

Documentation

about
Ex i ... 8 V DC stainless steel limit switch boxes
 with
Pepperl+Fuchs sensors
 for
pneumatic rotary- and linear actuators
 acc. to
guideline 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

and

 II 2G Ex ia/ib 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- and linear actuators at which the end position of the valve like **open** or **closed** is reported back to a control system. This is done via mounted limit switch boxes which are placed on / at the actuator, see images 1-3.





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



Image 1-3: left: stainless steel limit switch box, AISI 304, IP 65, 150x150x80 mm for rotary actuators acc. to VDI/VDE 3845 with bracket, right: with mounting set for linear actuators acc. to NAMUR IEC 534, below: with 3D indicator OPEN/CLOSED for rotary actuators with bracket

2. Technical specification

Table 1: Technical specifications as well as conditions of use for the stainless steel limit switch boxes

Term / Identifier:	Technical specifications:
Materials and dimensions housings	Stainless steel AISI 304 (=1.4301), 150x150x80 mm
Connection limit switch box to bracket	4x M6-winding at the bottom hole circle \varnothing 50 mm, F05-slot
Connection limit switch box to bracket for rotary- or linear actuator	- acc. to VDI/VDE 3845, shaft height 20, 30 and 50 mm, hole spacing 80x30 mm and 130x30 mm - mounting set f. linear actuators acc to IEC 534
Ambient temperature range from the complete limit switch box	-25 °C \leq T _a \leq +70 °C (for all versions acc. to table 3, page 9) -25 °C \leq T _a \leq +66 °C (for all versions acc. to table 3) ¹⁾
Protection class	IP 65
ATEX identification of Ex i ... 8 V DC limit switch boxes acc. to image 1+2, page 2	 II 2G Ex ia/ib IIC/IIB T6 Gb  II 2D Ex ia/ib IIIC T 80 °C Db
ATEX identification of Ex i ... 8 V DC limit switch boxes acc. to image 3, page 2	 II 2G Ex ia/ib IIB T6 Gb  II 2D Ex ia/ib IIIC T 80 °C Db
Temperature class	T6
<ul style="list-style-type: none"> Nominal voltage Nominal current Power 	U _i = 16 V (for all versions acc. to table 3, page 9) I _i = 25 mA P _i = 34 mW (P _i = 64 mW) ¹⁾
Cable glands	M20x1,5 mm, \varnothing 14,0-9,0 mm and \varnothing 9,0-5,0 mm, nickel-plated or stainless steel
Mini-terminals	2-pole and 3-pole, maximum 2,5 mm ²
Weight limit switch box without bracket and without stainless steel plate and mounting set	1,8 kg
<ul style="list-style-type: none"> Weight standard brackets Weight stainless steel plate and mounting set 	- 0,3 kg - 1,65 kg
Display and switching range	0° and 90° or adjustable 0° up to 360°

¹⁾ Connection only when: U_i = 16 V (for all versions acc. to table 3), I_i = 25 mA, P_i = 64 mW by ambient temperature range -25 °C \leq T_a \leq +66 °C

3. Mounting on/at the rotary- or linear actuators

3.1 Mechanical mounting: The limit switch boxes with the mounted brackets or the mounted stainless steel plates (via F05-slot) with the mounting sets are placed on/at the actuators and screwed together.

3.2 Electrical mounting: The limit switch boxes are connected to the mini-terminals using the cable glands. Connection to the mini-terminals according to the following wiring diagrams, see images 8-10. Page 5. The tightening torques for the cable glands see operating instructions page 7+8.

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

4. Mounting of the housing cover

4.1 Limit switch boxes without 3D-indicator: Turn the 4x cover locking pins $\frac{3}{4}$ to 1 turn correctly in the locking from the housing mechanism.

4.2 Limit switch boxes with 3D-indicator: First of all, the cover with the double flat shaft must be placed in the recess of the housing shaft. Then turn the 4x cover locking pins $\frac{3}{4}$ to 1 turn correctly in the locking from the housing mechanism.

5. Switching cams and wiring diagrams

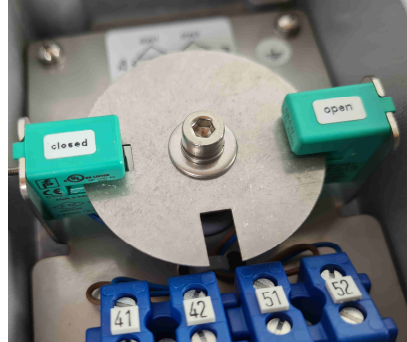
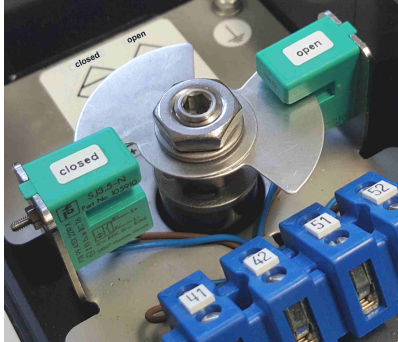


Image 4+5: left: 2x Pepperl+Fuchs sensors SJ 3,5-N with 2x aluminium switching cams for position 0° and 90°, the lower switching cam is tightened with a hexagon key SW = 4 mm and the upper switching cam is tightened with a mauth key SW = 13 mm, right: 2x Pepperl+Fuchs sensors SJ 3,5-SN with stainless steel switching cam for position 0° and 90°.

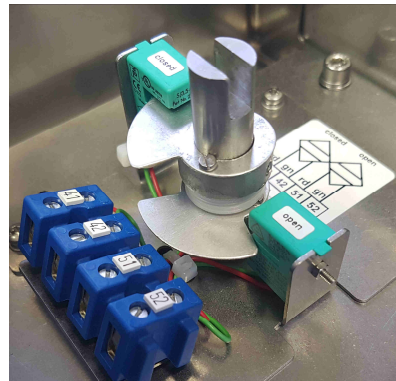


Image 6+7: left: 2x Pepperl+Fuchs sensors NJ2-12GK-N with stainless steel switching cam for position 0° and 90°, right: 2x Pepperl+Fuchs sensors SJ 3,5-S1N with 2x adjustable switching cams for position 0° and 90°, which is tightened with a hexagon key SW = 2 mm.

All sensors are mounted according to the wiring diagrams which always can be found within the inside of the housing.

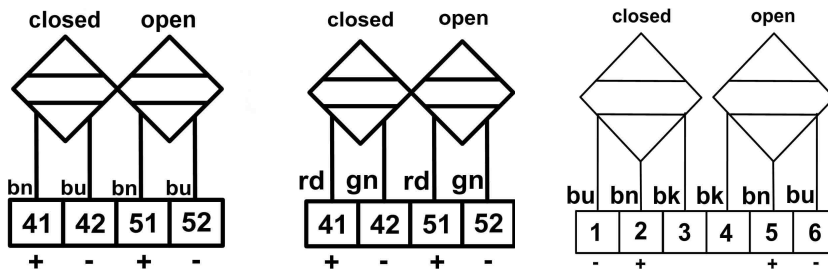


Image 8-10: bn = brown cable +, bu = blue cable -, rd = red cable +, gn = green cable -, (bk = black), 41 42 51 52, 1-6, closed = left sensor, open = right sensor

6. Components and parts lists

Table 2: Components and parts list of the stainless steel limit switch boxes

Term/Identifier	Article-No.	Material	Comments
Stainless steel empty housing with closed cover sealing and 4x locking pins / 4x plastic bush / 4x O-ring / 4x O-ring / 4x lock washer for shaft	SB-VA-L-2	stainless steel (AISI 304) / plastic / NBR / silikon / stainless steel	150x150x80 mm / 5x36 mm / Rittal-type: B.-Nr.: 315733 / B.-Nr.: 220267 / 5x2 mm / B.-Nr.: 220240 / 13x3 mm / B.-Nr.: 220507 / B.-Nr.: 321759
Aluminium shaft bearing body, F05-slot with 4x screw M3	SB-AL-E	Aluminium	∅ 75x25 mm, drawing-No 020
3D indicator for position OPEN/CLOSED, 0° and 90° / O-ring / 4x screw M8	SB-3D	Copolyester / Silikon / stainless steel	∅ 65x74 mm/ 62x3,5 mm/ M8x16 mm
Aluminium shaft bearing body f. 3D indicator / O-ring / 4x screw M4	SB-AL-E-3D	Aluminium / Silikon / Stainless steel	∅ 100x10mm / 94x2 mm
Cable gland fixed with hexagonal nut, metal with silicone O-ring	S SB-Cg-Ms	Brass Nickel-plated	M20x1,5 mm, clamping range for cables ∅ 14-9 mm and ∅ 9-5 mm Pflitsch-type: bg 220msHTex -55 °C up to +160 °C
Cable gland fixed with hexagonal nut, metal with silicone O-ring	SB-Cg-VA	Brass and Stainless steel	M20x1,5 mm, clamping range for cables ∅ 14-9 mm and ∅ 9-5 mm Pflitsch-type: bg 220VAHTex -55 °C up to +160 °C
2x Mini-terminals 2-pole and 3-pole with clamp indicators	SB-V	Thermoplastic and copper alloy	Maximum, 2,5 mm ² , blue, Bartec: 07-9702-0220/2 and 07-9702-0320/2
Ground plate for slot sensors	SB-PL	Stainless steel	93x70x1 mm, drawing-No 001
Ground plate for cylindrical sensors	SB-zy	Stainless steel	93x70x1 mm, drawing-No 004
Ground plate for cylindrical sensors 3D indicator	SB-PL-3D	Stainless steel	93x70x1 mm, drawing-No 0099
Ground plate	SB-PL-1	Stainless steel	125x79x1,5 mm, drawing-No 021
4x screw for ground plate	SB-B	Stainless steel	M3x4 mm
Shaft for slot sensors for rotary actuators	SB-W-schl.1	Stainless steel	∅ 12x67 mm, drawing-No 022
Shaft for cylindrical sensors for rotary actuators	SB-W-cyl.1	Stainless steel	∅ 12x67 mm, drawing-No 023
Shaft for slot sensors for linear actuators	SB-W-schl-H	Stainless steel	∅ 12x53 mm, drawing-No 060
Shaft for slot sensors for 3D indicator cover	SB-W-3D-C	Stainless steel	∅ 12x77 mm, drawing-No 0001
Shaft for slot sensors for 3D indicator housing	SB-W-3D-H	Stainless steel	∅ 12x101 mm, Drawing-No 0002a
O-Ring for shaft	SB-O	NBR 70	9x1,5 mm
O-Ring for Aluminium shaft bearing body	SB-O-1	NBR 70	65x3 mm
Washer for shaft, 4x	SB-U	Stainless steel	∅ 18 /∅ 12x1,2 mm
Lock washer for shaft, 4x	SB-S	Stainless steel	DIN 6799-9
Switching cam for slot sensors, 2x	SB-S-s	Aluminium	Drawing-No 003
M8/M4 screw and M8 hexagonal nut for slot switching cam	SB-B-S	Stainless steel	Drawing-No 105
Switching cam for cylindrical cam	SB-S-S	Stainless steel	Drawing-No 006
M4 screw for cylindrical switching cam	SB-B-z	Stainless steel	DIN 912
Switching cam for slot sensors, 2x adjustable	SB-S-V	Aluminium	Drawing-No 003 with tight collar and M4 screw
Cable ties	SB-C	Nylon	99x2,5 mm
Wiring diagram/ sensor indication	Sch-S	Polyvinylchlorid self-adhesive	30x30 mm and 8x4 mm
Type label	SB-type	Aluminium foil self-adhesive	70x32 mm
Pepperl+Fuchs sensors	SB-P+F	Plastic and stainless steel	see table 3, page 9
Stainless steel brackets standard for rotary actuators	SB-VA-K	Stainless steel	70x130x45/55 mm, for actuators acc. to VDI/VDE 3845
Stainless steel mounting plate for linear actuators with 4x fastening-screws	SB-VA-P	Stainless steel	135x80x10 mm, drawing-No.: 061
Stainless steel mounting set for linear actuators	SB-AB	Stainless steel and plastic	acc. to NAMUR IEC 534

7. Operating instruction cable glands

Tightening torque **M20x1,5 mm = 10 Nm**

Betriebsanleitung · Operating instructions



PTB 11 ATEX 1007X

blueglobe HT Ex e

**Messing vernickelt/blank und
Edelstahl**

**Für Kabel- und Leitungseinführungen (KLE)
der Zündschutzart „Erhöhte Sicherheit – Ex „e“**

Anwendung:

Die Kabel- und Leitungseinführungen (KLEs) blueglobe HT Ex e dienen zur Einführung von fest verlegten Kabeln und Leitungen in einen Anschlussraum oder in ein Gehäuse eines explosionsgeschützten elektrischen Betriebsmittels der Gerätegruppe II und der Kategorien 2 G/D und 3 G/D.

Der Anschlussraum oder das Gehäuse muss der Zündschutzart „Erhöhte Sicherheit – Ex „e“ nach den Normen EN 60079-0:2012 + A11:2013, EN 60079-7:2015, EN 60079-31:2014 entsprechen.

Die KLE ist für Betriebsmittel mit dem Grad der mechanischen Gefahr „hoch“ nach EN 60079-0 geeignet. Bei ordnungsgemäßer Montage der KLE kann die Schutzart IP 66/68 nach IEC 529 oder EN 60529 erreicht werden.

Kenzeichnung:

Die Kabel- und Leitungseinführungen blueglobe HT Ex e entsprechen den Normen EN 60079-0:2012 + A11:2013, EN 60079-7:2015, EN 60079-31:2014. Sie sind von der Physikalisch-Technischen Bundesanstalt (PTB) einer EG-Baumusterprüfung nach EG-Richtlinie 94/9/EG unterzogen worden.

Sie sind deshalb wie folgt gekennzeichnet:

Kenzeichnung Zulassungsnummer und Kennzeichen der Prüfstelle:

PTB 11 ATEX 1007X xx CE 0102

Kenzeichnung Gas:

II 2G Ex e IIC Gb

Kenzeichnung Staub:

II 2D Ex tb IIIC Db IP 66/68

Kenzeichnung extrem kleiner Bauteile:*

II 2G/II 2D CE 0102

Weitere Zertifikate:

IECEX – IECEX PTB 11.0019X

EAC – RU C-DE.MLU06.B.00119

*Kenzeichnung auf Kabelverschraubung

PTB 11 ATEX 1007X

blueglobe HT Ex e

**brass nickel-plated, brass and stain-
less steel**

**For cable glands and cable entry systems (CG/CES) of the
ignition protective class Ex “e”**

Application:

The cable glands and cable entry systems (CG/CES) blueglobe HT Ex e are used to insert permanently laid lines and cables into a connection space or housing of an explosion-protected electrical operating material of the appliance group II and categories 2 G/D and 3 G/D. The connection space or housing must conform to the ignition protective class “Increased safety – Ex e” in accordance with the standards EN 60079-0:2012 + A11:2013, EN 60079-7:2015 and EN 60079-31:2014. The CG/CES is suitable for operating material with the degree of mechanical risk “high” as per EN 60079-0. In selecting the material for the sealing insert, the ambient, surface and operating temperature at the installation point is to be observed. With proper assembly of the KLE, the protective class IP 66/68 according to IEC 529 or EN 60529 can be attained.

Designation:

The cable glands and cable entry systems (CG/CES) blueglobe HT Ex e conform with the standards EN 60079-0:2012 + A11:2013, EN 60079-7:2015, EN 60079-31:2014. They were subjected to an EC design test in accordance with EC directive 94/9/EC by the Physical-Technical Federal Institute (PTB).

They are therefore designated as follows:

ID of approval no. and ID of testing authority:

PTB 11 ATEX 1007X xx CE 0102

Designation gas:

II 2G Ex e IIC Gb

Designation dust:

II 2D Ex tb IIIC Db IP 66/68

Designation of extremely small components:*

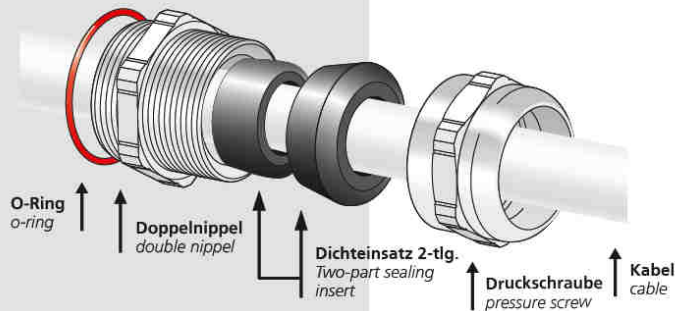
II 2G/II 2D CE 0102

ID of Approval IECEX:

IECEX – IECEX PTB 11.0019X

EAC – RU C-DE.MLU06.B.00119

*Designation on cable gland



Montage

Als Montagewerkzeug kann der PFLITSCH Steckschlüssel M28 verwendet werden.

Einsatztemperaturbereich:

Temperaturbereich Silikon: -55 °C bis +160 °C

Mindestwandstärken

- beim Einbau in Geräten mit Gewindebohrungen:
s = 5,0 mm (Kunststoff); 3,0 mm (Metall)
- beim Einbau in Geräten mit Durchgangsbohrungen:
s = 2,0 mm (Kunststoff); 1,0 mm (Metall)

Hinweis zur Zugentlastung der Kabelverschraubung:

Die KLE ist nur für fest verlegte Leitungen und Kabel geeignet. Der Betreiber muss in diesem Fall für geeignete Maßnahmen sorgen, um eine Zugentlastung zu gewährleisten.

Wichtig:

Dichtringe dürfen nicht mit dem Messer ausgeschnitten werden!

Demontage:

Die Demontage erfolgt in umgekehrter Reihenfolge.

Instandhaltung:

Die Blindstopfen sind in die Kontrollen bei der Inspektion und Wartung der elektrischen Betriebsmittel einzubeziehen.

Anschlussmaße für Durchgangsbohrungen:

Metrisch/metric	M12	M16	M20	M25	M32	M40				
d [mm] 0/+ 0,3	12,0	16,0	20,0	25,0	32,0	40,0				

Anzugsmomente:

Gewinde/Thread	M12	M16	M20	M25	M32	M40				
Nm	5	8	10	15	15	20				

Mechanische Festigkeit:

Gewinde/Thread	M12	M16	M20	M25	M32	M40				
Joule	7	7	7	7	7	7				

Assembly

The PFLITSCH socket spanner M28 can be used as a tool

Application temperature range:

Temperature range silicone: -55 °C bis +160 °C

Minimum wall thicknesses

- for installation in appliances with threaded holes:
s = 5.0 mm (plastic); 3.0 mm (metal)
- for installation in appliances with throughholes:
s = 2.0 mm (plastic); 1.0 mm (metal)

Pointer for strain relief of the cable gland:

The CG/CES are only suitable for permanently laid lines and cables. In this case, the operator must adopt appropriate measures to ensure strain relief.

Important:

Sealing rings must not be cut out with a knife!

Disassembly:

Disassembly is carried out in the reverse order.

Maintenance:

The CG/CES are to be included in the inspection and maintenance of the electrical operating material.

Connection dimensions for throughholes:

Tightening torques:

Mechanical strength:

8. Possible versions of limit switch boxes

Table 3: Possible versions of the limit switch boxes

limit switch boxes type:	slot-sensors:	C _i (nF)/L _i (µH)
SB-VA-SC 3,5-G-N0	2 oder 1 x SC 3,5-G-N0	150/150
SB-VA-SC 3,5-N0	2 oder 1 x SC 3,5-N0	150/150
SB-VA-SJ 3,5-N	2 oder 1 x SJ 3,5-N	50/250
SB-VA-SJ 3,5-SN	2 oder 1 x SJ 3,5-SN	30/100
SB-VA-SJ 3,5-S1N	2 oder 1 x SJ 3,5-S1N	30/100
SB-VA-SJ 3,5-S1N-3D-E	2 oder 1 x SJ 3,5-S1N	30/100
limit switch boxes type:	cylindrical sensors:	
SB-VA-NJ2-11-N-G	2 oder 1 x NJ2-11-N-G	30/50
SB-VA-NJ2-12-GM-N	2 oder 1 x NJ2-12GM-N	30/50
SB-VA-NJ2-12GK-N	2 oder 1 x NJ2-12GK-N	45/50 ¹⁾
SB-VA-NJ4-12GK-N	2 oder 1 x NJ4-12GK-N	45/50 ²⁾
SB-VA-NJ2-12GK-SN	2 oder 1 x NJ2-12GK-SN	50/150
SB-VA-NJ2-11-SN-G	2 oder 1 x NJ2-11-SN-G	50/150
SB-VA-NCB2-12GM35-N0	2 oder 1 x NCB2-12GM35-N0	90/100
SB-VA-NCN4-12GM35-N0	2 oder 1 x NCN4-12GM35-N0	95/100
SB-VA-NJ3-18GK-S1N	2 oder 1 x NJ3-18GK-S1N	70/200 ³⁾
SB-VA-NJ4-12-GM-N	2 oder 1 x NJ4-12GM-N	45/50
SB-VA-NJ5-18GM-N	2 oder 1x NJ5-18GM-N	70/50
SB-VA-NJ8-18GK-SN	2 oder 1x NJ8-18GK-SN	120/200

SB = Sensor-Box VA = Edelstahl 3D = indicator E = english version
C_i = Kapazität L_i = Induktivität

¹⁾ approve according by IBExU-declaration from v. 24.11.05 (He/Hüb 8491/05)

²⁾ approve according by IBExU-declaration from v. 13.08.07 (He/Hüb 6095/07)

³⁾ approve according by IBExU-declaration from v. 04.3.09 (He/Leh 1413/09)

9. 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“