

Documentation

about
limit switch boxes
for
mounting positioners
for
pneumatic rotary actuators



Topic:	Page:
1. Objectives and practical use	2
2. Technical specification	7
3. Setting switching cams/switching contacts	8
4. Connecting sensors/switches	10
5. Mounting	10
6. Data sheets P+F sensors	11
7. Data sheets Bartec switches	14
8. Stainless steel brackets	17

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 actuated with rotary actuators which the end position of the valve like “open” or “closed” is reported back to a control system. This is done via a mounted a limit switch box which is placed at the actuator. Furthermore can be mounted positioners in the top of the limit switch box for reported back by any positions, see images 1-6



Image 1: Norbro actuator with aluminium limit switch box, size: 125x80x57mm, stainless steel bracket for actuators acc. to VDI/VDE 3845 and mounted Samson positioner.



Image 2: Bar actuator with aluminium limit switch box, size: 125x80x57mm, stainless steel bracket for actuators acc. to VDI/VE 3845 and mounted Bar positioner



Image 3: Richter actuator with aluminium limit switch box, size: 220x120x90mm, stainless steel bracket for actuators acc. to VDI/VDE 3845 and mounted Samson positioner



Image 4: Aluminium limit switch box, size: 125x80x57, F05/F05 stainless steel bracket with Eckardt-Foxboro positioner and stainless steel bracket for actuators with slot acc. to VDI/VDE 3845, temperature range limit switch box: - 40°C up to + 70°C

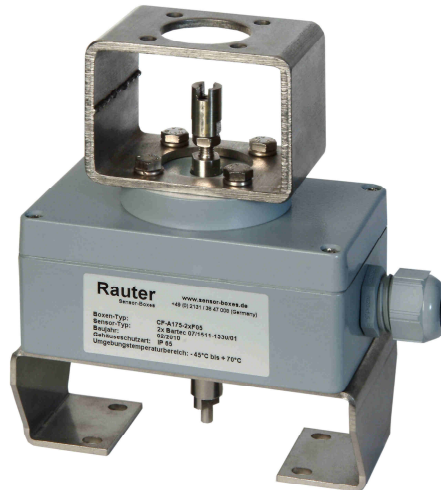


Image 5: Aluminium limit switch box, size: 125x80x57mm, stainless steel bracket for actuators acc. to VDI/VDE 3845 and mounted stainless steel bracket F05/F05.



Image 6: Aluminium limit switch box, size: 175x80x57mm, Stainless steel bracket for actuators acc. to VDI/VDE 3845 and mounted stainless steel brackets F05/F05.

2. Technical specification

- aluminium housings grey, size: 125x80x57mm, 175x80x57mm and 220x120x90mm with F05-slot in the cover and in the top
- 2x Ex i ... 8 V DC Pepperl+Fuchs sensors SJ 3,5-N, SJ 3,5-SN and SJ 3,5-S1N and 2x Ex d ... Bartec switches, data sheets P+F sensors see 6., page 11 and 7., page 14
- 4-6 pole clamp blue or grey, wiring diagram with position OPEN/CLOSED
- 1x plastic cable gland blue/black, M20x1,5mm, clamp range \varnothing 13,0 - 5,5 mm, torque = 5 Nm
- 1x Metal cable gland Ms-nickel coated, M20x1,5mm, clamp range \varnothing 13,0 - 9,0 mm, torque = 10 Nm
- 2-3x adjustable aluminium switching cams 0° and 90° and variable
- 2x adjustable aluminium switching contacts for variable positions
- stainless steel shaft with 2x sealings, stainless steel ground plate
- protection class: IP 65
- stainless steel brackets for actuators acc. to VDI/VDE 3845
- temperature range limit switch box:
- 25°C up to + 70°C and - 40°C up to + 70°C

3. Setting switching cams/switching contacts

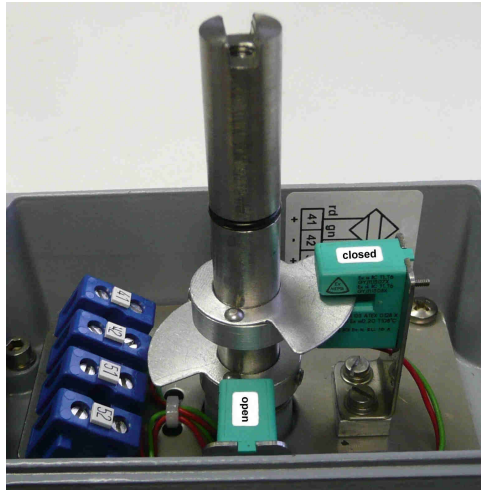


Image 7: 2x Pepperl+Fuchs sensors SJ 3,5-S1N for position open and closed with adjustable aluminium switching cams (with hexagon socket screw M4 SW 2mm) further more 4-pole clamp and going through stainless steel shaft with 2 O-rings



Image 8: 3x Pepperl+Fuchs sensors SJ 3,5-SN for position closed with adjustable aluminium switching cams (with hexagon socket screw M4 SW 2mm) further more 6-pole clamp and going through stainless steel shaft with 2 O-rings

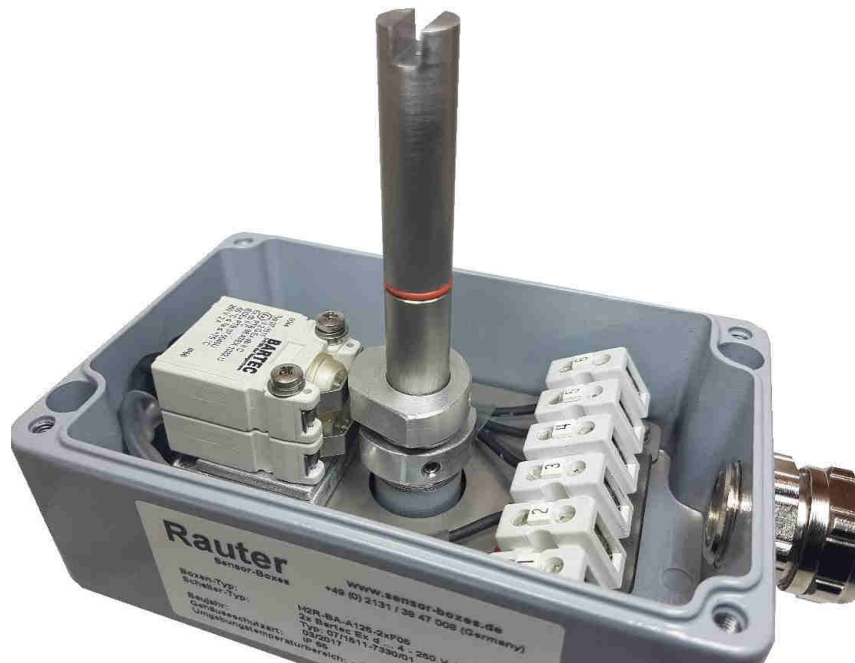


Image 9: 2x Ex d ... 4 - 250 V AC/DC Bartec switch with 2x aluminium switching contacts for variable switching positions (with hexagon socket screw, M4 SW 2mm) and continuous stainless steel shaft to the direct adaptation of the positioner.

4. Connecting sensors/switches

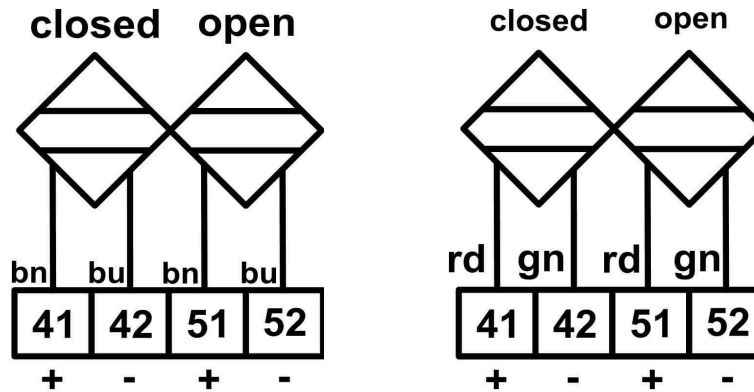


Image 10+11: left: Wiring diagramm for P+F sensors SJ 3,5-N and SJ 3,5-SN, right: Wiring diagram for SJ 3,5-S1N acc. to image 7 on 4-pole clamp

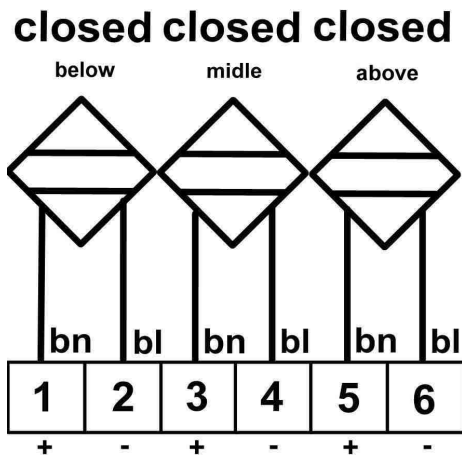


Image 12: Wiring diagramm for P+F sensors SJ 3,5-SN acc. to image 8 on 6-pole clamp

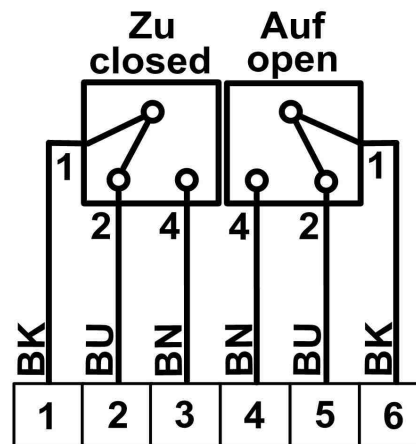


Image 13: Wiring diagram for Bartec switches acc. to image 9 on 6-pole clamp

5. Mounting

During the top mounting of the limit switch box to be respect unconditional, that the top exactly mounted as delivered by.

During the mounting for the Samson positioner and limit switch box on the pneumatic actuator (use only actuators with position 0° and 90°), to be respect unconditional the shaft rotation of the limit switch box.

6. Data sheets P+F sensors (only the first page)

 Inductive slot sensor

SJ3,5-N



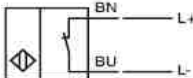
Model Number

SJ3,5-N

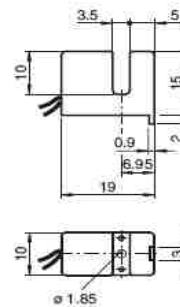
Features

- 3.5 mm slot width
- Usable up to SIL2 acc. to IEC 61508

Connection



Dimensions



Technical Data

General specifications

Switching element function	NAMUR, NC
Slot width	3.5 mm
Depth of immersion (lateral)	5 ... 7 mm, typ. 6 mm
Installation	
Output polarity	NAMUR

Nominal ratings

Nominal voltage	U_o	8.2 V (R_f approx. 1 k Ω)
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
Measuring plate detected		≤ 1 mA

Functional safety related parameters

MTTF _d	8415 a
Mission Time (T_M)	20 a
Diagnostic Coverage (DC)	0 %

Ambient conditions

Ambient temperature	-25 ... 100 °C (-13 ... 212 °F)
---------------------	---------------------------------

Mechanical specifications

Connection type	flexible leads LIY, 500 mm
Core cross-section	0.14 mm ²
Housing material	PBT/PPS
Protection degree	IP67

General information

Use in the hazardous area	see instruction manuals
Category	1G, 2G, 1D

Compliance with standards and directives

Standard conformity	
NAMUR	EN 60947-5-6:2000 IEC 60947-5-6:1999
Standards	EN 60947-5-2:2007 IEC 60947-5-2:2007

Approvals and certificates

FM approval	
Control drawing	116-0165F
UL approval	
cULus Listed, General Purpose	
CSA approval	
cCSAus Listed, General Purpose	
CCC approval	
Products with a maximum operating voltage of ≤ 36 V do not bear a CCC marking because they do not require approval.	

Release date: 2013-02-07 16:24 Date of issue: 2013-02-07 10:59:10_erng.xml

Subject to modifications without notice

Pepperl+Fuchs Group
www.pepperl-fuchs.com

USA: +1 330 486 0001
fa-info@us.pepperl-fuchs.com

Germany: +49 621 776-4411
fa-info@pepperl-fuchs.com

Copyright Pepperl+Fuchs
Singapore: +65 6779 9091
fa-info@sg.pepperl-fuchs.com

 **PEPPERL+FUCHS**
SENSING YOUR NEEDS

1

Inductive slot sensor

SJ3,5-SN



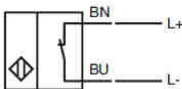
Model Number

SJ3,5-SN


Features

- 3.5 mm slot width
- Usable up to SIL 3 acc. to IEC 61508
- Extended temperature range

Connection

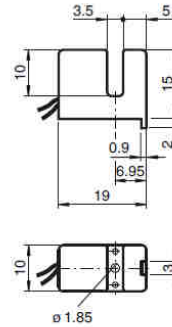


Application

Danger!
 In safety-related applications the sensor must be operated with a qualified fail safe interface from Pepperl+Fuchs, such as KFD2-SH-EX1. Consider the "exida Functional Safety Assessment" document which is available on www.pepperl-fuchs.com as an integral part of this product's documentation.

Release date: 2013-06-26 09:50 Date of issue: 2013-06-26 10:6710_eng.xml

Dimensions



Technical Data

General specifications

Switching element function	NAMUR, NC
Slot width	3.5 mm
Depth of immersion (lateral)	5 ... 7 typ. 6 mm
Installation	
Output polarity	Safety Function

Nominal ratings

Nominal voltage	U_o	8 V
Switching frequency	f	0 ... 3000 Hz
Hysteresis	H	with NAMUR switch amplifier: 0.045 mm (e. g. Pepperl+Fuchs KCD2-SR-Ex1.LB) with safety switch amplifier 0.025 mm (e. g. Pepperl+Fuchs KFD2-SH-Ex1)
Suitable for 2:1 technology		yes, with reverse polarity protection diode
Rate of current rise		-4.5 mA / mm

Current consumption		
Measuring plate not detected		≥ 3 mA
Measuring plate detected		≤ 1 mA

Functional safety related parameters

MTTF _d	7970 a
Mission Time (T_M)	20 a
Diagnostic Coverage (DC)	0 %

Ambient conditions

Ambient temperature	-50 ... 100 °C (-58 ... 212 °F)
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Mechanical specifications

Connection type	flexible leads LIY, 500 mm
Core cross-section	0.14 mm ²
Housing material	PBT
Protection degree	IP67
Note	adjustable stop Security relevant only up to -40°C

General information

Use in the hazardous area	see instruction manuals
Category	1G; 2G; 3G; 1D

Compliance with standards and directives

Standard conformity	
NAMUR	EN 60947-5-6:2000 IEC 60947-5-6:1999
Standards	EN 60947-5-2:2007 IEC 60947-5-2:2007

Approvals and certificates

FM approval	
Control drawing	116-0165F
UL approval	cULus Listed, General Purpose
CSA approval	cCSAus Listed, General Purpose
CCC approval	CCC approval / marking not required for products rated ≤ 36 V

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

Pepperl+Fuchs Group
www.pepperl-fuchs.com

USA: +1 330 486 0001
 fa-info@us.pepperl-fuchs.com

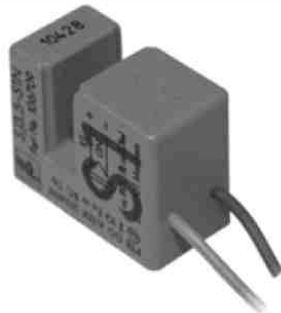
Germany: +49 621 776 4411
 fa-info@de.pepperl-fuchs.com

Singapore: +65 6779 9091
 fa-info@sg.pepperl-fuchs.com

 **PEPPERL+FUCHS** 1
 SENSING YOUR NEEDS

Inductive slot sensor

SJ3,5-S1N



Model Number

SJ3,5-S1N

Features

- 3.5 mm slot width
- Usable up to SIL 3 acc. to IEC 61508
- Nonferrous targets

Application

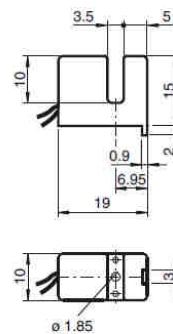
Danger!
In safety-related applications the sensor must be operated with a qualified fail safe interface from Pepperl+Fuchs, such as KFD2-SH-EX1. Consider the "exida Functional Safety Assessment" document which is available on www.pepperl-fuchs.com as an integral part of this product's documentation.

Release date: 2013-09-20 14:52 Date of issue: 2013-09-20 106709_eng.xml

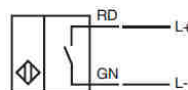
Technical Data

General specifications	
Switching element function	NAMUR, NO
Slot width	3.5 mm
Depth of immersion (lateral)	5 ... 7 typ. 6 mm
Installation	
Output polarity	Safety Function
Nominal ratings	
Nominal voltage	U _o 8 V
Switching frequency	f 0 ... 2500 Hz
Hysteresis	H with NAMUR switch amplifier: 0.09 mm (e. g. Pepperl+Fuchs KCD2-SR-Ex1.LB) with safety switch amplifier 0.05 mm (e. g. Pepperl+Fuchs KFD2-SH-Ex1)
Suitable for 2:1 technology	yes, with reverse polarity protection diode
Rate of current rise	2.1 mA / mm
Current consumption	
Measuring plate not detected	≤ 1 mA
Measuring plate detected	≥ 3 mA
Functional safety related parameters	
MTTF _d	7974 a
Mission Time (T _M)	20 a
Diagnostic Coverage (DC)	0 %
Ambient conditions	
Ambient temperature	-25 ... 100 °C (-13 ... 212 °F)
Mechanical specifications	
Connection type	flexible leads LIY, 500 mm
Core cross-section	0.14 mm ²
Housing material	PBT
Protection degree	IP67
Note	only for non-ferrous metal Adjustable stop
General information	
Use in the hazardous area	see instruction manuals
Category	1G; 2G; 3G; 1D
Compliance with standards and directives	
Standard conformity	
Standards	EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates	
FM approval	
Control drawing	116-0165F
UL approval	cULus Listed, General Purpose
CSA approval	cCSAus Listed, General Purpose
CCC approval	CCC approval / marking not required for products rated ≤36 V

Dimensions



Electrical Connection



Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

Pepperl+Fuchs Group

USA: +1 330 486 0001

Germany: +49 621 776 4411

Singapore: +65 6779 9091

PEPPERL+FUCHS
SENSING YOUR NEEDS

1

7. Data sheets Bartec switches

(Attention: left site insert switch will be used only in our limit switch boxes !!!)



Insert switch/limit switch

BARTEC



Insert switch



Limit switch

Description

Insert switch with connection cores

This switching element can be universally used for switching, controlling and regulating operations within Ex-areas. The insert switch is audited by the PTB according to the latest EC guideline 94/9/EC. Devices equipped with these insert switches have to be approved by a testing authority, the switch itself needs not be retested.

The cores are cast-in at the back of the switch. Their standard length is 500 mm; other lengths are available on request. To connect the cores we recommend the miniterminals from BARTEC.

Limit switch with connection cable

The limit switches have been developed for Ex-areas where safe and reliable signalling is required, for example on pumps, petrol pumps, as well as in mechanical and high-tec engineering. The switches must be mounted into the respective devices or systems in such a way as to guarantee mechanical protection. No further tests are required. The connection cable is cast in on the back of the switch. For the connection in Ex-areas BARTEC provides a large variety of terminals and terminal boxes.

Explosion protection

Ex protection type

- Insert switch II 2G Ex d IIC
- I M2 Ex d I
- Limit switch II 2G Ex d IIC T6
- II 2D Ex DA21 IP 66 T 80 °C

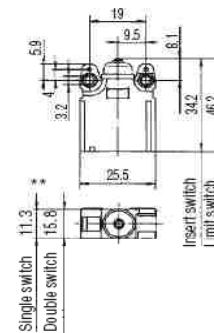
Certifications

- Insert switch PTB 98 ATEX 1032 U
IECEX PTB 07.0040 U
- Limit switch PTB 00 ATEX 1093 X
IBExU01ATEX1007 X
IECEX PTB 07.0045 X

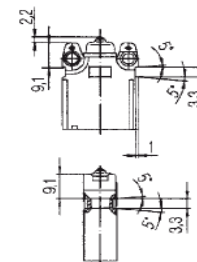
Ambient temperature

- 20 °C to +40 °C (-55 °C to +75 °C)
- 20 °C to +75 °C for DustEx
- 55 °C on request

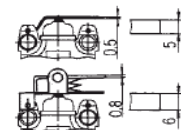
Dimensions in mm



Clip-on pockets



Lever widths



03-030-0154/IA-07/10-01CS-128006/1



Insert switch/limit switch

BARTEC

Technical data

Ex d Insert switch/limit switch

EN 60947-5-1
EN 60947-1

Protection class

IEC/EN 60529:IP 66

Electrical data for control switch

In accordance with DIN EN 60947-5-1

Rated operating voltage AC 400 V
Utilization category
AC-15 2 A 400 V
DC-13 0.15 A 250 V
Isolation voltage 400 V
(further electrical data on request)

Electrical data for switch

Rated current
AC 2 A 400 V
AC 7 A 250 V
DC 0.5 A 250 V
(further electrical data on request)

Ambient temperature +40 °C		
AC switching capacity		
	ohmic load	inductive load cos φ = 0,6
400 V	3 A	2 A
250 V	5 A	3 A
30 V	7 A	5 A
DC switching capacity		
	ohmic load	inductive load L/R = 3 μs
250 V	0.4 A	0.03 A
30 V	7 A	5 A

Tightening torque of fixing screws

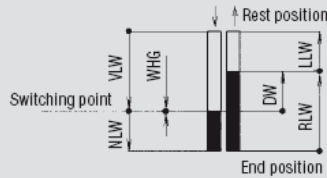
0.6 Nm

Rating of gold-coated contacts

Voltage: min. 5 V/max. 30 V
Current: min. 4 mA/max. 400 mA

- the product of voltage and current should not exceed 0.12 VA
- for alternating current these values have to be interpreted as peak values

Contact Travels



Contact break distance 2 x ≥ 0.3 mm		
Contact travels (in mm)		
Pretravel	VLW	max. 0.9
Overtravel	NLW	min. 0.5
Differential value	DW	max. 0.45
Release travel	RLW	0.9
Release travel	LLW	0.1 to 0.45
Repeat accuracy WHG (for repetitive actuation)		± 0.02

Service life

mechanical	> 2 x 10 ⁶
electrical	dependent on load
max. switching rate	1000 operations/h

Switching actuation force

Single-break switch	max. 2.0 N
Double-break switch	max. 3.6 N

Reset force

Single-break switch	min. 0.4 N
Double-break switch	min. 0.8 N
Operating rate	≥ 10 μm/sec.

Electrical connection

- Insert switch: cores 4 GAF 0.75
- Limit switch:
cable H05VV-F 0.75/A05VV-F 0.75
(other cables on request)

Conductor diameter

2-wire 6.1 ±^{0.3} mm
3-wire 6.6 ±^{0.3} mm
4-wire 6.7 ±^{0.3} mm
6-wire 8.9 ±^{0.3} mm

Contact element

snap-action contact element (double-break) as, normally-open, normally-closed, changeover contact as well as N/O + N/C contacts for circuits with equal potentials.

Contact material

Silver or gold-coated contacts
(all contact elements have a standard protective gold-coating as standard)

Double-break switch (switch options)

- *simultaneous switch sequence:*
chamber I and II almost simultaneous
- *defined switch sequence:*
chamber I switches mechanically safe 0.03 up to 0.3 mm before chamber II

Weight

- Insert switch with 500 mm cores:
single-break switch 35 g,
double-break switch 70 g
- Limit switch with 3 m cable:
single-break switch 210 g,
double-break switch 415 g

Housing material

plastic (thermoplastics)

Plunger/additional actuator

stainless steel

Technical data subject to change without notice.

03-0330-0154/A-07/10-BCS-12300/2



Insert switch/limit switch

BARTEC

Selection chart Single-break switch

Type of contact		Additional actuator*			
Switch chamber 1	Code no.	Options	Code no.	Options	Code no.
	10	without additional actuator	00		44
			01		45
			03		46
			21		48
	20		04		47
			22		49
			24	plastic roller metal roller plastic roller metal roller	61 62 63 64
	30		23		24
			24		61
			62		63
	40		41		63
			42		64
			43		66
			73		73

➔ **Complete order no.** 07- 511- /

Please enter code number.

03-0330-0154-08-08-BCS-123006/3

() Code for connection cable

* Dimensions for additional actuator are reference values

** When packing several switches, these dimensions are reduced to 11 mm resp. 15.5 mm

Insert switch with connection cores	1
Limit switch with connection cable	2

Length of connection cores in 100 mm
e.g. 5 = 500 mm

Length of connection cable in meters
e.g. 3 = 3 m

Please specify greater lengths in plain text, code no. = 0

Contact material

1	Silver
3	Gold-coated contacts

8. Stainless steel brackets

stainless steel brackets size 1 - 4 for limit switch boxes, rotary actuators

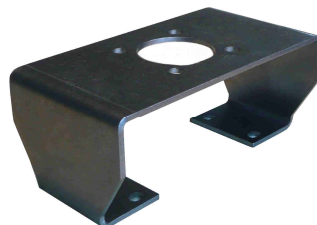
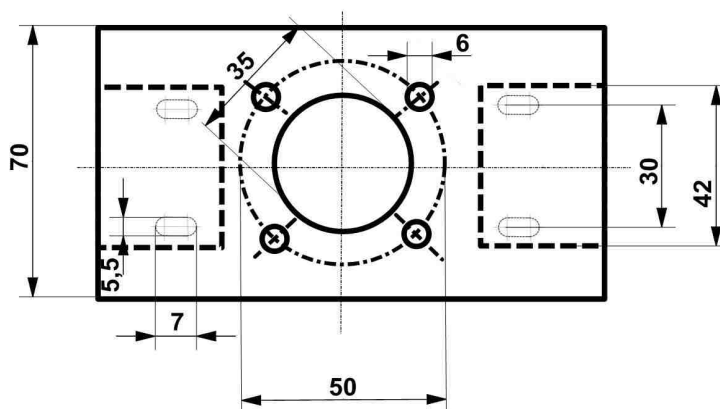
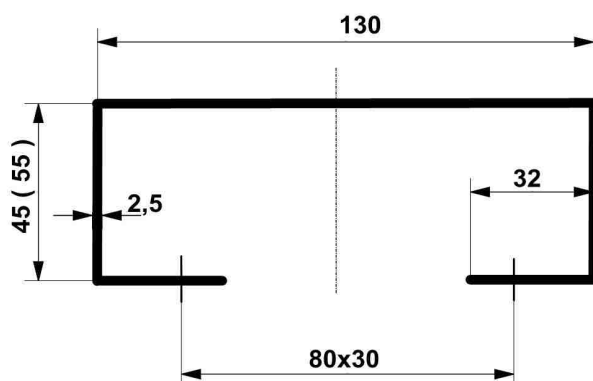


image.: brackets size 1 - 2 for actuators acc. to VDI/VDE 3845, steam height 20mm and 30mm, hole spacing 80x30mm

dimensions: without () = bracket size 1 () = bracket size 2

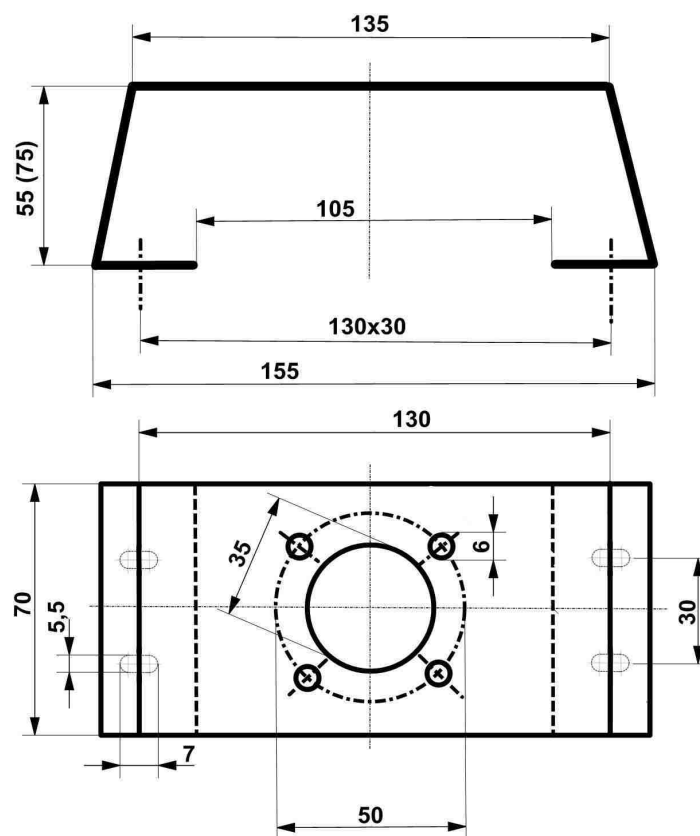


material = Aisi 304



image.: brackets size 3 - 4 for actuators
acc. to VDI/VDE 3845, steam high 30mm
and 50mm, hole spacing 130x30mm

dimensions: without () = bracket size 3 () = bracket size 4



material = Aisi 304