RAUTER
Sensor-Boxes

02/2014

Technical Documentation

of

ATEX sensor-boxes

for

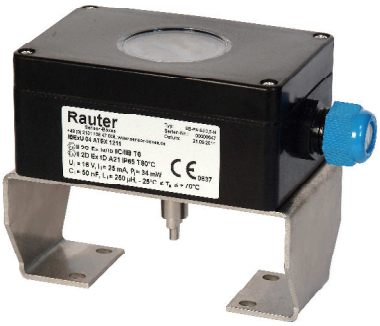
rotary and linear actuators

acc. to 94/9/EC, IBExU 04 ATEX 1211

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

and

I M2 Ex ia/ib I (for mining)



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1. Objectives and pratical 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 drives at which the end position of the valve like “open” or “closed” is reported back to a control system. This is done via a mounted sensor-box which is placed above the actuator, see image 1-4 and appendix image 12-32.

Use of the above mentioned sensor-boxes can be found in endangered explosive areas as in the chemicals industry, equipment group II, category 2G, zones 1 and 2 as well as the zones 21 and 22.

Besides the polyamide sensor-boxes, image 1 will be insert in explosive areas in the mining industry of equipment group I, category M2.

Another possibility also can be found the low temperature sensor-box, image 20+21, page 15, in explosive areas as the extremely cold zones in Sibirian, equipment group II, category 2G, zones 1 and 2 as well as the zones 21 and 22.

For pressure compensation can be use a membrane vent witch is fixed in the ground of the sensor-boxes, see 6.3, page 8.

Image 1-4: Image 1+2: polyamide and aluminium sensor-boxes, 120x80x55 mm for rotary actuators, image 3+4: polyamideand aluminium senso-boxes for linear actuators, 120x80x55mm

2. Technical specifications

Table 1: Technical specifications as well as conditions of use fort the sensor-boxes equipment group II, category 2G, zones 1, 2 and 2D, zones 21, 22 and equipment group I, category M2

Term / Identifier:	**Technical specifications:**
Potential recyclables and measurements	- Polyamide, black, 120x80x55mm [1), 2)] - Aluminium, grey, 125x80x57mm [2)]
Interface: Box to bridge [1), 2)]	4xM6-winding at the bottom hole circle ∅ 50 mm, F05-slot
Interface: Box to bridge to drive [1), 2)]	Acc. to VDI/VDE 3845 for flange images 80x30 mm or 130x30 mm
Surrounding temperature array [1), 2)]	-25°C ≤ T_a ≤ +70°C (for all versions acc. To table 2) -40°C ≤ T_a ≤ +70°C (for version low temperature sensor-box, table 2 with SJ 3,5-SN and membrane vent) -45°C ≤ T_a ≤ +70°C (for version low temperature sensor-box, table 2 with SJ 3,5-SN)
Protection class of the housings [1), 2)]	IP 65
Ignition protection class [2)]	II 2G Ex ia/ib IIC/IIB T6 II 2D Ex ia/ib IIIC T 80° C
Ignition protection class [2)]	I M2 Ex ia/ib I
Temperature class [2)]	T6
• Nominal voltage [1), 2)] • Nominal current [1), 2)] • Power [1), 2)]	U_i = 16 V (for all versions acc. to table 2) I_i = 25 mA P_i = 34 mW
Bush and cable entry points [1), 2)]	M16x1,5mm/M20x1,5 mm/M25x1,5mm, clamping range for cables ∅ 7-9mm/∅ 7-13/∅ 11–17mm, specially for the low temperature sensor-box: ∅ 13–9mm
Joint clamp [1), 2)]	max. 2,5 mm²
Weight (without bridge)	0,3 kg PA-Box [1), 2)] / 0,5 kg AL-Box [1), 2)]
Display and switching range [1), 2)]	0 bis 180°

[1)] for sensor-boxes of equipment group I (mining industry)
[2)] for sensor-boxes of equipment group II

3. Possible versions

Table 2: Possible versions of the sensor-boxes, equipment group II and I with the special intrinsically safe, inductive sensors of Pepperl+Fuchs, see page 13, image 12-32

Sensor-Box-Version for PA-Box: [1), 2)]	**Sensor-Box-Version: for AL-Box: [2)]**	**Trench shaped sensors:**	**C_I (nF)/ L_i (µH)**
SB-PA-SC 3,5-G-N0	or SB-AL-SC 3,5-G-N0	2 or 1 x SC 3,5-G-N0	150/150
SB-PA-SC 3,5-N0	or SB-AL-SC 3,5-N0	2 or 1 x SC 3,5-N0	150/150
SB-PA-SJ 3,5-N	or SB-AL-SJ 3,5-N	2 or 1 x SJ 3,5-N	50/250
SB-PA-SJ 3,5-SN	or SB AL-SJ 3,5-SN	2 or 1 x SJ 3,5-SN	30/100
SB-PA-SJ 3,5-S1N	or SB-AL-SJ 3,5-S1N	2 or 1 x SJ 3,5-S1N	30/100
	SB-AL-SJ 3,5-SN-T [3)]	2 or 1 x SJ 3,5-SN	30/100
Sensor-Box-Version for PA-Box: [1), 2)]	**Sensor-Box-Version for AL-Box: [2)]**	**Cylinder shaped sensors:**	
SB-PA-NJ2-11-N-G	or SB-AL-NJ2-11-N-G	2 or 1 x NJ2-11-N-G	30/50
SB-PA-NJ2-12-GM-N	or SB-AL-NJ2-12GM-N	2 or 1 x NJ2-12GM-N	30/50
SB-PA-NJ2-12-GK-N	or SB-AL-NJ2-12GK-N	2 or 1 x NJ2-12GK-N [4)]	45/50
SB-PA-NJ4-12-GK-N	or SB-AL-NJ4-12GK-N	2 or 1 x NJ4-12GK-N [5)]	45/50
SB-PA-NJ2-12GK-SN	or SB-AL-NJ2-12GK-SN	2 or 1 x NJ2-12GK-SN	50/150
SB-PA-NJ2-11-SN-G	or SB-AL-NJ2-11-SN-G	2 or 1 x NJ2-11-SN-G	50/150
SB-PA-NCB2-12GM35-N0	or SB-AL-NCB2-12GM35-N0	2 or 1 x NCB2-12GM35-N0	90/100
SB-PA-NCN4-12GM35-N0	or SB-AL-NCN4-12GM35-N0	2 or 1 x NCN4-12GM35-N0	95/100
SB-PA-NJ3-18GK-S1N	or SB-AL-NJ3-18GK-S1N	2 or 1 x NJ3-18GK-S1N [6)]	70/200
SB-PA-NJ4-12-GM-N	or SB-AL-NJ4-12GM-N	2 or 1 x NJ4-12GM-N	45/50
SB-PA-NJ5-18GM-N SB-PA-NJ5-18GK-N	or SB-AL-NJ5-18GM-N or SB-AL-NJ5-18GK-N	1 x NJ5-18GM-N 1 x NJ5-18Gk-N	70/50 70/50
SB-PA-NJ5-11-N-G	oder SB-AL-NJ5-11-N-G	2 oder 1 x NJ5-11-N-G [7)]	45/50
SB-PA-NJ5-18GK-N	oder SB-AL-NJ5-18GK-N	2 oder 1 x NJ5-18GK-N [8)]	70/50
Sensor-Box-Version for PA-Box: [1), 2)]	**Sensor-Box-Version for AL-Box: [2)]**	**Cuboid shaped sensors:**	
SB-PA-NJ2-V3-N	or SB-AL-NJ2-V3-N	2 x NJ2-V3-N	40/50
SB-PA-NCB2-V3-N0	or SB-AL-NCB2-V3-N0	2 x NCB2-V3-N0	100/100
SB-PA-NCN4-V3-N0	or SB-AL-NCN4-V3-N0	2 x NCN4-V3-N0	100/100
Sensor-Box-Version:		**Pcb shaped sensors:**	
SB-PA-PL3-F25-N4-K + BT32 (bedämpft)		1 x PL3-F25-N4-K	≤100/≤100
SB-PA-PL3-F25-N4-K + BTS-DSU35-EU2 (unbedämpft)		1 x PL3-F25-N4-K	≤100/≤100

SB = Sensor-Box PA = Polyamide AL = Aluminium C_i= Capacity L_i = Inductivity

[1)] for sensor-boxes of equipment group I, but with - U (mining industry), for example: SB-PA-SJ 3,5-N-U
[2)] for sensor-boxes of equipment group II
[3)] sensor-boxes version Low Temperature sensor-boxes, but with - T, for example: SB-AL-SJ 3,5-SN-T
[4)] approve according by IBExU-declaration from 24.11.05 (He/Hüb 8491/05)
[5)] approve according by IBExU-declaration from 13.08.07 (He/Hüb 6095/07)
[6)] approve according by IBExU-declaration from 4.3.09 (He/Leh 1413/09)
[7)] approve according by IBExU-declaration from xx.xx.xx (He/Leh xxx)
[8)] approve according by IBExU-declaration from xx.xx.xx (He/Leh xxx)

4. Connection of the sensors

The trench, cylinder and cuboid shaped sensors are all mounted according to the circuit diagram which always can be found within the inside of the housing, attached to the left long surface or directly on the pcb. There is the following circuit diagram, image 5 for the above mentioned sensors**.**

In image 5a see the circuit diagram for the sensor SJ 3,5-S1N and 6 NJ3-18GK-S1N.

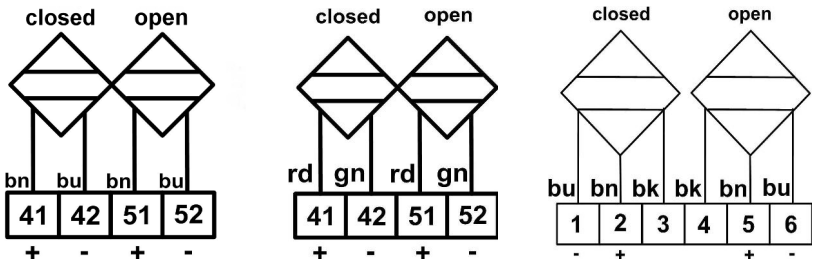


Image 5 and 5a, 6: bn=brown cable +, bu = blue cable -, rd=red cable +, gn=green cable -, (bk=black), 41 42 51 52 (1-6, only for sensor NJ3-18GK-S1N) = clamp allocation, closed = left sensor, open = right sensor

The left sensor usually is mounted at the clamp 41 42 and labelled with a small sticker “closed”. The right sensor is being connected analogically.

5. Cam switches / Cams

Table 3: Overview over the standard cam switches and special cam switches

Term/Identifier:	Technical specification:
Standard cam switch for trench shaped sensors	Image 7: 2 pieces separately adjustable cam switches made from AL, 0 - 180° possible
Standard cam switch for cylinder shaped sensors	Image 8: one-piece cam switch of 1.4301, 0 - 90°
Standard cam switch for cuboid shaped sensors	Image 9: POM-cam with 2 pieces of brass switching points, 0 - 90°
Special cam switch for cylinder shaped sensors	Image 10: 2 pieces cam switch of 1.4301, 0 - 180° possible
Special cam switch for trench shaped sensors	Image 11: one-pieces cam switch of 1.4301, 0 - 90° or 0 - 180° (de-energized)

Image 7

Image 8

Image 9

Image 10

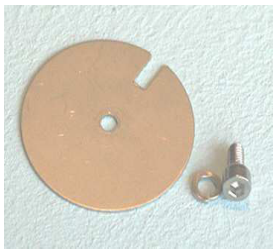


Image 11

6. Mounting on the actuator / technical indication of membrane vent

6.1 Mechanical mounting: The sensor-box with the mounted bridge or the mounted aluminium plate (via F05-slot) and the mounting set is placed on the actuator and screwed together.

6.2 Electrical mounting: The sensor box is electrically mounted to the 4-pole connection clamp within the housing through the bush and cable entry points tightening torque, see operating instructions 1-3 in the appendix. Data like cable thickness and cable cross section are shown in table 1, page 4. You also have to take the attached circuit diagrams into consideration which can always be found on the left long surface within the housing or directly on the pcb-see image 5 and 6.

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

6.3 technical indication of membrane vent: The safety or rather the protection class of the housing is only when the membrane vent resident sealed fixed in the housing ground (between actuator and housing with mounted kid).

At use in the group II outside of the normal temperature range at a minimal ambient temperature up to - 40°C the membrane vent must be installed and operated mechanically protected accordind to the low risk of mechanical danger according to EN 60079-0: 2004, paragraph 26.4.2.

At the use of the membrane vent in group I the mounting location must be selected in such a way, that it is protected against the risk of mechanical danger during the normal operation based on the requirements of EN 60079-0: 2004, paragraph 9.2.

Damaged membrane vents have to be replaced immediately.

7. Components and parts lists

7.1 Trench shaped sensors

Table 4: Components and parts list of sensor-boxes for trench shaped P+F sensors

Term/Identifier	Article-No.	Material	Comments
Polyamide empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, cover with flag window as well as 4 pieces of cover screws	SB-PA-L	PA 12	120x80x55mm, black
Aluminium empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, closed cover as well as 4 pieces of cover screws	SB-AL-L	AL-Si 12	125x80x57mm, grey
Cable entry points and bush, blue	SB-KL	PA	M16x1,5mm/M20x1,5 mm/M25x1,5mm
Cable entry points and bush, blue-black	SB-KL-25	PA	M20x1,5mm,∅13-5,5mm
Connection clamp, 2 pieces, with clamp allocation,	SB-V	Polyester or PA	max. 2,5 mm², blue
Pcb for trench shaped sensors	SB-PL	1.4301	93x70x1 mm, Z.-No. 001
Attechment screws for pcb, 4 pieces	SB-B	V2A	M3x4 mm
Shaft for trench shaped sensors	SB-W-schl	1.4305	∅12x64 mm, Z.-No. 002
O-ring for shaft	SB-O	NBR 70	9x1,5 mm
Washer for shaft, 2 pieces	SB-U	POM	∅18/∅12x1,2 mm
Lock washer for shaft, 2 pieces	SB-S	V2A	DIN 6799-9
Cam switches for shaft, 2 pieces	SB-S-s	AL	Z.-No. 003
Fasteners for cam switches	SB-B-S	V2A	M8/M4-socked screw, M8-nut, washer for M8
Cable binder, 2 pieces	SB-K	Neylon	99x2,5 mm
Circuit diagram and sensor label	SB-Sch-S	PVC	30x32 mm and 2 pieces 8x4 mm
Membrane vent with sealing (option)	SB-D	Basic Material: Zinc, Coating: Ni, Cu	M12x1,5mmx 21,5mm
Harting connection			
housing bulkhead mounting	SB-HA-AL-A	aluminium, grey	09 20 003 0301
housing screw mounting	SB-HA-AL-E	aluminium, grey	19 20 003 1150
hood top-entry	SB-HA-AL-T	aluminium, grey	19 20 003 1440
housing bulkhead mounting	SB-HA-PC-A	polycarbonate, black	19 20 003 0327
hood top-entry	SB-HA-PC-T	polycarbonate, black	19 20 003 0427
crimp terminal	SB-HA-2611	plastic, 4+ground	09 20 004 2611
crimp terminal	SB-HA-2633	plastic, 4+ground	09 20 004 2633
crimp terminal	SB-HA-2711	plastic, 4+ground	09 20 004 2711
crimp terminal	SB-HA-2733	plastic, 4+ground	09 20 004 2733
crimp terminal	SB-HA-3031	plastic, 7+ground	09 21 007 3031
crimp terminal	SB-HA-3131	plastic, 7+ground	09 21 007 3131
different crimp contact		nickel or gold plated	
aluminium plate grey or black for mounting set acc. to Namur IEC 534	SB-AB	Al	135x80x10mm,Z.-Nr.: 061
sensor possible versions		Housing PBT	see page 5, table 2

7.2 Cylindrical shaped sensors

Table 5: Components and parts list of sensor-boxes for cylinder shaped P+F sensors

Term/Identifier	Article-No.	Material	Comments
Polyamide empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, cover with flag window as well as 4 pieces of cover screws	SB-PA-L	PA 12	120x80x55mm, black
Aluminium empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, closed cover as well as 4 pieces of cover screws	SB-AL-L	AL-Si 12	125x80x57mm, grey
Cable entry points and bush, blue	SB-KL	PA	M16x1,5mm/M20x1,5 mm/M25x1,5mm
Cable entry points and bush, blue-black	SB-KL-25	PA	M20x1,5mm,∅13-5,5mm
Connection clamp, 2 pieces, with clamp allocation	SB-V	Polyester or PA	max. 2,5 mm², blue
Pcb for cylinder shaped sensors	SB-zy	1.4301	93x70x1 mm, Z.-No.: 004
Attechment screws for pcb, 4 pieces	SB-B	V2A	M3x4 mm
Shaft for cylinder shaped sensors	SB-W-zy	1.4305	∅12x64 mm, Z.-No.: 005
O-Ring for shaft	SB-O	NBR 70	9x1,5 mm
Washer for shaft, 2 pieces	SB-U	POM	∅18/∅12x1,2 mm
Lock washer for shaft, 2 pieces	SB-S	V2A	DIN 6799-9
Switching cam for shaft	SB-S-S	1.4301	Z.-No.: 006
Fasteners for cam switches	SB-B-z	V2A	M4x6-socket screw and spring ring for M4
Cable binder, 2 pieces	SB-K	Neylon	99x2,5 mm
Circuit diagram and sensor label	SB-Sch-S	PVC	30x32 mm u. 2 pieces 8x4 mm
Membrane vent with sealing (option)	SB-D	Basic Material: Zinc, Coating: Ni, Cu	M12x1,5mmx 21,5mm
Harting connection			
housing bulkhead mounting	SB-HA-AL-A	aluminium, grey	09 20 003 0301
housing screw mounting	SB-HA-AL-E	aluminium, grey	19 20 003 1150
hood top-entry	SB-HA-AL-T	aluminium, grey	19 20 003 1440
housing bulkhead mounting	SB-HA-PC-A	polycarbonate, black	19 20 003 0327
hood top-entry	SB-HA-PC-T	polycarbonate, black	19 20 003 0427
crimp terminal	SB-HA-2611	plastic, 4+ground	09 20 004 2611
crimp terminal	SB-HA-2633	plastic, 4+ground	09 20 004 2633
crimp terminal	SB-HA-2711	plastic, 4+ground	09 20 004 2711
crimp terminal	SB-HA-2733	plastic, 4+ground	09 20 004 2733
crimp terminal	SB-HA-3031	plastic, 7+ground	09 21 007 3031
crimp terminal	SB-HA-3131	plastic, 7+ground	09 21 007 3131
different crimp contact		nickel or gold plated	
aluminium plate grey or black for mounting set acc. to Namur IEC 534	SB-AB	Al	135x80x10mm,Z.-Nr.: 061
sensor possible versions		Housing PBT	see page 5, table 2

7.3 Cuboid shaped sensors

Table 6: Components and parts list of sensor-boxes for cuboid shaped P+F sensors

Term/Identifier	Article-No.	Material	Comments
Polyamide empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, cover with flag window as well as 4 pieces of cover screws	SB-PA-L	PA 12	120x80x55mm, black
Aluminium empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, closed cover as well as 4 pieces of cover screws	SB-AL-L	AL-Si 12	125x80x57mm, grey
Cable entry points and bush, blue	SB-KL	PA	M16x1,5mm/M20x1,5 mm/M25x1,5mm
Cable entry points and bush, blue-black	SB-KL-25	PA	M20x1,5mm,∅13-5,5mm
Connection clamp, 2 pieces, with clamp allocation	SB-V	Polyester or PA	2,5 mm², blue
Pcb for cylinder shaped sensors	SB-q	1.4301	93x70x1 mm, Z.-No.: 007
Attechment screws for pcb, 4 pieces	SB-B	V2A	M3x4 mm
Shaft for cuboid sensors	SB-W-q	1.4305	∅12x77 mm, Z.-No.: 008
O-Ring for shaft	SB-O	NBR 70	9x1,5 mm
Lock washer for shaft, 2 pieces	SB-U	POM	∅18/∅12x1,2 mm
Lock washer for shaft, 2 pieces	SB-S	V2A	DIN 6799-9
Cam for shaft attachment screw M4	SB-S-q	POM/MS	Z.-No.: 009
Attachment bent/attachment screws (2 pieces) for sensor	SB-B-S-q	PA/V2A	17x29x9,5 mm, 2 pieces M3x32 mm
Cablr binder	SB-K	Neylon	99x2,5 mm
Circuit diagram and sensor label	SB-Sch-S	PVC	30x32 mm u. 2 pieces 8x4 mm
Membrane vent with sealing (option)	SB-D	Basic Material: Zinc, Coating: Ni, Cu	M12x1,5mmx 21,5mm
Harting connection			
housing bulkhead mounting	SB-HA-AL-A	aluminium, grey	09 20 003 0301
housing screw mounting	SB-HA-AL-E	aluminium, grey	19 20 003 1150
hood top-entry	SB-HA-AL-T	aluminium, grey	19 20 003 1440
housing bulkhead mounting	SB-HA-PC-A	polycarbonate, black	19 20 003 0327
hood top-entry	SB-HA-PC-T	polycarbonate, black	19 20 003 0427
crimp terminal	SB-HA-2611	plastic, 4+ground	09 20 004 2611
crimp terminal	SB-HA-2633	plastic, 4+ground	09 20 004 2633
crimp terminal	SB-HA-2711	plastic, 4+ground	09 20 004 2711
crimp terminal	SB-HA-2733	plastic, 4+ground	09 20 004 2733
crimp terminal	SB-HA-3031	plastic, 7+ground	09 21 007 3031
crimp terminal	SB-HA-3131	plastic, 7+ground	09 21 007 3131
different crimp contact		nickel or gold plated	
aluminium plate grey or black for mounting set acc. to Namur IEC 534	SB-AB	Al	135x80x10mm,Z.-Nr.: 061
sensor possible versions		Housing PBT	see page 5, table 2

7.4 Low temperature sensor-box

Table 7: Components and parts list of low temperature sensor-box with Pepperl+Fuchs sensor SJ 3,5-SN, **surrounding temperature array: -45°C ≤ T_a ≤ +70°C**

Term/Identifier	Article-No.	Material	Comments
Aluminium empty housing: Consisting of a lower part with F05-slot, shaft bushing ∅ 12mm, tap hole M20x1,5 mm, closed cover as well as 4 pieces of cover screws	SB-AL-L-T	AL-Si 12	125x80x55 mm, grey
Cable entry points and bush, silver Sealing insert	SB-KL-T	MS LSR	M20x1,5mm, clamping range for cables ∅ 13-9mm Pflitsch-type: U28.UNI Ex e -60°C-+180°C
Cable entry points and bush, silver Sealing insert	SB-KL-VA-T	1.4301 LSR	M20x1,5mm, clamping range for cables ∅ 13-9mm Pflitsch-type: U28.UNI Ex e -60°C-+180°C
Shaft for trench shaped sensors	SB-W-schl	1.4305	∅12x64 mm, Z.-No. 002
O-Ring for shaft	SB-O-T	Silikon	9x1,5 mm
Washer for shaft, 2 pieces	SB-U	POM	∅18/∅12x1,2 mm
Lock washer for shaft, 2 pieces	SB-S	V2A	DIN 6799-9
Cam switches for shaft, 2 pieces	SB-S-s	AL	Z.-No. 003
Cable binder, 2 pieces	SB-K	Neylon	99x2,5 mm
Circuit diagram and sensor label	SB-Sch-S	PVC	30x32 mm and 2 pieces 8x4 mm
Membrane vent with sealing (option)	SB-D	Basic Material: Zinc, Coating: Ni, Cu	M12x1,5mmx 21,5mm, **Surrounding temperature array: -40°C ≤ T_a ≤ +70°C**
aluminium plate grey or black for mounting set acc. to Namur IEC 534	SB-AB	Al	135x80x10mm,Z.-Nr.: 061
Sensors with attachment screws and nut:	SJ 3,5-SN	Housing PBT	10x15x19mm, -50°C ≤ T_a ≤ +70°C

8. Appendix

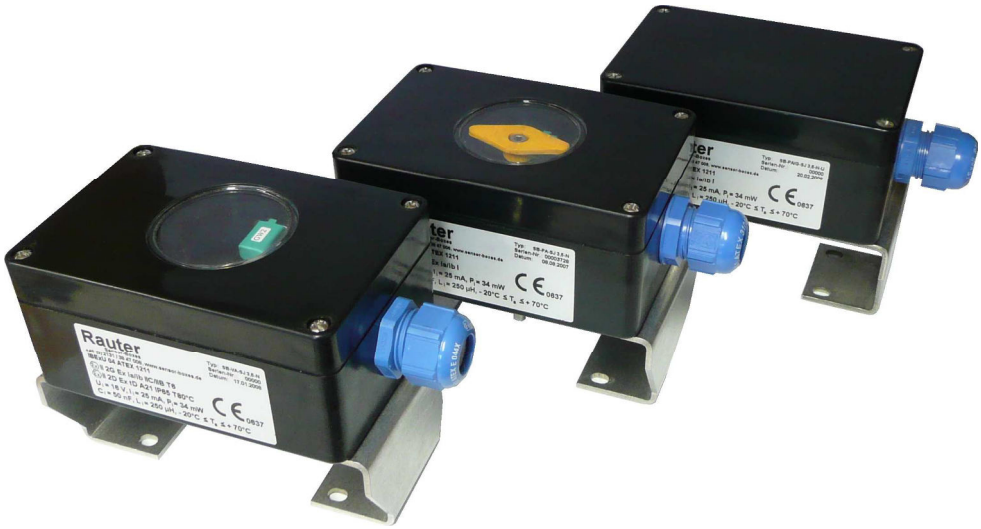


Image 12-15: polyamide sensor-boxes, 120x80x55mm and different inner views with Pepperl+Fuchs SJ 3,5-N (Image 13), NJ2-12GK-N (Image 14), NJ2-V3-N (Image 15)

Image 23: Polyamide and Aluminium sensor-box for linear actuators, 120x80x55mm and 125x80x57mm

Image 24-26: inner views with P+F sensors SJ 3,5-N (Image 24), NJ2-12GK-N (Image25), NJ2-V3 (Image 26)

Image 26a: mounting set acc. to Namur IEC 534 for linear actuators

Image 27: polyamide sensor-box with mounted membrane vent

Image 28: rapid changing polyamide sensor-box with Harting connector

Image 29: interlock

Image 30: unlock

Image 31: pull out / push in

Image 32: connector protection cover

Operating instructions 1: impact resistant (=torque) for M16x1,5mm = 4 Nm, M20x1,5mm = 5 Nm, M25x1,5mm = 6 Nm

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

Fig. 1

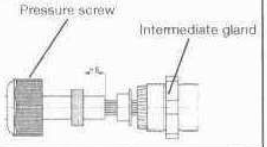


Fig. 2

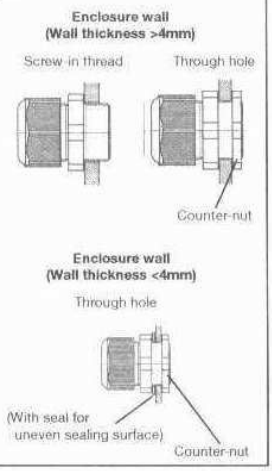


Fig. 3

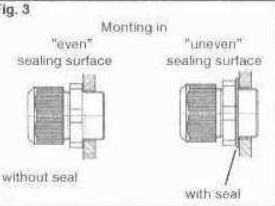
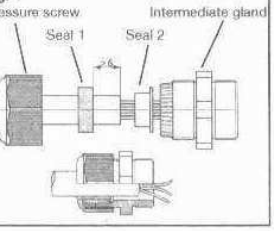


Fig. 4



4 Field of application

The entries and components covered by these instructions (see Technical Data) are suited for mounting in potentially explosive atmospheres in Zone 1, Zone 2 and Zone 21, Zone 22 accordance with IEC 60079-10!
The materials used, including the exterior metal parts, are high quality materials that ensure a corrosion resistance and resistance to chemical substances according to the requirements for use in a "normal industrial atmosphere":

- impact resistant polyamide
- stainless steel AISI 316 L

In case of use in an extremely aggresive atmosphere, please refer to manufacturer

5. Application / Properties

All the cable entries and components covered by these operating and mounting instructions are suited for use in enclosures and apparatus in the type of protection "Increased Safety".

Consider table "Temperature table" on page 18 with installation.

Cable entries and enlargement glands are used for feeding fixed cables into enclosures and apparatus.

Warning: Cables shall be secured in such a way (e.g. with a cable clamp) that they cannot be pulled out of the entry.

Trumpet-shaped cable glands are used for feeding flexible cables into enclosures and apparatus.

Warning: The fitting of seal inserts one inside the other or the interchanging of seal inserts of different entries to reduce the cable opening is not permitted.

Reducing glands can be used to reduce the size of threaded or through holes in enclosures to a smaller thread size.

Warning: The screwing of several reducing glands one inside the other to reduce the threaded or through holes is not permitted.

Blanking plugs are used to seal metric COOPER CROUSE-HINDS cable entries and COOPER CROUSE-HINDS multiple entries.

Screw glands are used to seal unused through and threaded holes.

Any condensation in the apparatus can escape via drain plugs (see 6.1, Mounting).

Applications other than those described are not permissible without a written declaration of consent from Messrs. COOPER CROUSE-HINDS.

The instructions according to section 7 of the operating instructions shall be observed during operation.
The sole responsibility with respect to the suitability and proper use of these entry components with regard to the basic conditions of these instructions (see Technical Data) lies with the operator.

6. Installation

The relevant national regulations(e.g. Elex V, the equipment safety law for Germany) and the generally recognized rules of engineering apply for the installation and operation.

The improper installation and operation of enclosures can result in the invalidation of the guarantee.

6.1 Mounting

Warning: Prior to mounting, ensure that the threads of the entry components match the threads of the apparatus or enclosure.

The mounting of entry components with damaged or dirty threads can impair the IP degree of protection.

6.1.1 Cable entries (KLE)

The intermediate gland (see Fig. 1) of the cable entries shall be fitted with a suitable tool, e.g. fork, ring or box spanner.
It is mounted directly in the threaded hole or via the through hole of the enclosure (see Fig. 2).

If the sealing surfaces are uneven, seals shall be used between the enclosure wall and the intermediate gland (see Fig. 3). Counter-nuts shall be used for walls with a thickness of less than 4mm (see Fig. 2).

Cables are fed in as shown in Fig. 4.
The seal inserts shall be chosen to suit the respective cable diameter (Figs. A,B,C and D).

The intermediate gland and the pressure screw shall be tightened down to ensure the specified minimum degree of protection.

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Owner Engineer Peter Rauter D-41460 Neuss (Germany) Fax +49 (0) 2131 / 38 47 009 www.sensor-boxes.de

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

Fig. 5

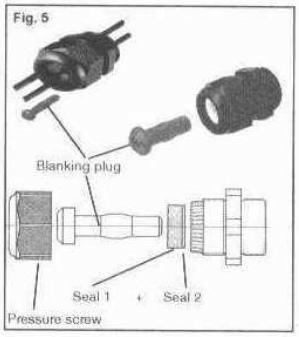


Fig. 6

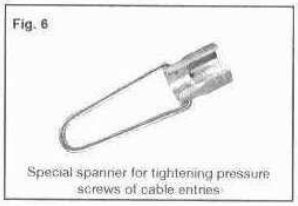


Fig. 7

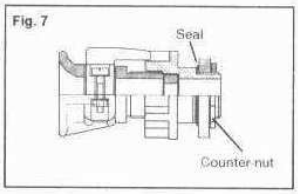


Fig. 8

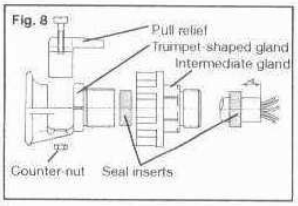
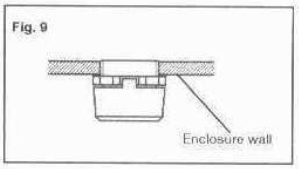


Fig. 9



Overtightening can impair the degree of protection.

Use COOPER CROUSE-HINDS spanners with a side opening can be used to facilitate the tightening of the pressure screw when the cable entry has been mounted (see Fig. 6).

Order No. GHG 960 1951 R0001 for Set 1 (M12, 16, 20, 25, 32 and 40)

Order No. GHG 960 1951 R0002 for Set 2 (M50 and M63)

Optionally, cable entries with colour-coded (light blue) pressure screws can be used for intrinsically safe circuits (see main COOPER CROUSE-HINDS catalogue for order numbers).

6.1.2 Blanking plugs

The following shall be observed when mounting blanking plugs for COOPER CROUSE-HINDS metric cable entries (see Fig. 5):

1. Only the blanking plug associated to the KLE shall be used.
2. The KLE shall be provided with seal inserts (Seals 1 and 2).
3. The head of the blanking plug shall, as shown in Fig. 5, be on the outside.
4. The blanking plug shall be pushed into the KLE until it reaches the stop.
5. The pressure screw of the KLE shall be tightened down as described in 6.1.1.

6.1.3 Screw plug

The screw plug shall be screwed tightly into the threaded hole in the enclosure using a suitable tool, e.g. 8 mm socket head spanner or a suitable screw driver.

A counter-nut shall be used for through holes or enclosures that are less than 4 mm thick. An additional seal shall be used for uneven sealing surfaces.

Warning: In general, the M50 screw plug shall be mounted together with the seal supplied.

6.1.4 Trumpet-shaped gland

A suitable tool, e.g. a fork spanner, shall be used for mounting the intermediate gland in the trumpet-shaped gland in such a way that it cannot twist.
It is necessary to ensure that the gland cannot twist once the cable has been fed in and the trumpet-shaped gland mounted (e.g. by using a counter-nut, see Figs. 7 + 8). A counter-nut shall be used for through holes or enclosures that are less than 4 mm thick. When mounting, a seal shall always be used between the enclosure wall and intermediate gland (see Fig. 7).

The following describes the mounting of the cable in the trumpet-shaped gland, as shown in Fig. 8:

1. Cut out the individual rings of the "onion ring" seal insert to match the respective cable diameter.
2. After feeding in the cable, that has been cut to length and has the seal mounted, into the intermediate gland, screw the trumpet-shaped gland tightly into the intermediate gland to seal off the cable.
3. Then mount the pull relief on the trumpet-shaped gland.

It is necessary to ensure that there is sufficient pull relief, that damage to the cable is not possible and that the trumpet-shaped gland cannot twist.

6.1.5 Reducing gland

A suitable tool, e.g. a fork, ring or box spanner, shall be used for screwing the reducing gland tightly into the threaded hole in the enclosure.
A counter-nut shall be used for through holes or enclosures that are less than 4 mm thick. An additional seal shall be used for uneven sealing surfaces.

Warning: Screwing several reducing glands one inside the other to reduce the size of the entry thread is not permitted.

6.1.6 Drain plug

A suitable tool, e.g. a fork, ring or box spanner, shall be used for screwing the drain plug tightly into the threaded hole in the enclosure.
An additional seal shall be used for uneven sealing surfaces.
The drain plug shall be mounted at the lowest point of the apparatus or enclosure (see Fig. 9).

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Operating instructions 2 (only for low temperature sensor-box, see image 20+21 page 16)

CE 0102

PFLITSCH
Kompetenz im Kabelmanagement
Stand: 22.06.2006

Operating and assembly instructions for cable glands (KV/CG)
of the ignition protective class Ex "e"
Type: U 2. UNI Ex e, brass nickel-plated

Application
The cables glands (KVs/CGs) U 2. UNI 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 60079-0:2004, EN 60079-7:2003 and EN 50281-1-1:1999.
The KLE is suitable for operating material with the degree of mechanical risk "high" as per EN 60079.
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 68 according to IEC 529 or EN 60529 can be attained.

Designation
The KLE U 2. UNI Ex e conforms with the standards EN 60079-0:2004, EN 60079-7:2003 and EN 50281-1-1:1999. 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:

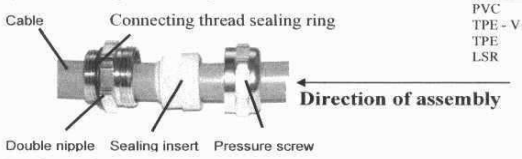
II 2 G/D Ex e II PTB 98 ATEX 3109 IP 68 XX CE0102

and with the connecting thread type and size, e.g. M 16 or Pg 21.

Application temperature range:

Material	Temperature range
PVC	- 20° C - + 85° C
TPE - V	- 40° C - + 135° C
TPE	- 40° C - + 115° C
LSR	- 60° C - + 180° C

Assembly



The Pflitsch socket spanner M28 can be used as a tool.

Minimum wall thicknesses for installation in appliances with threaded holes: 5.0 mm (plastic); 3.0 mm (metal)
Minimum wall thicknesses for installation in appliances with throughholes: 2.0 mm (plastic); 1.0 mm (metal)

Pointer for strain relief of the cable gland:
The KLE with the standard pressure screw is only suitable for permanently laid lines and cables. In this case, the operator must adopt appropriate measures to ensure strain relief.

Sealing rings must not be cut out with a knife
Housing holes that are not used must be sealed with an Ex closure plug. KLEs with corresponding thread sizes are to be sealed with a closed sealing insert or with a UNI Ex e blind sealing insert. Non-used holes of multi-sealing inserts are to be sealed with a bolt.

Disassembly:
Disassembly is carried out in the reverse order.
Maintenance:
The KLEs are to be included in the inspection and maintenance of the electrical operating material.

Connection dimensions for throughholes

metr.	M 10	M 12	M 16	M 20	M 25	M 32	M 40	M 50	M 63	M 72
d [mm] 0/+ 0,3	10,0	12,0	16,0	20,0	25,0	32,0	40,0	50,0	63,0	72,0
Pg	7	9	11	13,5	16	21	29	36	42	48
d [mm] 0/+0,3	12,5	15,5	19	20,5	22,5	28,5	37	47	54	59,5
NPT	3/8"	½"	¾"	1"	1 ¼"	1 ½"	2"			
d [mm] 0/+0,3	17,1	21,3	26,6	33,3	42,0	48,1	60,1			

Tightening torque

thread	M10	M12	M16	M20	M25	M32	M40	M50	M63	
Nm	6	6	8	10	10	15	20	20	20	
thread	Pg 7	Pg 9	Pg 11	Pg 13,5	Pg 16	Pg 21	Pg 29	Pg 36	Pg 42	Pg 48
Nm	6,25	6,25	6,25	6,25	7,5	10	10	10	10	10

Seite 3 von 4

Operating instructions 3 (only for low temperature sensor-box, see image 20+21 page 16)

CE 0102

PFLITSCH
Kompetenz im Kabelmanagement
Stand: 22.06.2006

Operating and assembly instructions for cable glands (KV/CG)
of the ignition protective class Ex "e"
Type: U 28. UNI Ex e, stainless steel:

Application
The cables glands (KVs/CGs) U 28. UNI 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 60079-0:2004, EN 60079-7:2003 and EN 50281-1-1:1999.
The KLE is suitable for operating material with the degree of mechanical risk "high" as per EN 60079.
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 68 according to IEC 529 or EN 60529 can be attained.

Designation
The KLE U 28. UNI Ex e conforms with the standards EN 60079-0:2004, EN 60079-7:2003 and EN 50281-1-1:1999. 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:

II 2 G/D Ex e II PTB 01 ATEX 3104X IP 68 XX CE 0102

and with the connecting thread type and size, e.g. M 16.

Assembly

Direction of assembly

Application temperature range:

Material	Temperature range
PVC	- 20° C - + 85° C
TPE - V	- 40° C - + 135° C
TPE	- 40° C - + 115° C
LSR	- 60° C - + 180° C

The Pflitsch socket spanner M28 can be used as a tool.

Minimum wall thicknesses for installation in appliances with threaded holes: 5.0 mm (plastic); 3.0 mm (metal)
Minimum wall thicknesses for installation in appliances with throughholes: 2.0 mm (plastic); 1.0 mm (metal)

Pointer for strain relief of the cable gland:
The KLE with the standard pressure screw is only suitable for permanently laid lines and cables. In this case, the operator must adopt appropriate measures to ensure strain relief.

Sealing rings must not be cut out with a knife
Housing holes that are not used must be sealed with an Ex closure plug. KLEs with corresponding thread sizes are to be sealed with a closed sealing insert or with a UNI Ex e blind sealing insert. Non-used holes of multi-sealing inserts are to be sealed with a bolt.

Disassembly:
Disassembly is carried out in the reverse order.

Maintenance:
The KLEs are to be included in the inspection and maintenance of the electrical operating material.

Connection dimensions for throughholes

metr.	M 10	M 12	M 16	M 20	M 25	M 32	M 40	M 50	M 63	M 72
d [mm] 0/+ 0,3	10,0	12,0	16,0	20,0	25,0	32,0	40,0	50,0	63,0	72,0
Pg	7	9	11	13,5	16	21	29	36	42	48
d [mm] 0/+0,3	12,5	15,5	19	20,5	22,5	28,5	37	47	54	59,5
NPT	3/8"	½"	¾"	1"	1 ¼"	1 ½"	2"			
d [mm] 0/+0,3	17,1	21,3	26,6	33,3	42,0	48,1	60,1			

Tightening torque

thread	M10	M12	M16	M20	M25	M32	M40	M50	M63	
Nm	6	6	8	10	10	15	20	20	20	
thread	Pg 7	Pg 9	Pg 11	Pg 13,5	Pg 16	Pg 21	Pg 29	Pg 36	Pg 42	Pg 48
Nm	6,25	6,25	6,25	6,25	7,5	10	10	10	10	10

9. applicable standards

- EN 60079-0: 2012	Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-11: 2012	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety „i“