Documentation

about

Ex i … 8 V DC chemical limit switch box

with

Pepperl+Fuchs sensors SJ 3,5-N

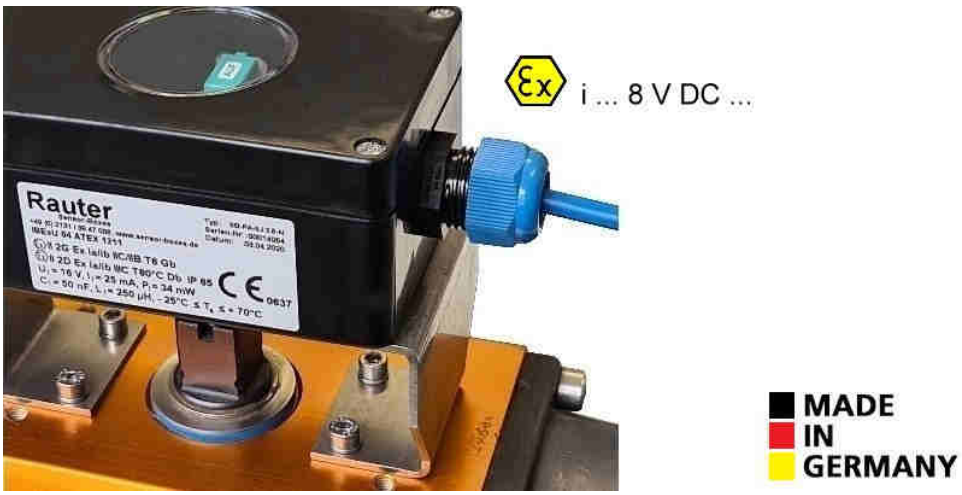
for

pneumatic rotary actuators

acc. to

guidline 2014/34/EU, IBExU 04 ATEX 1211

II 2G Ex ia/ib IIC/IIB T6 Gb **II 2D Ex ia/ib IIIC T 80 °C Db**



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1. **Objectives** and **practical use**

The positions of industrial valves represent an important piece of information for the course of action of a production. These valves are e.g. actuated with pneumatic rotary actuators at which the end position of the valve like **open** or **closed** are reported back to a control system. This is done via a mounted a limit switch box which is placed on the actuator.

Use of the above mentioned limit switch boxes can be found in endangered explosive areas as in the chemicals and petrochemicals industry, equipment group II, category 2G, zones 1, 2 or 2D, zones 21, 22. See image 1+2.

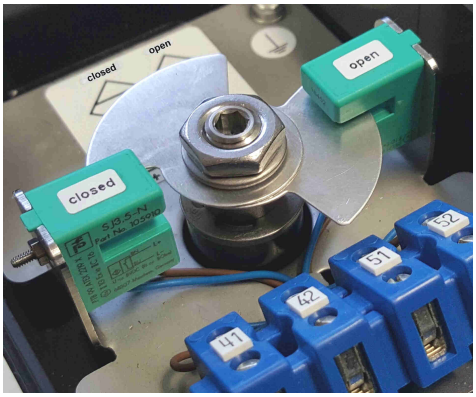


Image 1+2: Polyamide (Vestamide) limit switch box mounted on the actuator, size: 120x80x55 mm, transparent window in the top, stainless steel bracket for actuators with steam hight 20 mm acc. to VDI/VDE 3845
inside: 2x Pepperl+Fuchs sensor SJ 3,5-N for position open and closed.

2. Technical specification

Table 1: Technical specifications as well as conditions of use for the limit switch boxes equipment group II, category 2G, zones 1, 2 or 2D, zones 21, 22

Term / Identifier:	**Technical specifications:**
Materials and dimensions housings	Polyamide (Vestamide), black, , $R_o \leq 10^9$ Ω, RAL 9005, 120x80x55 mm
Connection: Box to bracket	4x M6-winding at the bottom hole circle ∅ 50 mm, F05-slot
Connection: Box to bracket for rotary actuator	acc. to VDI/VDE, steam hight 20,30 or 50 mm, hole spacing 80x30 mm or 130x30 mm
Ambient temperature range from the complete limit switch box	- 25 °C ≤ T_a ≤ + 70 °C
Protection class	IP 65
ATEX indentification	**II 2G Ex ia/ib IIC/IIB T6 Gb** **II 2D Ex ia/ib IIIC T 80 °C Db**
Temperature class	T6
• Nominal voltage • Nominal current • Power	U_i = 16 V I_i = 25 mA P_i = 34 mW
Cable gland	M20x1,5 mm clamp range ∅ 11-9,5 mm, ∅ 9-7 mm, ∅ 7-5,5 mm, Polyamide
Mini-terminals	2x 2-pole, maximum 2,5 mm²
Weights	- limit switch box without stainless steel bracket = 0,3 kg - limit switch box with stainless steel bracket = 0,6 kg
Display and switching range	0° up to 180°

3. Mounting on the actuator, electrical connection

3.1 Mechanical mounting: The limit switch box with the mounted bracket is placed on the actuator and screwed together.

3.2 Electrical mounting: The limit switch box is electrically mounted to the mini-terminals within the housing through the cable gland tightening torque for M20x1,5mm = **4 Nm**, see page 7. You also have to take the attached wiring diagram into consideration which can always be found on the left long surface within the housing or directly on the pcb, see image 3.

Metal parts have to be grounded or the metal housing has to be connected to the equipotential bonding.

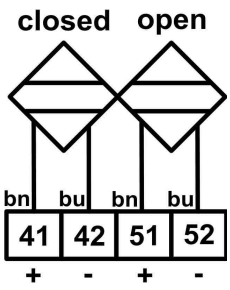


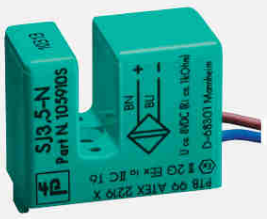
Image 3: Wiring diagram 2x Pepperl+Fuchs sensors SJ 3,5-N at the mini-terminals,bn = brown, bu = blue.

4. **Components** and **parts list**

Table 2: Components and parts list of limit switch box equipment group II, category 2G, zones 1, 2 or 2D, zones 21, 22

Term/Identifier	**Article-No.**	**Material**	**Comments**
Polyamide empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12 mm, tap hole M20x1,5 mm, cover with flag window as well as 4 pieces of cover screws	SB-PA-L	Polyamide	120x80x55 mm, black
Cable gland, blue-black	SB-KL-25	Polyamide	M20x1,5 mm, clamp range: ∅ 11-9,5 mm, ∅ 9-7 mm, ∅ 7-5,5 mm, Cooper Crouse-Hinds-type: GHG9601955R0109
Mini-terminals, 2x 2-pole with clamp indicators	SB-V	Thermoplastic and copper alloy	Maximum, 2,5 mm², blue, Bartec: 07-9702-0220/2
Pcb for sensors	SB-PL	Stainless steel	93x70x1 mm, drawing-No.: 001
Attechment screws for pcb, 4 pieces	SB-B	Stainless steel	M3x4 mm
Shaft for sensors	SB-W-schl	Stainless steel	∅ 12x64 mm, drawing-No.: 002
O-ring for shaft	SB-O	NBR 70	9x1,5 mm
2D-indicator yellow (option)	Si/WE	Plastic	40x18x3 mm, drawing-No.: 0019
Washer for shaft, 2 pieces	SB-U	Polyamide	∅ 18 / ∅ 12x1,2 mm
Lock washer for shaft, 2 pieces	SB-S	Stainless steel	DIN 6799-9
Switching cams, 2 pieces	SB-S-s	Aluminium	drawing-No.: 003
Fasteners for cams	SB-B-S	Stainless steel	M8/M4-socked screw, M8-nut, washer for M8
Cable binder, 2 pieces	SB-K	Nylon	99x2,5 mm
Wiring diagram/ sensor indication	SB-Sch-S	Polyvinylclorid self-adhesive	30x32 mm and 2 pieces 8x4 mm
Type label	SB-type	Aluminium foil self-adhesive	70x32 mm
Pepperl+Fuchs sensor with screw and nut	SJ 3,5-N	Housing PBT	10x15x19 mm, check page 6
Stainless steel standard bracket	SB-VA-K	Stainless steel	70x130x45/20 mm, for actuators with steam hight 20 mm acc. to VDI/VDE 3845

5. Data sheet sensor (Extract from Pepperl+Fuchs data sheet page 1)

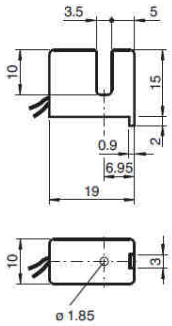


Inductive slot sensor

SJ3,5-N

- 3.5 mm slot width
- Usable up to SIL 2 acc. to IEC 61508

Dimensions



Technical Data

General specifications		
Switching function		Normally closed (NC)
Output type		NAMUR
Slot width		3.5 mm
Depth of immersion (lateral)		5 ... 7 mm , typ. 6 mm
Output type		2-wire
Nominal ratings		
Nominal voltage	U_o	8.2 V (R_i approx. 1 kΩ)
Operating voltage	U_B	5 ... 25 V
Switching frequency	f	0 ... 3000 Hz
Hysteresis	H	0.41 ... 0.6 mm
Suitable for 2:1 technology		yes , Reverse polarity protection diode not required
Current consumption		
Measuring plate not detected		≥ 3 mA at nominal voltage
Measuring plate detected		≤ 1 mA at nominal voltage
Functional safety related parameters		
$MTTF_d$		8415 a

Release date: 2020-12-14 Date of issue: 2020-12-14 Filename: 105910_eng.pdf

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6. Cable Gland

Extract from Cooper-Crouse-Hinds operating instruction page 13+14

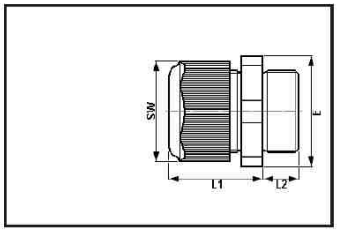
Tightening torque **M20x1,5 mm = 4 Nm**

GB

Cable entries, blanking plugs, screw plugs, trumpet-shaped cable glands, reducing glands and drain plugs

Dimension drawings and dimensions in mm

Fig. A
Pressure screw
Intermediate gland
>5 mm
Ø
M12, M16 (Ø < 9 mm), M20 ... M63
0 mm
Ø
M16 (Ø > 9 mm)



1 Technical data

1.1 **Technical details for: Cable entries (KLE)** **M12x1,5 to M63x1,5**

ATEX type examination certificate:	PTB 14 ATEX 1015 X(A)
Marking acc. to 2014/34/EU and standard:	
EN 60079-0	Ⓔx II 2 G Ex e IIC Gb
	Ⓔx II 2 D Ex tb IIIC Db
IECEx type examination certificate:	IECEx PTB 14.0027X(A)
Category of application: IEC60079-0	Ex e IIC Gb
	Ex tb IIIC Db

(A) The EC-Type Examination Certificate and any future supplements thereto shall, at the same time, be regarded as supplements to the EC-Type Examination Certificates PTB 99 ATEX 3128 X and PTB 99 ATEX 3101 X

Perm. storage temperature in original packing:	-20° C to +70° C
Degree of protection to IEC/EN 60529:	IP 66*) (when fully assembled)

*) M40, M50 und M63 with suitable flange seal

Type	SW	L1	L2	E	weight app.
M12x1,5	15 mm	19,3 mm	12 / 8 mm	16,2 mm	3,4 g
M16x1,5	20 mm	23,0 mm	12 / 8 mm	22,0 mm	6,5 g
M20x1,5	24 mm	25,0 mm	13 / 8 mm	26,5 mm	10,1 g
M25x1,5	29 mm	29,5 mm	13 / 8 mm	32,0 mm	16,9 g
M32x1,5	36 mm	35,5 mm	15 / 10 mm	40,0 mm	27,6 g
M40x1,5	46 mm	39,5 mm	15 / 10 mm	50,5 mm	50,3 g
M50x1,5	55 mm	44,0 mm	16 / 12 mm	60,0 mm	75,9 g
M63x1,5	68 mm	47,0 mm	16 / 12 mm	75,0 mm	117,6 g

Type	operating temperature	impact resistance	Cable diameter												Screw-in thread in enclosure	Colour of dust protection cover
			Seal 1+2+3 (1)(2)(3)				Seal 1+2 (1)(2)				Seal 1 (1)					
			min.		max.		min.		max.		min.		max.			
	°C	Joule	Ø	Nm**	Ø(1)(2)	Nm**	Ø	Nm**	Ø(1)(2)	Nm**	Ø	Nm**	Ø(2)	Nm**	Nm**	
M12x1,5	-20 - 70	4									5,0	0,8	7,0	1,0	1,2	white
M16x1,5	-20 - 70	4					5,5	1,0	7,0	1,0	7,0	1,0	10,0	1,4	3,3	white
M20x1,5	-20 - 70	7	5,5	1,5	7,0	1,0	7,0	1,5	9,0	1,4	9,5	1,0	13,0	1,7	2,7	white
M20x1,5	-40 - 70	4	5,5	1,5	7,0	1,0	7,0	1,5	9,0	1,4	9,5	1,0	11,0	1,7	2,7	green
M25x1,5	-20 - 70	7	8,0	1,5	10,0	2,0	10,0	2,3	13,0	2,6	13,5	1,3	17,5	2,3	3,0	white
M25x1,5	-55 - 70	7	8,0	1,5	10,0	2,0	10,0	2,3	13,0	2,6	13,5	1,5	15,0	2,3	3,0	green
M32x1,5	-20 - 70	7					14,0	3,0	17,0	4,0	17,5	1,5	21,0	1,3	5,0	white
M32x1,5	-55 - 70	7					14,0	3,0	17,0	4,0	17,5	1,5	21,0	1,3	5,0	green
M40x1,5	-55 - 70	7					19,0	3,3	22,0	5,5	22,0	3,3	28,0	6,7	7,5	green
M50x1,5	-55 - 70	7					24,0	6,0	28,0	7,0	28,0	5,0	35,0	7,0	7,5	green
M63x1,5	-55 - 70	7					29,0	12,0	35,0	12,0	36,0	12,0	41,0	13,0	7,5	green
additional seal							41,0	13,0	48,0	7,8						

** Test torques at 20°C

(1) The tests of clamping ranges and torque values were performed with metal mandrel. The clamping range can vary by using cables with different manufacturing tolerances and material properties. Please use the combination of sealing 1 + 2 + 3 for the intermediate region.
(2) When selecting the seal rubber, ensure that the cap nut can be tightened when carrying out any future maintenance work on the cable entry.

Fig. B Cable diameter 9 mm
e.g. for M25x1,5

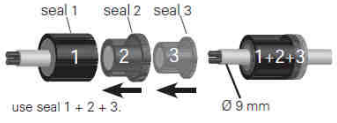


Fig. C Cable diameter 12 mm
e.g. for M25x1,5

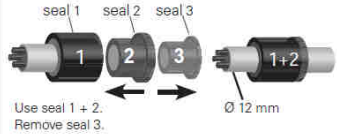
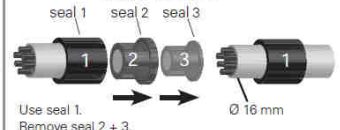


Fig. D Cable diameter 16 mm
e.g. for M25x1,5



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GB

Cable entries, blanking plugs, screw plugs, trumpet-shaped cable glands, reducing glands and drain plugs

Dimension drawings and dimensions in mm

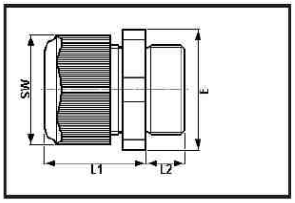
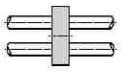


Fig. D/1 Seal insert



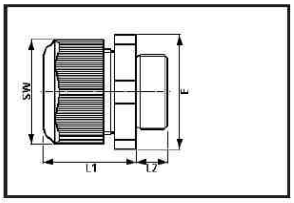
for multiple gland

1.2 Multiple glands

Type	SW	L1	L2	E	weight app.
M25x1,5 2- times	29 mm	29,5 mm	13 / 8 mm	32,0 mm	16,9 g
M32x1,5 4- times	36 mm	35,5 mm	15 / 10 mm	40,0 mm	27,6 g

Type	Operating temperature	Impact resistant	Cable diameter				
			Seal 1				
				min.		max.	
	°C	Joule		Ø	Nm	Ø	Nm
M25x1,5 2- times	-20 - 70	< 7	2x	4,5	2,0	7,0	2,0
M32x1,5 4- times	-20 - 70	< 7	4x	4,5	3,0	7,0	3,5

1.3 Enlargement glands



Type	SW	L1	L2	E	weight app.
M16x1,5 / M20x1,5	24 mm	25,0 mm	12 mm	26,5 mm	9,2 g
M20x1,5 / M25x1,5	29 mm	29,5 mm	13 mm	32,0 mm	16,7 g
M25x1,5 / M32x1,5	36 mm	35,5 mm	15 mm	40,0 mm	27,0 g
M32x1,5 / M40x1,5	46 mm	39,5 mm	15 mm	50,5 mm	46,5 g
M40x1,5 / M50x1,5	55 mm	44,0 mm	15 mm	60,0 mm	73,5 g
M50x1,5 / M63x1,5	68 mm	47,0 mm	16 mm	75,0 mm	106,4 g

Type	Operating temperature	Impact resistant	Cable diameter												Screw-in thread in enclosure
			Seal 1+2+3 (1)(2)(3)				Seal 1+2 (1)(2)				Seal 1 (1)				
			min.		max.		min.		max.		min.		max.		
	°C	Joule	Ø	Nm**	Ø(1)(2)	Nm**	Ø	Nm**	Ø(1)(2)	Nm**		Nm**	Ø(1)	Nm**	Nm**
M16x1,5 / M20x1,5	-20 - 70	< 7	5,5	1,5	7,0	1,0	7,0	1,5	9,0	1,4	9,5	1,0	13,0	1,7	3,3
	-40 - 70	< 4	5,5	1,5	7,0	1,0	7,0	1,5	9,0	1,4	9,5	1,0	11,0	1,7	3,3
M20x1,5 / M25x1,5	-20 - 70	< 7	8,0	1,5	10,0	2,0	10,0	2,3	13,0	2,6	13,5	1,3	17,5	2,3	2,7
	-40 - 70	< 4	8,0	1,5	10,0	2,0	10,0	2,3	13,0	2,6	13,5	1,5	15,0	2,3	2,7
M25x1,5 / M32x1,5	-55 - 70	< 7					14,0	3,0	17,0	4,0	17,5	1,5	21,0	1,3	3,0
M32x1,5 / M40x1,5	-55 - 70	< 7					19,0	3,3	22,0	5,5	22,0	3,3	28,0	6,7	5,0
M40x1,5 / M50x1,5	-55 - 70	< 7					24,0	6,0	28,0	7,0	28,0	5,0	35,0	7,0	7,5
M50x1,5 / M63x1,5	-55 - 70	< 7					29,0	12,0	35,0	12	36,0	12,0	41,0	13,0	7,5
additional seal							41,0	13,0	48,0	7,8					

** Test torques at 20°C

(1) The tests of clamping ranges and torque values were performed with metal mandrel. The clamping range can vary by using cables with different manufacturing tolerances and material properties. Please use the combination of sealing 1 + 2 + 3 for the intermediate region.

(2) When selecting the seal rubber, ensure that the cap nut can be tightened when carrying out any future maintenance work on the cable entry.

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7. Applicable standards

EN 60079-0: 2018 Explosive atmospheres - Part 0: Equipment - General requirements

EN 60079-11: 2012 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety “i“

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