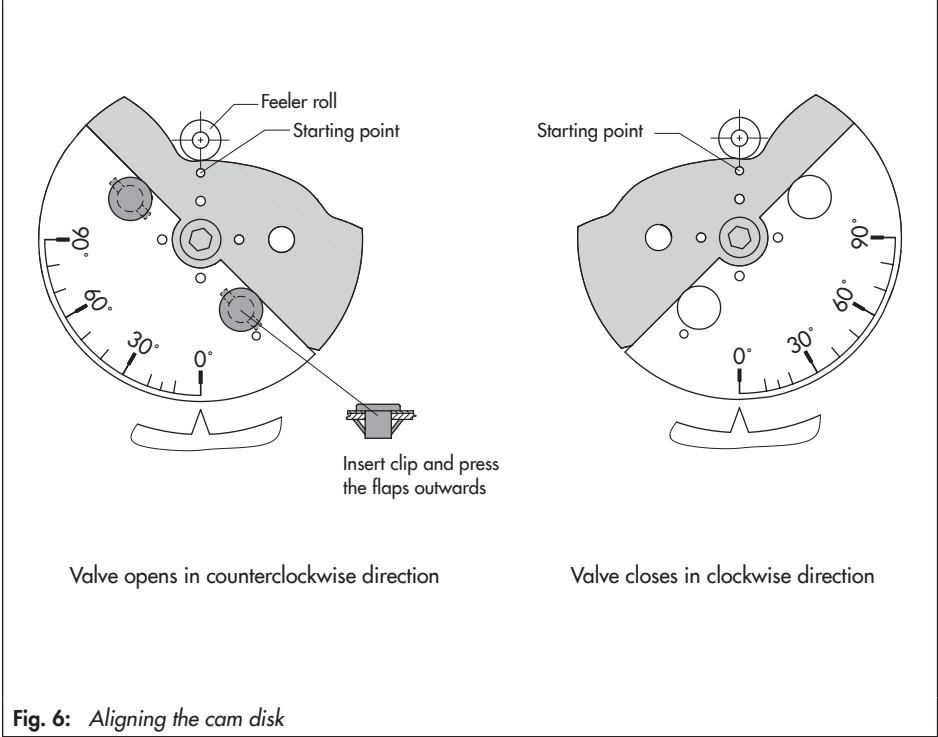
The following applies on aligning the cam disk:

- The cam disk alignment depends on the valve's direction of rotation, i.e. whether it opens clockwise or counterclockwise.
- The cam disk must be set when the valve is closed.
- Align the starting point (hole) of the cam so that the fulcrum of the cam disk and 0° position on the scale as well as the arrow on the window are in line with each other.
- When aligning the cam disk, clip the double-sided scale disk on the cam disk, while making sure that the value on the scale matches the valve's direction of rotation.

Securing the aligned cam disk

To prevent the cam disk from turning, proceed as follows:

- Drill a hole into the adapter (36) or coupling (44) to allow a 2 mm dowel pin to be inserted.
- Select one of the four holes located around the center hole of the cam disk to secure the cam disk in position.



3.3.4 Reversing amplifier for double-acting actuators

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

SAMSON Type 3710 Reversing Amplifier

We recommend using a Type 3710 Reversing Amplifier. Refer to the mounting and operating instructions ► EB 8392 for more information on how to mount and connect the Type 3710.

Reversing amplifier (1079-1118 or 1079-1119)

If a different reversing amplifier (item no. 1079-1118 or 1079-1119) is used, follow the mounting instructions described below:

➔ Refer to Fig. 7

1. Remove the sealing plug (1.5). The rubber seal (1.4) must remain installed.
2. Screw the special nuts (1.3) from the accessories of the reversing amplifier into the threaded connections of the limit switch.
3. Insert the gasket (1.2) into the recess of the reversing amplifier and slide both the hollowed special screws (1.1) into the connecting boreholes A_1 and Z.
4. Place the reversing amplifier onto the limit switch and screw tight using the two special screws (1.1).

The following applies to all reversing amplifiers:

The signal pressure of the positioner is supplied at the output 1 of the reversing amplifier. An opposing pressure, which equals the required supply pressure (Z) when added to the pressure at output 1, is applied at output 2.

The following relationship applies:

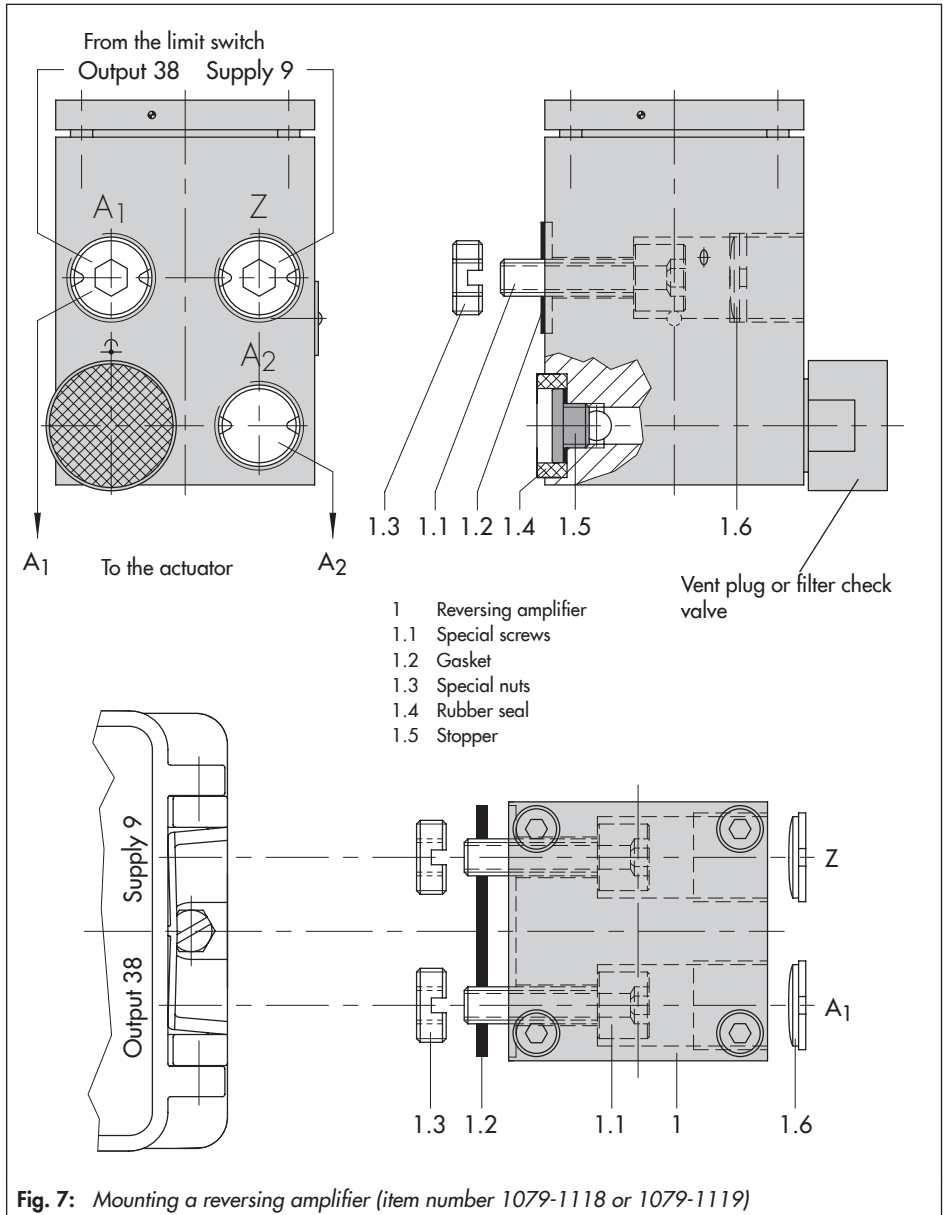
Output 1 + Output 2 = Supply pressure (Z).

- ➔ Connect output 1 to the signal pressure connection on the actuator that causes the valve to open when the pressure rises. Connect output 2 to the signal pressure connection on the actuator that causes the valve to close when the pressure rises.

i Note

How the outputs are marked depends on the reversing amplifier used:

- Type 3710: Output 1/2 = Y1/Y2
 - 1079-1118 and 1079-1119:
Output 1/2 = A1/A2
-



Attachment to the valve

Table 1: Mounting kits for direct attachment (see Fig. 2 on page 11)

Actuator size	Lever with associated clamp and intermediate plate	Order no.	
120 cm ²	D1 lever with stopper for output (38)	Standard version	1400-7116
		Version compatible with paint	1402-0944
175, 240, 350 cm ²	D1 lever (33 mm long with 17 mm clamp)	Standard version	1400-6370
		Version compatible with paint	1402-0942
355, 700, 750 cm ²	D2 lever (44 mm long with 13 mm clamp)	Standard version	1400-6371
		Version compatible with paint	1402-0943

Table 2: Additionally required accessories for direct attachment for version **with** solenoid valve

Type 3277-5xxx Actuator (120 cm ²)			
Switchover/connecting plate	Antrieb	Order no.	
Switchover plate for 120 cm ² actuator	Type 3277-5xxxxxx.00 Actuator (old)	1400-6819	
Switchover plate (new) for 120 cm ² actuator	Actuator with index .01 and higher (new)	1400-6822	
Connecting plate for additionally hooked-up valve accessory (e.g. Type 3709 Lock-up Valve) with 120 cm ² actuator	3277-5xxxxxxx.00 (old)	G 1/8	1400-6820
		1/8 NPT	1400-6821
Connecting plate (new) for 120 cm ² actuator	Actuator with index .01 and higher (new)	1400-6823	
<p>i Note</p> <p>Only new switchover and connecting plates can be used with new actuators (Index 01). Old and new plates are not interchangeable.</p>			
Type 3277 Actuator (175 to 750 cm ²)			
Accessory		Order no.	
Required connection block for 175, 240, 350, 355, 700 and 750 cm ² actuator (including gaskets and fastening screw)	G 1/4	1400-8819	
	1/4 NPT	1400-8812	

Table 3: Pipe connection for direct attachment onto Type 3277 for version with solenoid valve

Pipe connection	Actuator size	Material	Connection	Order no.
Piping with screw fittings – for fail-safe action "actuator stem retracts" – with air purging of the top diaphragm chamber	175 cm ²	Steel	G ¼ / G ¾	1402-0970
			¼ NPT/ ¾ NPT	1402-0976
		Stainless steel	G ¼ / G ¾	1402-0971
			¼ NPT/ ¾ NPT	1402-0978
	240 cm ²	Steel	G ¼ / G ¾	1400-6444
			¼ NPT/ ¾ NPT	1402-0911
		Stainless steel	G ¼ / G ¾	1400-6445
			¼ NPT/ ¾ NPT	1402-0912
	350 cm ²	Steel	G ¼ / G ¾	1400-6446
			¼ NPT/ ¾ NPT	1402-0913
		Stainless steel	G ¼ / G ¾	1400-6447
			¼ NPT/ ¾ NPT	1402-0914
	355 cm ²	Steel	G ¼ / G ¾	1402-0972
			¼ NPT/ ¾ NPT	1402-0979
		Stainless steel	G ¼ / G ¾	1402-0973
			¼ NPT/ ¾ NPT	1402-0980
700 cm ²	Steel	G ¼ / G ¾	1400-6448	
		¼ NPT/ ¾ NPT	1402-0915	
	Stainless steel	G ¼ / G ¾	1400-6449	
		¼ NPT/ ¾ NPT	1402-0916	
750 cm ²	Steel	G ¼ / G ¾	1402-0974	
		¼ NPT/ ¾ NPT	1402-0981	
	Stainless steel	G ¼ / G ¾	1402-0975	
		¼ NPT/ ¾ NPT	1402-0982	

Attachment to the valve

Table 4: Further accessories for direct attachment

Accessories		Order no.
Pressure gauge mounting kit for supply air and signal pressure	Stainless steel/brass	1400-6950
	Stainless steel/stainless steel	1400-6951
Filter check valve, replaces vent plug on the device		
Filter check valve in housing with G ¼ thread	Polyamide, IP65 degree of protection	1790-7408
	1.4301, IP65 degree of protection	1790-7253
	Polyamide, NEMA 4 degree of protection	1790-9645
	1.4301, NEMA 4 degree of protection	1790-9646
Vent plug G ¼ (-50 to +80 °C)	1.4404, IP65 degree of protection	1991-2110

Table 5: Attachment according to IEC 60534-6 (Fig. 4)

Mounting kit	Valve		Travel [mm]	With lever	Order no.	
NAMUR mounting kit, see Fig. 4 for parts.	Valve with cast yoke		7.5 to 60	N1 (125 mm)	1400-6787	
			22.5 to 120	N2 (212 mm)	1400-6789	
	Rod diameter [mm] of rod- type yoke	20 to 25		N1	1400-6436	
		20 to 25		N2	1400-6437	
		25 to 30		N1	1400-6438	
		25 to 30		N2	1400-6439	
		30 to 35		N1	1400-6440	
		30 to 35		N2	1400-6441	
Attachment to Fisher and Masoneilan linear actuators (one of each mounting kits is required per actuator)				1400-6771 and 1400-6787		
Accessories (for version with solenoid valve)					Order no.	
Pressure gauge mounting block			G ¼	1400-7098		
			¼ NPT	1400-7099		
Pressure gauge mounting kit for supply air and signal pressure			Completely of stainless steel	1402-0939		
			Stainless steel/brass	1400-6950		

Table 6: Attachment according to IEC 60534-6 (pin positions)

Travel [mm] ¹⁾	7.5	15	15	30	30	60	30	60	60	120
Pin at marking ¹⁾	1	2	1	2	1	2	1	2	1	2
Distance between pin and lever fulcrum	42	84	42	84	42	84	84	168	84	168
With lever	N1 (125 mm long)						N2 (212 mm long)			
Pin (27a) at position	A		A		B		A		B	

¹⁾ Calculate intermediate values

Table 7: Mounting parts for rotary actuators (Fig. 5)

Mounting parts	Order no.	
Actuator according to VDI/VDE 3845 ¹⁾	1400-8815	
SAMSON Type 3278 Actuator	160 cm ²	1400-7103
	320 cm ²	1400-7104
Attachment Masoneilan	Camflex I, DN 25 to 100	1400-7118
	Camflex I, DN 125 to 250	1400-7119
	Camflex II	1400-7120
Cam disk with accessories	1400-6664	
Cam disk, linear characteristic (0050-0072) 0 to 90° opening angle		
Cam disk for Masoneilan Camflex I and II, linear (0059-0007) to be set between 0 and 55°	1400-6637	
Reversing amplifier for double-acting actuators	SAMSON Type 3710	

¹⁾ VDI/VDE 3845 (September 2010 edition), level 2

4 Electrical connections

⚠ DANGER

Risk of electric shock.

For electrical installation, observe the relevant electrotechnical regulations and the accident prevention regulations that apply in the country of use. In Germany, these are the VDE regulations and the accident prevention regulations of the employers' liability insurance.

The following regulations apply to installation in hazardous areas: EN 60079-14:2008, VDE 0165-1 Explosive Atmospheres – Electrical Installations Design, Selection and Erection.

ⓘ NOTICE

Adhere to the terminal assignment. Switching the assignment of the electrical terminals may cause the explosion protection to become ineffective. Do not loosen enameled screws in or on the housing. The maximum permissible values specified in the EC type examination certificates apply when interconnecting intrinsically safe electrical equipment (U_i or U_o , I_i or I_o , P_i or P_o , C_i or C_o and L_i or L_o).

ⓘ Note

Note on the selection of cables and wires:

Observe clause 12 of EN 60079-14: 2008 (VDE 0165, Part 1) for installation of the intrinsically safe circuits. Clause 12.2.2.7 applies when running multi-core cables and wires with more than one intrinsically safe circuit.

The radial thickness of the insulation of a conductor for common insulating materials (e.g. polyethylene) must not be smaller than 0.2 mm. The diameter of an individual wire in a fine-stranded conductor must not be smaller than 0.1 mm. Protect the conductor ends against splicing, e.g. by using wire-end ferrules.

When two separate cables are used for connection, an additional cable gland can be installed. Seal cable entries left unused with plugs. Fit equipment used in ambient temperatures below -20 °C with metal cable entries.

i Note**Note concerning equipment for use in zone 2:**

In equipment operated according to type of protection Ex nA II (non-sparking equipment) according to EN 60079-15:2003, circuits may be connected, interrupted or switched while energized only during installation, maintenance or repair.

Equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited equipment) according to EN 60079-15:2003 may be switched under normal operating conditions. The maximum permissible values specified in the statement of conformity or its addenda apply when interconnecting the equipment with energy-limited circuits in type of protection Ex nL IIC.

4.1 Conditions concerning connection according to PTB 03 ATEX 2182 X

The cable entries in the enclosure for the Type 3768-8x Limit Switch must provide the degree of protection IP54 (according to EN 60529) at the minimum. The wiring must be connected in such a way that the connection is not subjected to pulling or twisting.

4.2 Terminal assignment

→ Refer to terminal assignment Fig. 8 or to the label on the terminal block.

Switching amplifier

The operation of the inductive limit contacts requires switching amplifiers in accordance with EN 60947-5-6 to be connected in the output circuit.

Observe the relevant regulations for installation in hazardous areas.

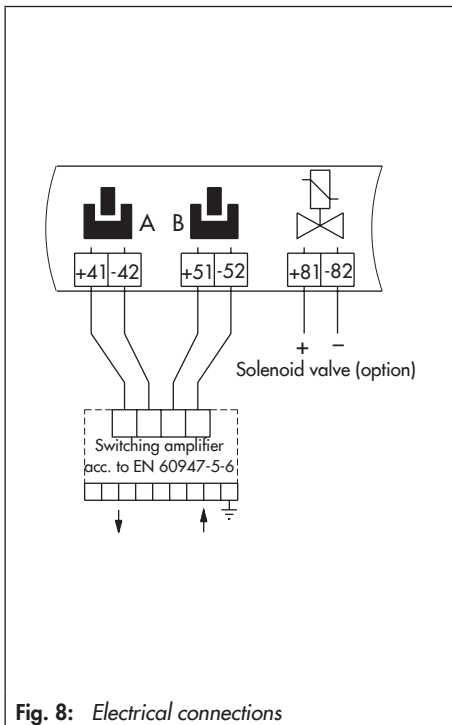


Fig. 8: Electrical connections

Accessories:

Device index 3768 x...x.03 and lower

Cable gland PG 13.5	
Version	Order no.
Black plastic	1400-6781
Blue plastic	1400-6782

Adapter PG 13.5 to ½ NPT	
Version	Order no.
Metal to metal	1400-7109
Painted blue	1400-7110

Device index 3768 x...x.04 and higher

Cable gland M20x1.5		
Version	Order no.	Clamping range
Black plastic	1400-6985	5.5 to 13 mm
Blue plastic	1400-6986	5.5 to 13 mm
Nickel-plated brass	1400-4875	6 to 12 mm

Adapter M20x1.5 to ½ NPT:	
Version	Order no.
Powder-coated aluminum	0310-2149

4.3 Pneumatic connections for version with solenoid valve

The pneumatic connections are optionally designed as a bore with 1/4 NPT or G 1/4 thread. Customary fittings for metal or copper tubing or plastic hoses can be used.

NOTICE

Risk of malfunction due to failure to comply with required air quality.

Only use supply air that is dry and free of oil and dust.

Read the maintenance instructions for upstream pressure reducing stations.

Blow through all air pipes and hoses thoroughly before connecting them.

For direct attachment to a Type 3277 Actuator, the signal pressure connection is fixed. For attachment according to NAMUR, the signal pressure is routed either to the top or bottom diaphragm case of the actuator depending on the fail-safe action, i.e. "actuator stem retracts" or "actuator stem extends".

Exhaust air:

Models with index 3768-x...x.03 and higher are equipped with a hinged cover without a vent hole. The exhaust air connections for these models are included in the accessories in this case.

The vent plug is located on the plastic cover of the actuator for direct attachment, whereas for NAMUR attachment, it is located on the adapter housing. The vent plug is located on the intermediate piece for attachment to rotary actuators.

Note

If you intend to replace older models with index 3768-x...x.02 or lower, the mounting parts may need to be replaced as well.

5 Operation – Adjusting the limit contacts

Two adjustable tags (51) are located on the rotary axis which activate the associated proximity switches (50).

The operation of the inductive limit switches requires switching amplifiers to be connected in the output circuit (see section 4).

When the tag (51) is located in the inductive field of the switch, the switch assumes a high resistance. When it moves outside the field, the switch assumes a low resistance.

The limit contacts are usually adjusted to issue a signal for both end positions. The switching points can also be adjusted to indicate intermediate positions.

The switches **A** and **B** must be assigned to the end positions of the control valve (valve OPEN or CLOSED) depending on the mounting position of the limit switch according to

Table 8 and Table 9. The terminals 41/42 and 51/52 can optionally be assigned to the switches **A** and **B** by turning the associated label on the terminal block (see Fig. 8).

- The tags of the limit contacts cannot be turned by 360° . As a result, it is important to observe the correct assignment of switches **A** and **B** to the valve positions (valve CLOSED and valve OPEN), especially when the limit contacts are to be connected in safety circuits.
- The required switching function, i.e. whether the output relay is to be picked up or released when the tag enters the field, must be determined by jumpers for either load current or no-load current at the switching amplifier.

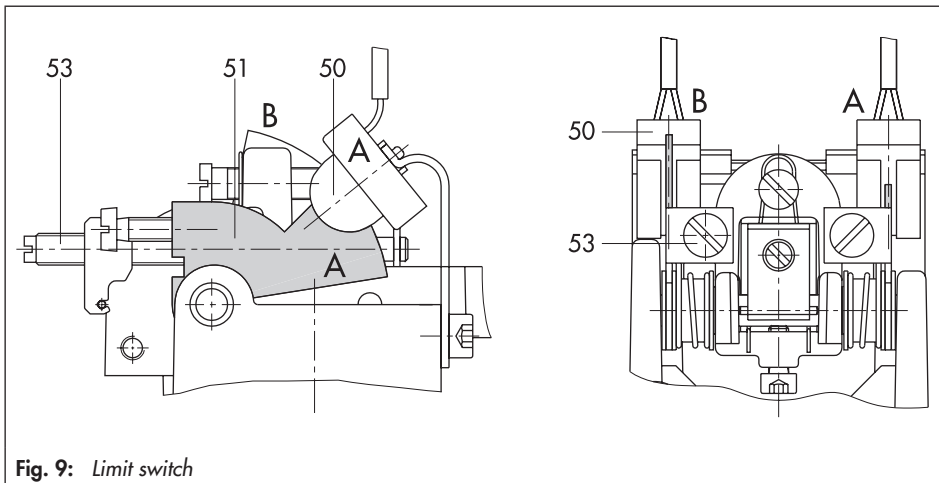


Fig. 9: Limit switch

Adjusting the switching point:

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

To guarantee the switching under all ambient conditions, adjust the switching point approx. 1/6 turn before the mechanical stop (OPEN – CLOSED).

Table 8: Direct attachment to Type 3277 Actuator (Fig. 2)

	Left attachment		Right attachment	
	Switch			
Valve position	Tag outside inductive field	Tag inside inductive field	Tag outside inductive field	Tag inside inductive field
Closed	B	A	A	B
Open	A	B	B	A

Table 9: NAMUR attachment (Fig. 4) Mounting position of the adapter housing when looking onto the lever (18)

Left attachment				Right attachment			
Cable gland points toward	Valve position	Switch Tag		Cable gland points toward	Valve position	Switch Tag	
		outside inductive field	inside inductive field			outside inductive field	inside inductive field
Front	Closed	B	A	Front	Closed	A	B
	Open	A	B		Open	B	A
Back	Closed	A	B	Back	Closed	B	A
	Open	B	A		Open	A	B

6 Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate, or given the device a mark of conformity.

Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device before putting it back into operation. Document the passing of the routine test by attaching a mark of conformity to the device.

Replace explosion-protected components only with original, routine-tested components by the manufacturer.

Devices that have already been used outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices. Before being operated inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

7 Maintenance and calibration

Interconnection with intrinsically safe circuits to check or calibrate the equipment inside or outside hazardous areas is to be performed only with intrinsically safe current/voltage calibrators and measuring instruments to

rule out any damage to components relevant to explosion protection.

- Observe the maximum permissible values specified in the certificates for intrinsically safe circuits.

8 Disposal



SAMSON is a producer registered at the following European institution
▶ <https://www.ewrn.org/national-registers/national-registers>.
WEEE reg. no.:
DE 62194439/FR 025665

- Observe local, national and international refuse regulations.
- Do not dispose of components, lubricants and hazardous substances together with your other household waste.

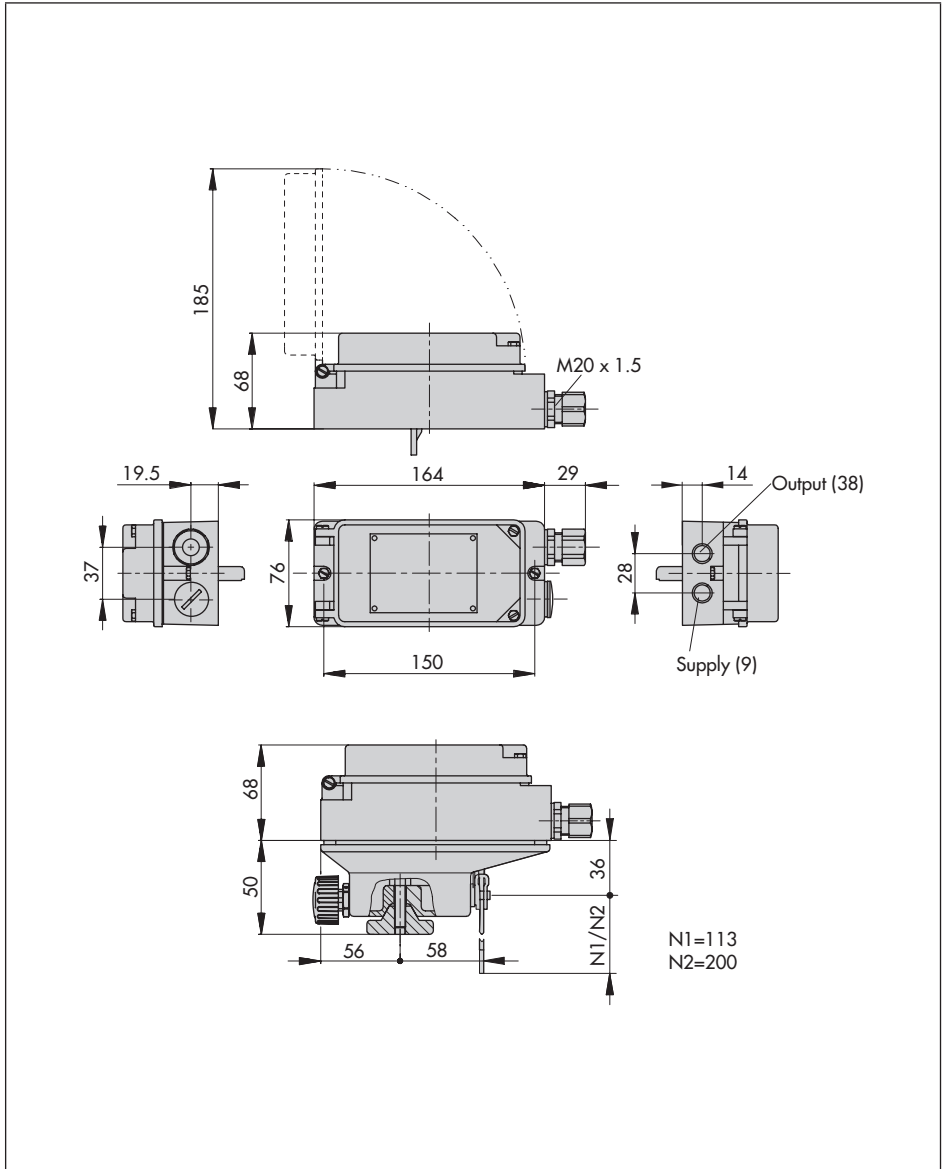
i Note

We can provide you with a recycling passport according to PAS 1049 on request. Simply e-mail us at aftersaleservice@samsongroup.com giving details of your company address.

💡 Tip

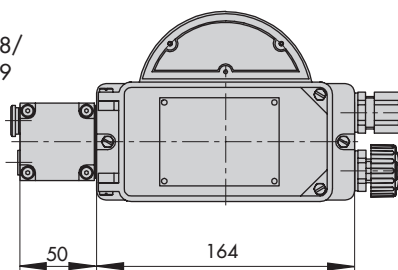
On request, we can appoint a service provider to dismantle and recycle the product.

9 Dimensions in mm

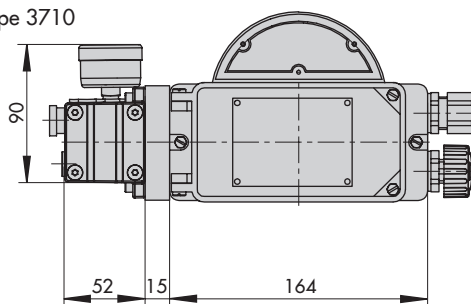


With reversing amplifier

1079-1118/
1079-1119



Type 3710





EU Konformitätserklärung / EU Declaration of Conformity

Für das folgende Produkt / For the following product

Induktiver Grenzsinalgeber für pneumatische Stellgeräte / Inductive Limit Switch for Pneumatic Control Valves Typ / Type 3768

wird die Konformität mit den nachfolgenden EU-Richtlinien bestätigt / signifies compliance with the following EU Directives:

EMC 2004/108/EC (bis/to 2016-04-19)
EMC 2014/30/EU (ab/from 2016-04-20)

EN 61000-6-2:2005, EN 61000-6-3:2010,
EN 61326-1:2006

Hersteller / Manufacturer:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany

Frankfurt, 2016-04-06

Gert Nahler
Zentralabteilungsleiter/Head of Department
Entwicklung Automation und Integrationstechnologien/
Development Automation and Integration Technologies

Günther Scherer
Qualitätssicherung/Quality Management



EU Konformitätserklärung / EU Declaration of Conformity

Für das folgende Produkt / For the following product

Induktiver Grenzsinalgeber für pneumatische Stellgeräte /

Inductive Limit Switch for Pneumatic Control Valves

Typ / Type 3768-1...

Entsprechend der EG-Baumusterprüfbescheinigung PTB 02 ATEX 2077 ausgestellt von der/
according to the EU Type Examination PTB 02 ATEX 2077 issued by

Physikalisch Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig
Benannte Stelle / Notified Body 0102

wird die Konformität mit den nachfolgenden EU-Richtlinien bestätigt / signifies compliance with the
following EU Directives:

EMC 2004/108/EC (bis/to 2016-04-19)
EMC 2014/30/EU (ab/from 2016-04-20)

EN 61000-6-2:2005, EN 61000-6-3:2010,
EN 61326-1:2006

Explosion Protection 94/9/EC (bis/to 2016-04-19)
Explosion Protection 2014/34/EU (ab/from 2016-04-20)

EN 60079-0:2009, EN 60079-11:2012

Hersteller / Manufacturer:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany

Frankfurt, 2016-04-06

Gert Nahler
Zentralabteilungsleiter/Head of Department
Entwicklung Automation und Integrationstechnologien/
Development Automation and Integration Technologies

ppa. Günther Scherer
Qualitätssicherung/Quality Management



EU Konformitätserklärung / EU Declaration of Conformity

Für das folgende Produkt / For the following product

Induktiver Grenzsinalgeber für pneumatische Stellgeräte / Inductive Limit Switch for Pneumatic Control Valves Typ / Type 3768-8...

Entsprechend der EG-Baumusterprüfbescheinigung PTB 03 ATEX 2182 X ausgestellt von der/
according to the EU Type Examination PTB 03 ATEX 2182 X issued by

Physikalisch Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig
Benannte Stelle/ Notified Body 0102

wird die Konformität mit den nachfolgenden EU-Richtlinien bestätigt/ signifies compliance with the
following EU Directives:

EMC 2004/108/EC (bis/to 2016-04-19)	EN 61000-6-2:2005, EN 61000-6-3:2010,
EMC 2014/30/EU (ab/from 2016-04-20)	EN 61326-1:2006
Explosion Protection 94/9/EC (bis/to 2016-04-19)	EN 60079-0:2009, EN 60079-15:2010
Explosion Protection 2014/34/EU (ab/from 2016-04-20)	

Hersteller / Manufacturer:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany

Frankfurt, 2016-04-06

Gert Nahler
Zentralabteilungsleiter/Head of Department
Entwicklung Automation und Integrationstechnologien/
Development Automation and Integration Technologies

ppa. Günther Scherer
Qualitätssicherung/Quality Management



TRANSLATION

(1) **EC TYPE EXAMINATION CERTIFICATION**

- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (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.

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.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Ptb28-3768.doc



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



Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 19. July 2002

(Signature)

(Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Ptb28-3768.doc

(13) **Schedule**

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 02 ATEX 2077**

(15) **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 U_i , I_i and P_i 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 EEx ia IIC
only for connection to a certified
intrinsically safe circuit

Maximum values:

$U_i = 16 \text{ V}$
 $I_i = 52 \text{ mA}$
 $P_i = 169 \text{ mW}$
 $C_i = 30 \text{ nF}$
 $L_i = 100 \text{ } \mu\text{H}$
or
 $U_i = 16 \text{ V}$
 $I_i = 25 \text{ mA}$
 $P_i = 64 \text{ mW}$
 $C_i = 30 \text{ nF}$
 $L_i = 100$

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

EC Type Examination Certificates without signature and seal are invalid.
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Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

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Temperature class	Permissible ambient temperature range	I_0 / P_0
T6	-45 °C ... 45 °C	52 mA / 169 mW
T5	-45 °C ... 60 °C	
T4	-45 °C ... 75 °C	
T6	-45 °C ... 65 °C	25 mA / 64 mW
T5	-45 °C ... 80 °C	
T4	-45 °C ... 100 °C	

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

Signal circuit, nominal signal
(terminals 81/82)

Type of protection: Intrinsic safety
EEx ia IIC

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

Version	UN	6V	12V	24V
Temperaturclass	T6	60°C		
	T5	-45°C....70°C		
	T4	80°C		
Characteristic linear or rectangular		#	##	

C_i negligible, L_i negligible

- # The maximum permissible power dissipation P_i 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:

U _i	25 V	27 V	28 V	30 V	32 V
I _i	150 mA	125 mA	115 mA	100 mA	85 mA
P _i	no limitation				
		C _i negligible	L _i negligible		

EC Type Examination Certificates without signature and seal are invalid.
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Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

(17) **Special conditions for safe use**

None

(18) **Essential Health and Safety Requirements**

In compliance with the standards specified above.

Zertifizierungsstelle Explosionsschutz

By order

Braunschweig, 19. July 2002

(Signature)

(seal)

Dr. Ing. U. Johannsmeyer

Regierungsdirektor

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Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Ptb28-3768.doc

TRANSLATION

- (1) **Statement of Conformity**
- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (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.

1/4

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. Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

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

 II 3 G EEx nA II T6

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 30 September 2003

(Signature)

(Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirktor

2/4

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.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Ptb30 Ex n.doc

(13) **S c h e d u l e**

(14) **Statement of Conformity PTB 03 ATEX 2182 X**

(15) **Description of Equipment**

The Model 3768-8... Limit Switch is suitable for attachment to rotary actuators according to VDE/VDI 3845 and integral attachment to Model 3277 Linear Actuators with concealed lever sytem.

There are verious 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:

Temperature class	Permissible ambient temperature range
T6	-45°C . . . 60°C
T5	-45°C . . . 70°C
T4	-45°C . . . 80°C

Electrical data

Inductive proximity switch
(terminals 41/42, 51/52)

Type of protection: EEx nA II

Solenoid valve module

Type of protection: EEx nA II

(16) Test report: **PTB Ex 03-23303**

(17) **Sepcial 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.

3/4

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.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.



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

(18) **Basic health and safety requirements**

Are satisfied by compliance with the standard specified above.

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 30 September 2003

(Signature) (seal)

Dr. Ing. U. Johannsmeyer

Installation Manual for apparatus certified by CSA for use in hazardous locations.

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

Table 1: Maximum values

	Limit switches (inductive)	Solenoid valve
Circuit No.	1 and 2	3
Terminal No..	41 / 42 and 51 / 52	81 / 82
U_i or V_{max}	16V	28V
I_i or I_{max}	25/52 mA	115mA
P_i or P_{max}	64/169mW	250mW (##)
C_i	30nF	0nF
L_i	100μH	0μH

Notes: Entity parameters shall meet the following requirements:

Solenoid valve 12V and 24V version P_{max} no limited
 (##)Solenoid valve 6V version P_{max} 250mW

U_o or V_{oc} ≤ U_i or V_{max} / I_o or I_{oc} ≤ I_i or I_{max} / P_o ≤ P_i or P_{max}; C_α ≥ C_i and L_α ≥ L_i

Table 2: CSA – certified barrier parameters of circuit 3

Barrier	Supply barrier		Evaluation barrier	
	V_{max}	R_{min}	V_{max}	
circuit 3	≤ 28V	≥ 280Ω	≤ 28V	Diode Return
circuit 3 (##)	≤ 28V	≥ 280Ω	≤ 28V	Diode Return

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

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

Temperature class	Permissible ambient temperature range
T6	- 45°C ... 60°C
T5	- 45°C ... 70°C
T4	- 45°C ... 80°C

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

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	- 45°C ... 45°C	52mA
T5	- 45°C ... 60°C	
T4	- 45°C ... 75°C	
T6	- 45°C ... 60°C	25mA
T5	- 45°C ... 80°C	
T4	- 45°C ... 80°C	

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

CSA- certified for hazardous locations

Ex ia IIC T6; Class I, Zone 0

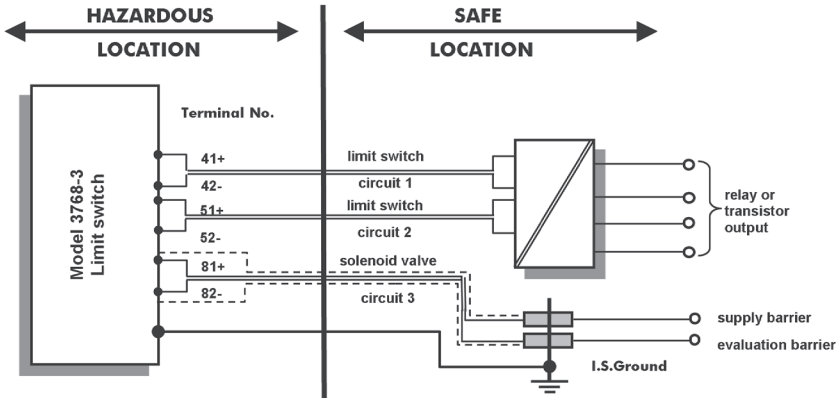
Type 4 Enclosure

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_i or V_{max}**; **I_i or I_{max}**; **P_i or P_{max}**; C_i and L_i 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 I.S. wires must be protected by a shield that is grounded at the I.S. Ground. The shield shall extend as close to the terminal 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.



Version: Model 3768 with solenoid valve and inductive limit switch(es.)

Relay or transistor output 1 or 2 channel(s) resp. CSA certified.

Supply and evaluation barrier CSA- certified.

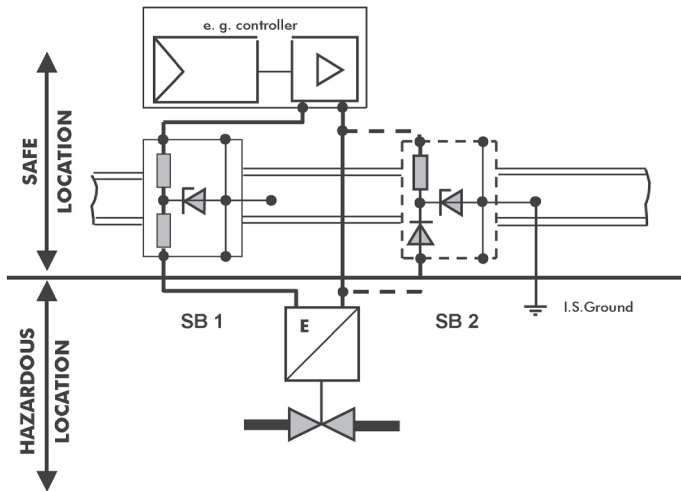
For the permissible maximum values for the intrinsically safe circuits see Table 1

For the permissible barrier parameters for the circuits 3 see Table 2

Cable entry M 20 x 1.5 or metal conduit according to drawing No. 1050 – 0539 T or 1050 – 0540 T

Circuit diagram of a ground- free signal circuit.

(position indicator and solenoid valve)



Ground-free control signal circuit with barrier SB1 and SB2

Revisions Control Number: 1 May 2005

Addendum to FR 8356 FN

In grounded signal circuits with only one barrier, the return line must be grounded or included in the potential equalization network of the system.

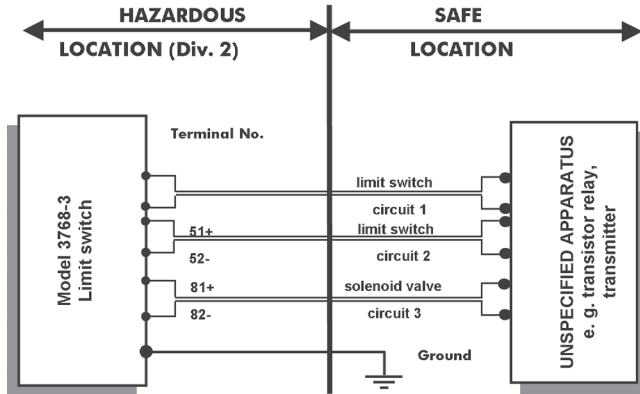
CSA- certified for hazardous locations

Class I; Div. 2, Groups A, B, C, D.

Class II; Div. 2, Groups E, F + G, Class III

Type 4 Enclosure

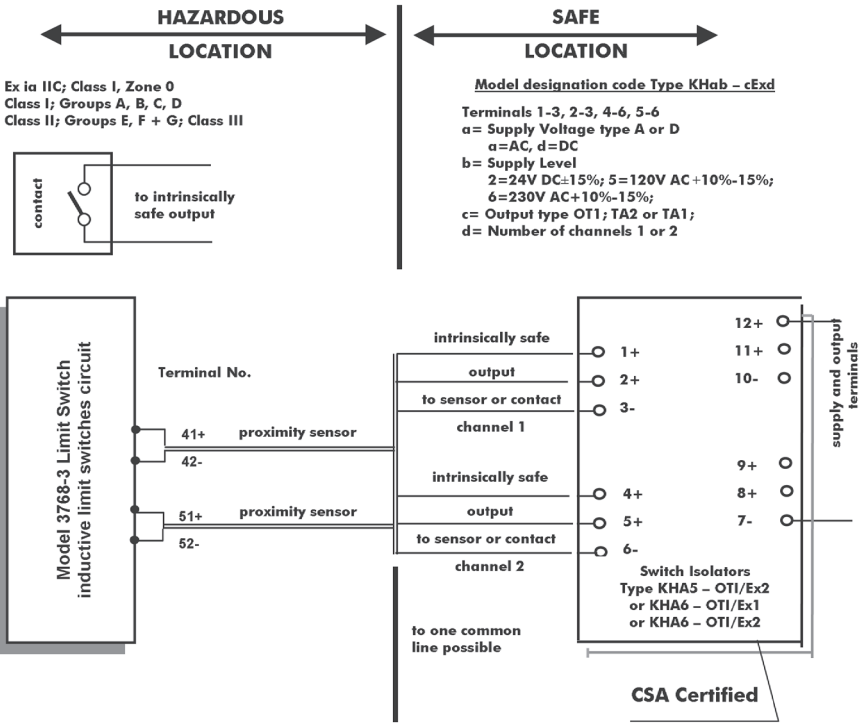
Limit Switch with solenoid valve and limit switches.



Notes:

- 1.) The installation shall be in accordance with the Canadian Electrical Code Part.1
- 2.) For the maximum values for the individual circuits see Table 1 and 2.
- 3.) The cables shall be protected by conduits.
- 4.) Cable entry only rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T

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



The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

maximum capacitance of each inductive sensor 30nF
maximum inductance of each inductive sensor 100µH

System parameters

Control Relay Terminal No.	Groups	L [mH]	C [µF]	V _{0C} [V]	I _{SC} [mA]	V _{max} [V]	R _{min} [Ω]
1-3; 2-3 4-6; 5-6	A + B	84.88	1.273	↑	↑	↑	↑
	C + D	298.7	3.82	12.6	19.8	12.6	650
	E, F, G	744.4	10.18	↓	↓	↓	↓

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

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Installation Manual for apparatus approved by FM for use in hazardous locations.

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

Table 1: Maximum values

	Limit switches inductive	Solenoid valve
Circuit No.	1 and 2	3
Terminal No.	41 / 42 and 51 / 52	81 / 82
U_i or V_{max}	16V	28V
I_i or I_{max}	25/52 mA	115mA
P_i or P_{max}	64/169mW	250mW (##)
C_i	30nF	0nF
L_i	100μH	0μH

Notes: Entity parameters must meet the following requirements:

Solenoid valve 12V and 24V version P_i or P_{max} no limited
 (##)Solenoid valve 6V version P_i or P_{max} 250mW

**U₀ or V_{0c} or V_t ≤ U_i or V_{max} / I₀ or I_{sc} or I_t ≤ I_i or I_{max} / P₀ or P_{max} ≤ P_i or P_{max}
 C_a ≥ C_i + C_{cable} and L_a ≥ L_i + L_{cable}**

Table 2: FM – approved barrier parameters of circuit 3

Barrier	Supply barrier				Evaluation barrier		
	V_{0c}	R_{min}	I_{sc}	P_{max}	V_{0c}	R_{min}	I_{sc}
circuit 3 (#)	≤ 28V	≥ 200Ω	≤ 115mA	(#)	≤ 28V	#	0mA
circuit 3 (##)	≤ 28V	≥ 785Ω	≤ 115mA	(##)	≤ 28V	#	0mA

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

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

Temperature class	Permissible ambient temperature range
T6	60°C
T5	- 45°C ≤ ta ≤ 70°C
T4	80°C

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

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	45°C	52mA
T5	- 45°C ≤ ta ≤ 60°C	
T4	75°C	
T6	60°C	25mA
T5	- 45°C ≤ ta ≤ 80°C	
T4	80°C	

FM- approved for hazardous locations

Class I, Zone 0 A Ex ia IIC T6

Class I, II, III Division 1, Groups A, B, C, D; E, F + G

NEMA 4X

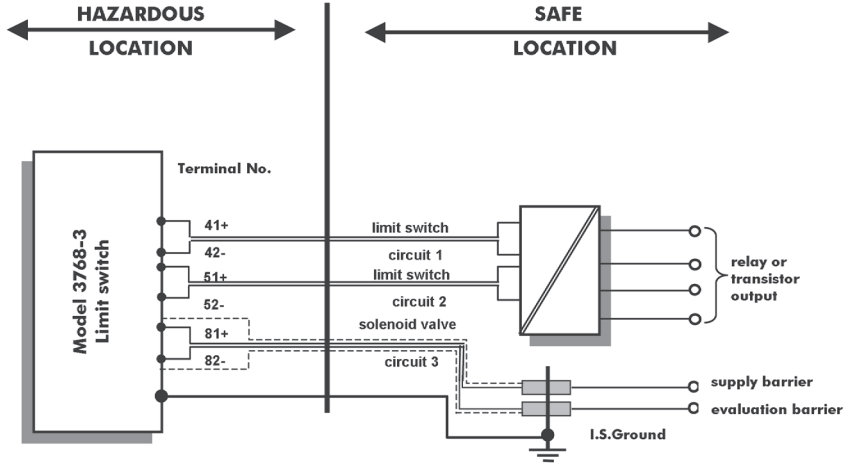
Notes:

- 1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved apparatus. For maximum values of U_i or V_{max} ; I_i or I_{max} ; P_i or P_{max} ; C_i and L_i 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 barrier. For barrier selection see Table 2.
- 3.) Installation shall be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01

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



Version: Model 3768 with solenoid valve and inductive limit switch(es.)

Relay or transistor output 1 or 2 channel(s) resp. FM/CSA approved.

Supply and evaluation barrier FM/CSA- approved.

For the permissible maximum values for the intrinsically safe circuits see Table 1

For the permissible barrier parameters for the circuits 3 see Table 2

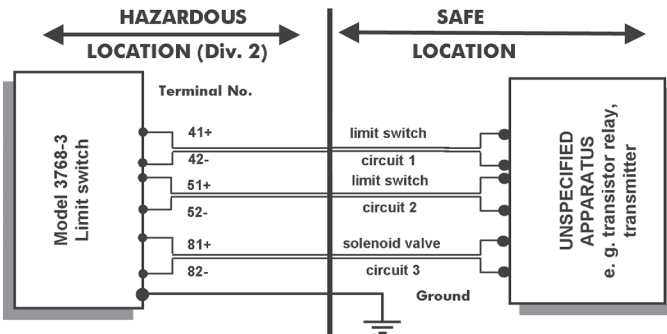
Cable entry M 20 x 1.5 or metal conduit according to drawing No. 1050 – 0539 T or 1050 – 0540 T

FM- approved for hazardous locations

Class I, Division 2, Groups A, B, C, D.

Class II Division 2, Groups F + G; Class III

NEMA 4X



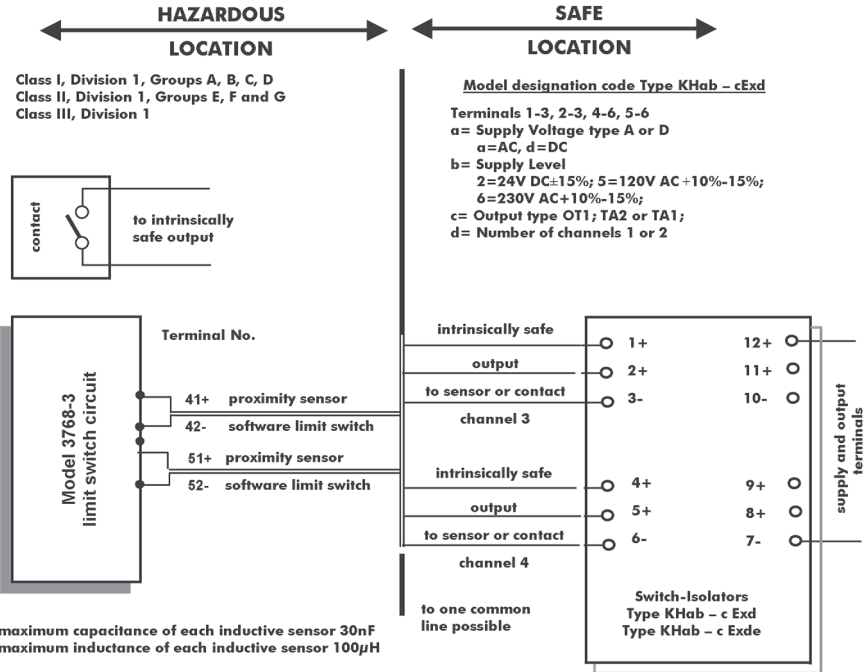
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Notes:

- 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 cables shall be protected by conduits.
- 4.) Cable entry only rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T

Installation drawing Control Relay Hab – cEx de with Model SJ-b-N Proximity Sensors



maximum capacitance of each inductive sensor 30nF
 maximum inductance of each inductive sensor 100µH

The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

Control Relay Terminal No.	Groups	L [mH]	C [µF]	VOC [V]	ISC [mA]
1-3; 2-3 4-6; 5-6	A + B	84,8	1,27	↑	↑
	C + E	299	3,82	12,9	19,8
	D, F, G	744	10,2	↓	↓

Model designation code Type KHab – cExde

- a= Supply Voltage type A or D
a=AC, d=DC
- b= Supply Level
2=24V DC±15%; 5=120V AC+10%-15%;
6=230V AC+10%-15%;
- c= Output type RTA;/ RW1;/ SS1;/ SS2;/ RS1;/ SR;/ ST-or SOT
- d= Number of channels 1 or 2
- e= Power rail designation, P, 2S.P or GS.P (includes Model KHD2-EB-PB Power Feed Module) or Blank

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EB 8356 EN



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