BALLUFF

sensors worldwide

Object Detection

Mechanical and Inductive Single and Multiple Position Switches

Balluff is a worldwide leading company in the field of position detection.

Our products range includes electronic sensors, transducers based on various operating principles, identification systems, bus-compatible sensors as well as mechanical and inductive single and multiple position switches. Balluff products are found wherever accuracy and reliability are in demand.

Wherever there is a need to automate, sense objects, or report linear and rotary motion to controllers – Balluff is always the right partner.

Our QM system meets the requirements of DIN EN ISO 9001:2008. Eleven Balluff companies have a certified QM system, two a certified environmental protection system.

By mastering process-capable production and assembly techniques and statistical process control we achieve consistently high product quality. Intensive testing before serial production begins guarantees reliable function.

With more than 50 years of experience in the field of sensor technology, Balluff today is one of the most capable manufacturers of both standardized and custom limit switches. Innovative technology and application-specific customer solutions are the outstanding features of the entire product range.

Highly-qualified development engineers and experienced designers work closely with the manufactures to ensure mature series products that are used successfully in every area of automation – even under extreme and aggressive operating conditions.

CE

Object Detection

General Information — i

Principles of Mechanical and Inductive Single and Multiple Position Switches

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Cam Trays and Cams — 5.2

Connectors and Function Indicators — 5.3

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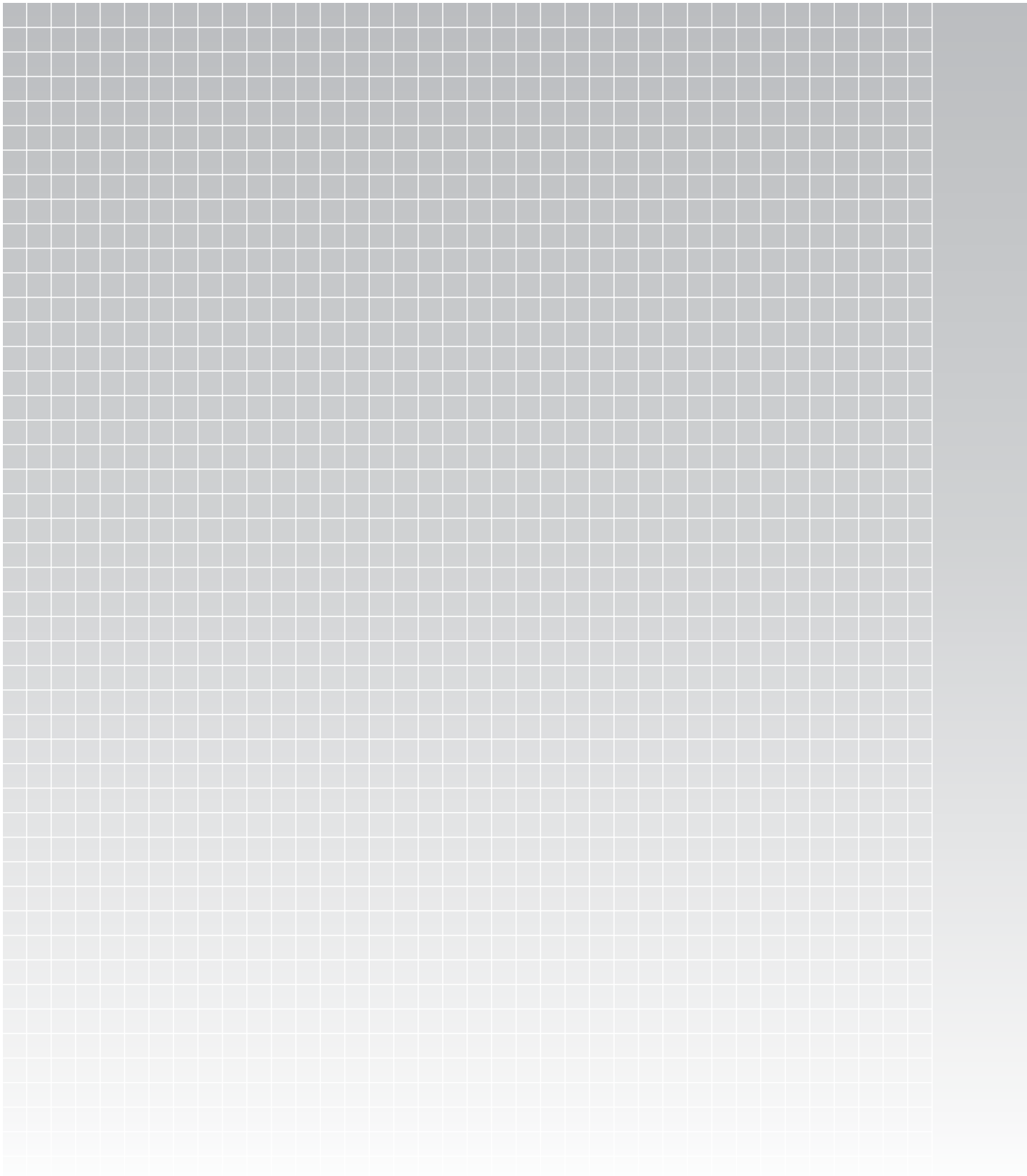

Principles

In this section we cover the key concepts, technical details, conditions of use, standards, etc.

10 Applications
12 Design/Construction Form factors Standards
13 Design/Construction Form factors with safety switch positions
14 Design/Construction Form factors with quick-change plunger block
15 Switch Elements, Switching Characteristics
16 Plunger Styles
17 Plunger Systems
18 Design/Construction of Inductive Single and Multiple Position Switches
19 Function Descriptions, Definitions, Protection Circuits
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26 Product Overview

Single and multiple position switches are used as actuators for automatic controls, for positioning and for end-of-travel switching on machine tools, transfer lines, transport equipment, in the automobile industry and in machine and equipment building.

Their proven design principle and large number of possible switching operations as well as consistent inspection ensure lasting quality and reliability.

Reliable switching under extreme conditions

Balluff single and multiple position switches have been proven for decades under harsh conditions. They ensure trouble-free function under conditions of vibration, shock, rapid temperature fluctuations, aggressive coolants and heavy presence of chips. Inductive single and multiple position switches are also characterized by high electromagnetic compatibility.

Safety of man and machine

For safety functions such as E-Stop or end-of-travel restriction, Balluff designs special safety switches to DIN EN 60204-1/ VDE 0113, which offer the highest level of safety.

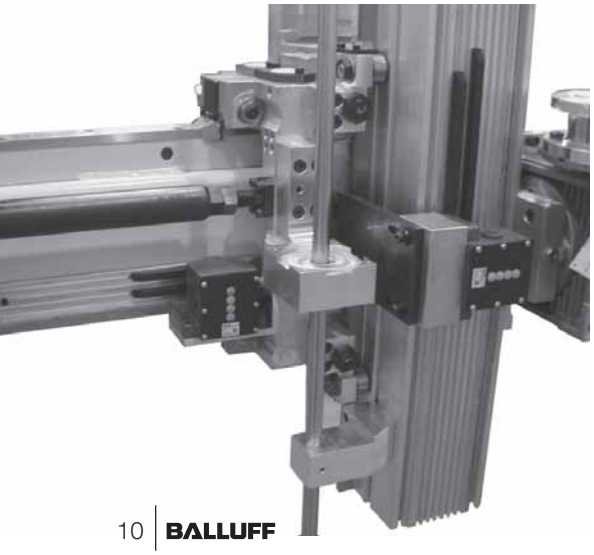
more added value

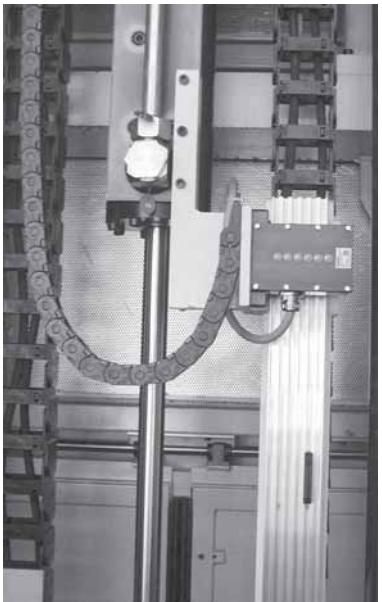
High reliability and mature technology for high system availability and economy in production.

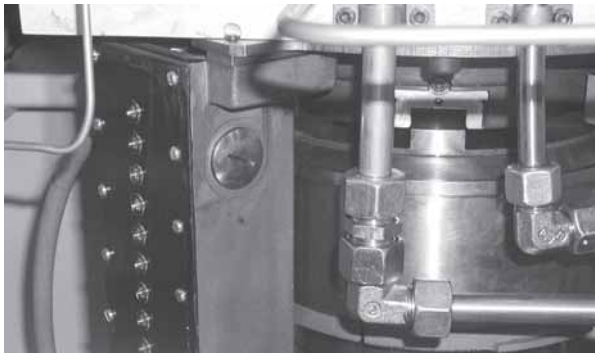
more added value

Proof of safety for mechanical switches is easier to verify than for electronic products.

The automation classics – Single and multiple limit switches custom tailored for you







For standard applications

Mechanical single and multiple position switches

The switching operation is performed using a telescoping plunger. This plunger is used to switch a mechanical switching element in a separate, sealed chamber. Optimum selection of the plunger style in combination with our cams guarantees long service life.

Features

- Maintenance-free, self-lubricating slide bearing bush. Slide bearing constructed of three layers: Steel back, bronze and Teflon coating.
- Lowest coefficient of friction
- Can be continuously run without lubrication
- Plunger will not stick after production is stopped even when aggressive coolants are used
- Optional function indicators
- Optional inductive switch elements

For safety applications:

Single and multiple limit switches with safety switch positions per DIN EN 60204-1/VDE 0113

The switching operation is initiated by a rigid plunger which actuates a mechanical switching element with positive-opening contacts per DIN EN 60204-1/ VDE 0113.

Features

- Housing styles and sizes for a variety of applications
- Various plunger spacings
- Up to 12 switch positions
- Rigid chisel plungers for reliable switching
- Creep or snap switch elements with positive opening in accordance with DIN EN 60204-1/ VDE 0113 for the greatest possible safety
- Maintenance-free
- Optional function indicators

Catalog and custom products

Standardized switches and application-optimized switches

For applications with standardized mounting and function dimensions we offer switches per DIN 43693 and DIN 43697. The product range is supplemented by switches with application-specific dimensions.

For retrofitting and rotating applications

Wireless position switches

Sensors without cables: excellent for rotating applications and applications that do not permit cables. Ideal for retrofitting.

Features

- Wireless signal transmission
- No cumbersome wiring
- Simple to install
- Fast setup
- Flexible use

more added value

Optimized for your application.
Customer-specific products also available.

Mechanical and inductive single and multiple position switches – Position sensing for general machine building

Construction of mechanical single and multiple position switches

A maintenance-free, self-lubricating plunger guide guarantees reliable switch function.

We offer these switches in a standardized housing per DIN 43693 or DIN 43697. Additional form factors can be found on the following pages.

Highly elastic, wear-free **membrane** made of Viton is used for hermetic sealing between the plunger mechanism and switch interior This dual chamber design allows us to guarantee an IP 67 rating.

The seals are a critical element for the quality of our products. This is why we use only Viton today for the membrane, cover gasket and O-rings. Compared with the previous NRB material, Viton offers improved resistance to aggressive media over a large temperature range and under pressure.

Snap and creep switch elements are available as changeover contacts with self-cleaning effect. A variety of switch elements can be used.
The creep switch element opens and closes depending on the speed with which it is actuated.
The snap switch element opens regardless of its actuation speed.

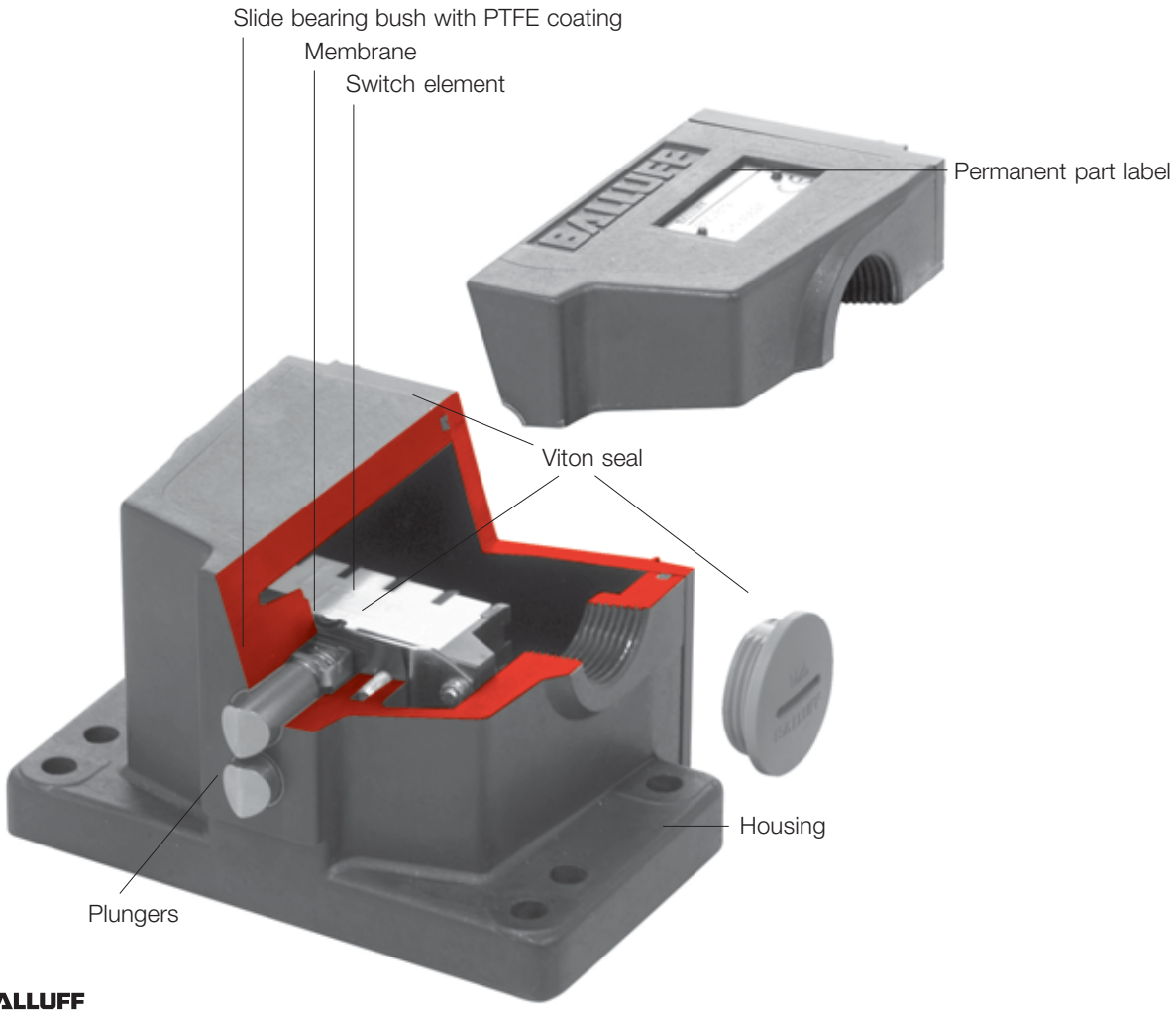
Function indicator for the switch positions with LED possible (option).
Standard configuration: Metric fitting per EN 50262 or connector S80/S90 (option).

The threads on factory installed connectors are sealed.

IO-Link

IO-Link

- 3-wire M12 connection
- No cable gland needed, factory sealed to IP 67
- Can be connected in seconds
- COM2 mode (38.4 Kbaud)
- Service data (N.O./N.C. parameter)
- Fitted standard with S4 connector
- Available for all standard form factors



Construction of the safety switch position

- BSE 61 creep switch element or BSE 85 snap switch element with positive opening per DIN EN 60204-1/ VDE 0113 (see page 112 for technical details)
- For optimum safety we recommend chisel plungers

Available series

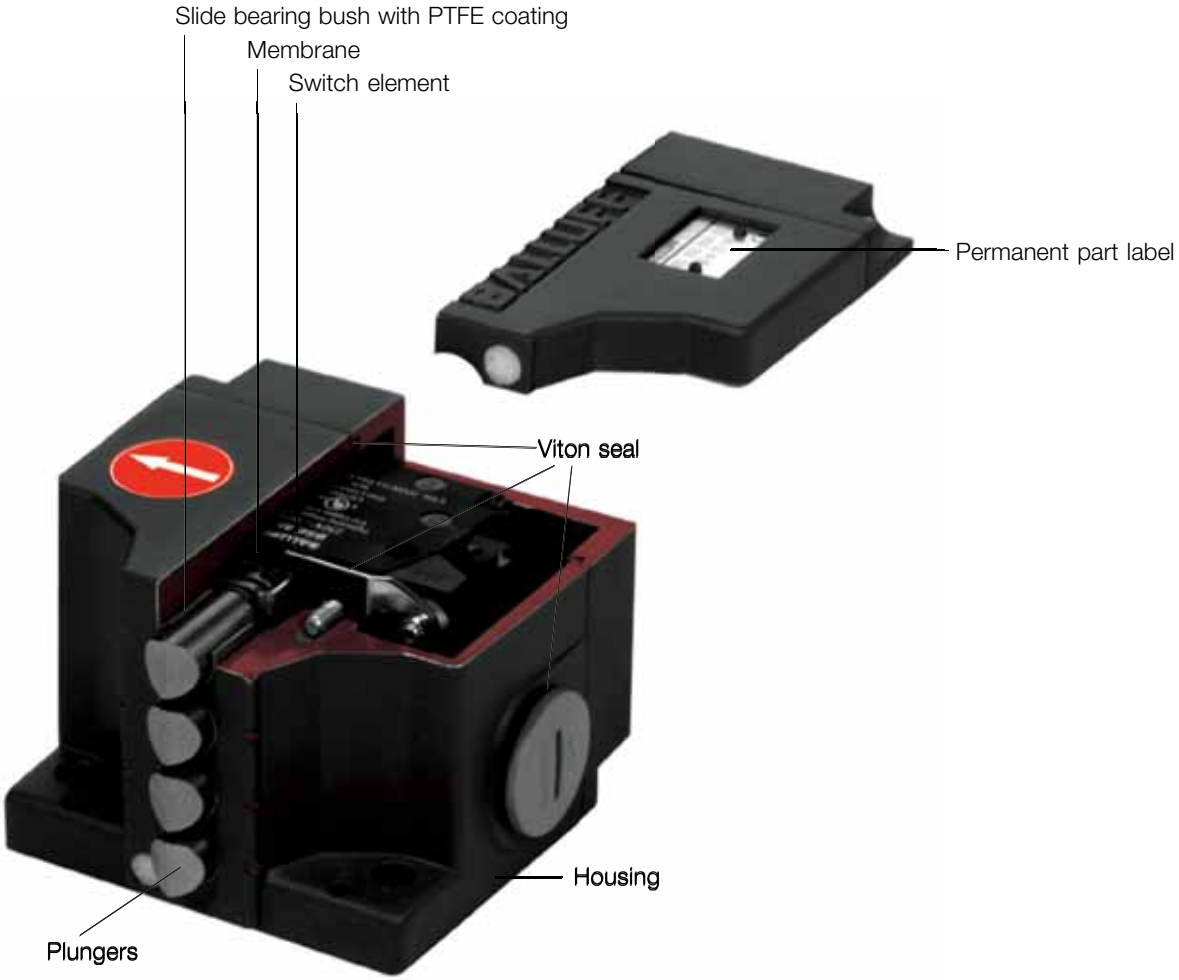
Safety switch positions can be installed in Series 100, 62, 61, 72 and F 60 single and multiple position switches.

Switch position combinations

Switches with safety switch positions can be assembled using both other mechanical elements and inductive elements. Such mixed assemblies can be provided on request. Refer also to Section 3.

Note!

Cams for safety switch positions must be installed to fit.



Balluff multiple position switches have for decades proven themselves under the most difficult conditions. The design principle and large number of possible switching types and configurations as well as consistent quality inspection ensure the highest level of quality and reliability.

The plungers are the only moving parts outside of the housing and are subjected to daily exposure to a wide range of unavoidable influences such as

- Abrasive materials
- Weld splatter
- Strongly resinating coolants and lubricants
- Long cam travel
- High speeds

For such applications Balluff offers the Series 100 and 61 switch family with quick-change plunger block as an option to the standard multiple limit switches.

The Balluff multiple position limit switch with quick-change plunger block makes time-consuming plunger replacement a thing of the past. In just a few moments the complete block system can be replaced without the use of special tools and without the risk of wiring mistakes.

The advantages of the quick-change unit as a problem solver are clear:

- Minimal machine downtime
- Low repair costs
- No wiring mistakes
- Simple to install
- Can be used even in the harshest conditions
- No special knowledge necessary
- Plungers are individually replaceable
- Degree of protection IP 67

The right switch element for every application

The switch element determines the switching behavior and, in emergency cases, the switching safety. Balluff offers switch elements for various functions.

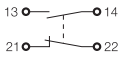
Switch characteristics

The respective application needs to be taken into account when selecting plungers and switch elements.

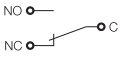
Switch elements for standard applications

Switches for standard applications without safety function are fitted with snap switch elements. Available are:

Snap switch element BSE 30.0
Dual changeover, one normally open and one normally closed, galvanically isolated, double interruption.



Snap switch elements BSE 69.1/70.1/73.1/74.1
Single-pole changeover

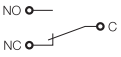


Additional characteristics:
Snap switch elements BSE 73.1 or BSE 74.1 have specially formed gold contacts making them suitable for low currents from 10...100 mA.

Switch element with positive opening

were developed for small series. Typical applications include end-of-travel sensing. Available are:

Snap switch element BSE 64, BSE 63
Single-pole changeover, NO with snap function, NC with forced opening

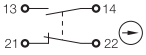


Switch elements with safety functions

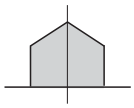
for E-Stop and end-of-travel restriction. These have positive-opening contacts conforming with DIN EN 60204-1/VDE 0113. Available are:

Creep switch element BSE 61
NC, double interruption, positive-opening.

Snap switch element BSE 85
Dual-changeover:
1. Dual-changeover (snap function), 2. Positive-opening (double interruption), all galvanically isolated

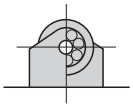


Chisel plunger for short actuation travel



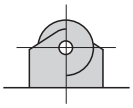
- max. approach velocity 40 m/min
- Typical cam length 100 mm
- Defined approach direction
- Repeatability up to ±0.002 mm
- Recommended in conjunction with rigid plunger for safety applications
- Hardened, polished contact surface
- Angle of slope 30°
- Hardness 58 HRC

Roller bearing plunger for long actuation travel



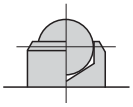
- max. approach velocity 120 m/min
- Typical cam length 1000 mm
- Defined approach direction
- Repeatability up to ±0.01 mm
- Not recommended in safety positions
- Low-noise
- Hardness 58 HRC

Roller plunger for medium actuation travel



- max. approach velocity 60 m/min
- Typical cam length 500 mm
- Defined approach direction
- Repeatability up to ±0.01 mm
- Not recommended in safety positions
- Hardness 58 HRC

Ball plunger actuation from any direction



- max. approach velocity 10 m/min
- Repeatability up to ±0.002 mm
- Not recommended in safety positions
- Hardened ball
- Hardness 58 HRC

Dimensions of Roller and roller bearing plungers	**Series 46, 40, 99, 100**	**Series 100, 62, 61, 72, F 60**
Plunger diameter in mm	6	10
Roller diameter in mm	5	7.8
Roller width in mm	2.8	3.8
Roller bearing diameter in mm		8
Roller bearing width		3.6

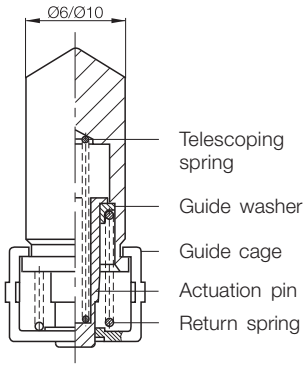
The specified approach speeds for all plunger styles apply only in combination with **Balluff mechanical cams** (see page 122/123)

Telescoping plunger mechanism prevents overloading of the switch element, increases the service life and protects the plunger from sticking.
For safety switches the use of rigid plungers is required.

Telescoping plungers

For standard switch positions

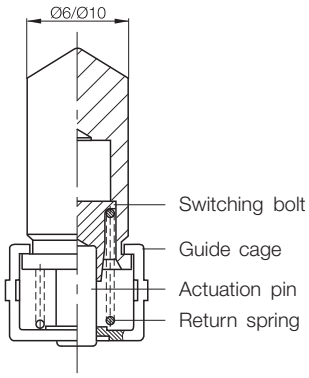
- Maintenance-free, self-lubricating slide bearing bush with Teflon coating (PTFE)
- Can be dry-run in continuous operation with no lubrication
- Lowest coefficient of friction
- Resistant to chemical effects



Rigid plunger

For use with forced separation and positive opening safety switch positions conforming with DIN EN 60204-1/VDE 0113

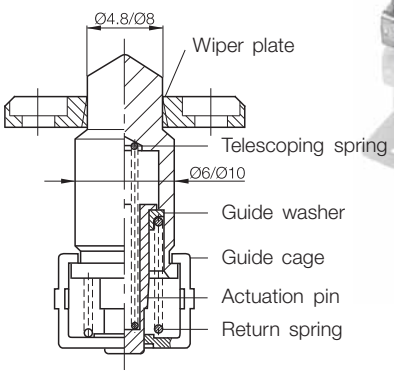
- Reliable opening of the switching circuit even when overload causes contact welding
- In addition to all the positive features of the telescoping plunger



Telescoping plunger Chisel with wiper plate

Encapsulated version for extreme applications

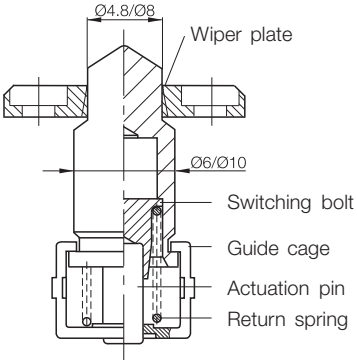
- One-piece, easily replaceable plastic plate with wiper edge
- Protection against sticking, hardened coolants and lubricants
- Breaks up sticking, hardened coolants
- Slide bearing bush is kept clean
- Ideal for use in processing cast materials



Rigid plunger Chisel with wiper plate

For use with forced separation and positive opening safety switch positions conforming with DIN EN 60204-1/VDE 0113

- Reliable opening of the switching circuit even when overload causes contact welding
- In addition to all the positive features of the telescoping plunger



These switches use the same housing as for the mechanical versions. The switching function is handled by an inductive switch element whose active surface is damped contactlessly by the approach of special electronic cams.

Machine-compatible **housing** per DIN 43697 made of a special cast aluminum allow or application-specific, absolutely deformation resistant.

Sensing face, material PA 12, insensitive to aggressive coolants.

High quality Viton seal, insensitive to aggressive coolants (enclosure rating IP 67).

The threads on factory installed connectors are sealed.

Inductive switch elements available in two sensing head diameters, 3-/4-wire (DC PNP and NPN), 2-wire (AC and DC), NAMUR.

Function indicator for each switch position with LED (except NAMUR).

Metric fittings, cable glands or connectors, flexible cabling for each position.

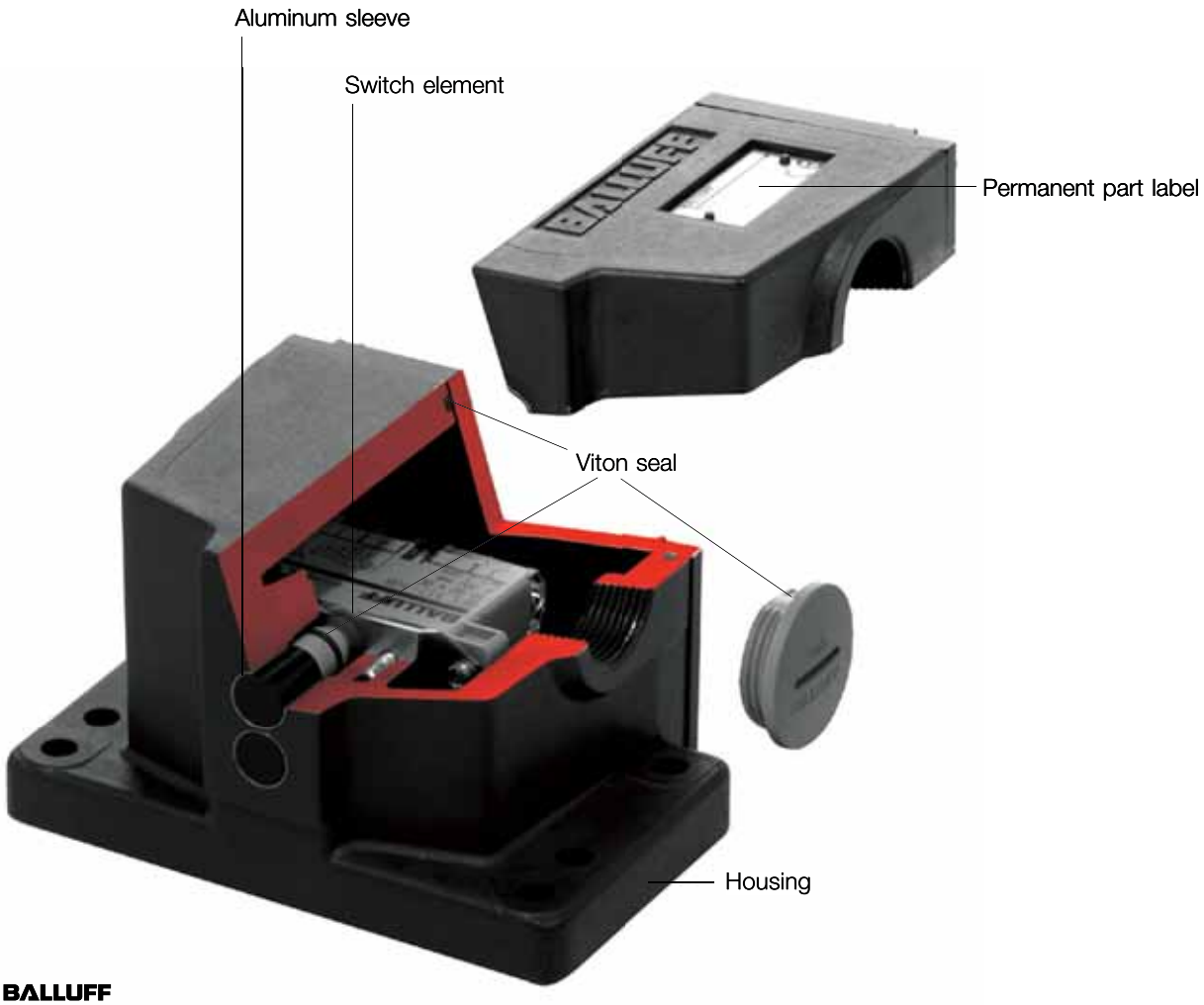
Switching distances

For adapting to various working distances we offer switch elements with the following rated switching distances s_n:
0... 1.1 mm
0... 2 mm
0... 5 mm

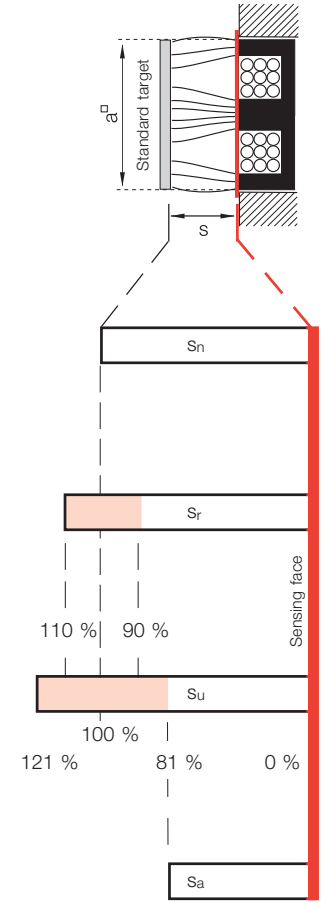
Inductive switch elements with extended switching distance available on request!

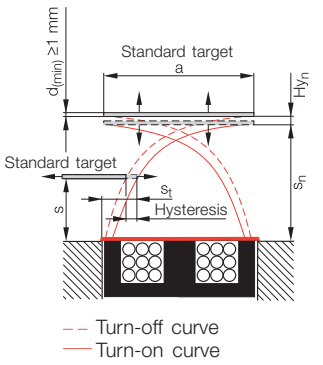
Utilization categories per EN 60947-5-2/ IEC 60947-5-2

Category		Typical load applications
AC 12	AC-switch	Resistive and semiconductor loads, optocouplers
AC 140	AC-switch	Small electromagnetic load $I_a \leq 0.2$ A; e. g. contactor relay
DC 12	DC-switch	Resistive and semiconductor loads, optocouplers
DC 13	DC-switch	Electromagnets



Supply voltage U_B	... is the permissible voltage range in which certain safe	operation of the switch is guaranteed (including ripple σ).
Voltage drop U_d	... is the voltage measured across the load of a closed	(conducting) switch element at load current I_e.
Rated operating current I_e	... is the permissible constant output current that	may flow through the load R_l.
Off-state current I_r	... is the residual current flowing through the load	when a switch element is not conducting (open).
Inrush capacity I_k	... in the case of alternating current indicates the current I_k (A_{eff}) which is permitted to	flow during a given turn-on time t_k (ms) and at a given frequency (Hz).
Minimum operating current I_m	... is the smallest load current required for function of the	switch element when ON.
Ambient temperature range T_a	... is the temperature range over which the function of	the switch is guaranteed..
Rated operating distance s_n	... is a theoretical value, which does not take into account manufacturing	tolerances, operating temperatures, supply voltages, etc.
Effective operating distance s_r	... is the switching distance of a single inductive switch element measured under the specified conditions	(installation, voltage, temperature). T_a = +23 °C ±5 (0.9 $s_n \leq s_r \leq$ 1.1 s_n)
Useful operating distance s_u	... is the permissible switching distance of an individual switch element within the specified voltage	and temperature conditions. (0.81$s_n \leq s_u \leq$ 1.21 s_n).
Assured operating distance s_a	... is the switching distance at which assured operation of the switch element is guaranteed at specified	voltage and temperature conditions. (0 $\leq s_a \leq$ 0.81 s_n).
Hysteresis H (switching hysteresis when target is backed off)	... is given as a percentage of the effective operating distance s_r. It is measured at an ambient temperature of +23 °C ±5 and at the rated operational voltage. It must	be less than 20 % of the effective operating distance (s_r). H ≤ 0.2 s_r



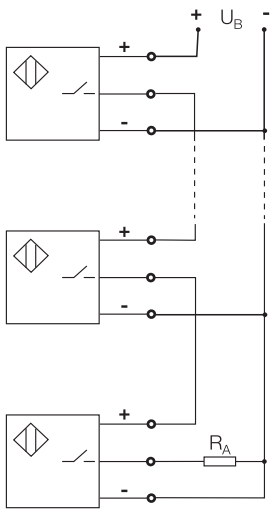


Switching frequency f	.. refers to the maximum number of switching operations per second.	Damping is per EN 60947-5-2 with standard targets on a rotating, non-conducting disk. The surface area ratio of iron to non-conductor must be 1 : 2.	The rated value of the switching frequency is reached when – either the turn-on signal t_1 = 50 µs or the – turn-off signal t_2 = 50 µs.
Polarity reversal protected	... protected against any possible lead reversal for inductive switch elements with short circuit protection.	... against reversal of plus/ minus leads for inductive switch elements without short circuit protection.	
Short circuit protected with maximum voltage 60 V DC)	... is achieved for inductive switch elements with pulsing or thermal short circuit protection. The output stage is thereby protected against overload and short circuit.	The trigger current for the short circuit protection is higher than the rated operating current I_e. Currents from switching and load capacitances are specified in	the sensor data and do not result in triggering, but rather are masked by a short delay in the output circuit.
Short circuit/overload protected (for operating with AC or DC supply)	... AC or AC/DC sensors are often operated with a relay or contactor as the load. AC switching devices (contactors/relays) create a significantly higher load (6...10 × rated current) when they are first energized as compared with their static operation due to the fact that the core is still open. The static value of the load (current) is not reached until several milliseconds later.	Not until the magnetic field is closed does the max. permissible rated operating current I_e flow through the sensor. This means that the threshold value for a short circuit condition in these switch elements must lie significantly higher and would, if for example the contactor is prevented for mechanical or electrical reasons from fully closing, result in an overload on the switch elements. This is where the overload protection comes into play. It is designed as slow-acting (time-delayed). Its trigger threshold lies only slightly above the maximum permissible I_e.	A response (i. e. turn-off) is delayed, depending on the magnitude of the overload, by more than 20 milliseconds. This ensures that properly working relays and contactors can be switched normally, while defective devices will not destroy the Balluff switch elements. The short circuit/ overload protection is generally of a bi-stable design, which means that it must be reset by turning off the supply voltage to the switch element.

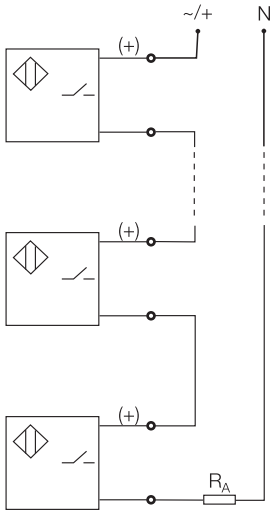
Series connection

... can cause a time delay (e. g. start-up delay). The number of connected switch elements is limited by the total voltage drop (sum of all U_d).
In the case of 2-wire sensors it is limited by the addition of the minimum supply voltages.
For 3-wire switches, the load capacity of the output stage represents a further limitation, since the current consumption I_0 of all switches is added to the rated current I_e.
The ready delay time t_v is the ready delay of a sensor × (number of sensors n–1).

3-wire DC switch elements



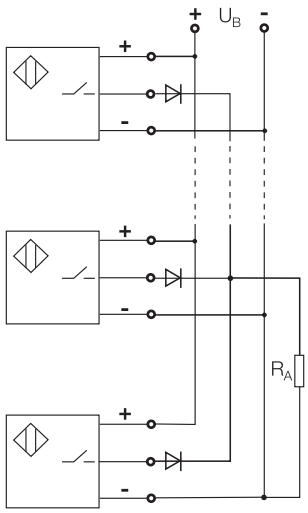
2-wire DC switch elements (AC/DC)



For parallel connection

... of switch elements with LED it is recommended that the outputs of the individual switches be decoupled using diodes (as shown).
This prevents all LED's from lighting-up when the output stage of one switch is turned on.

3-wire DC switch elements



2-wire DC switch elements

Parallel wiring of 2-wire switch elements is not recommended, since missed pulses can be caused by the ready delay while the oscillation is built up.

Switch	Multiple position switches	DIN 43697
	Single position switches	DIN 43693
	Single and multiple position switches with safety switch positions	DIN EN 60204-1/VDE 0113 Teil 1
	Metric fitting	EN 50262/DIN EN 60204-1
Enclosure rating	IP 67	EN 60529/IEC 60529
EMC (electromagnetic compatibility) for switches with inductive switch elements	RF emission from electrical equipment	EN 55011
	Static discharge immunity (ESD)	EN 61000-4-2
	Immunity to electromagnetic fields (RFI)	EN 61000-4-3
	Immunity to fast transients (burst)	EN 61000-4-4
	Immunity to line-carried noise induced by high-frequency fields	EN 61000-4-6
	Surge-voltage stability	EN 60947-5-2
Environmental simulation	Vibration, sinusoidal	EN 60068-2-6/IEC 60068-2-6
	Shock	EN 60068-2-27/IEC 60068-2-27
	Continuous shock	EN 60068-2-29/IEC 60068-2-29

Quality Management System
per DIN EN ISO 9001:2008

Balluff company	
Balluff GmbH	Germany
Balluff Elektronika KFT	Hungary
Nihon Balluff Com. Ltd.	Japan
Balluff U.K. Ltd.	Great Britain
Balluff Automation s.r.l.	Italy
Balluff Inc.	USA
Balluff GmbH	Austria
Balluff CZ, s.r.o.	Czech Republic
Hy-Tech AG	Switzerland
Balluff Sensortechnik AG	Switzerland
Balluff Controles Elétricos Ltda.	Brazil

Environmental Management System
per DIN EN ISO 14001:2005

Balluff company	
Balluff GmbH	Germany
Balluff Elektronika KFT	Hungary

Balluff products meet the EU Directives

Products requiring marking are subjected to a conformity evaluation process according to the EU Directive and the product is marked with the CE Marking. Balluff products fall under the following EU Directives:

2004/108/EG	EMC Directive
2006/95/EG	Low-Voltage Directive applies to AC and AC/DC sensors

Approvals

.. are granted by national and international institutions. Their symbols affirm that our products meet the specifications of these institutions.

„US Safety System“ and „Canadian Standards Association“ under the auspices of Underwriters Laboratories Inc. (cUL).

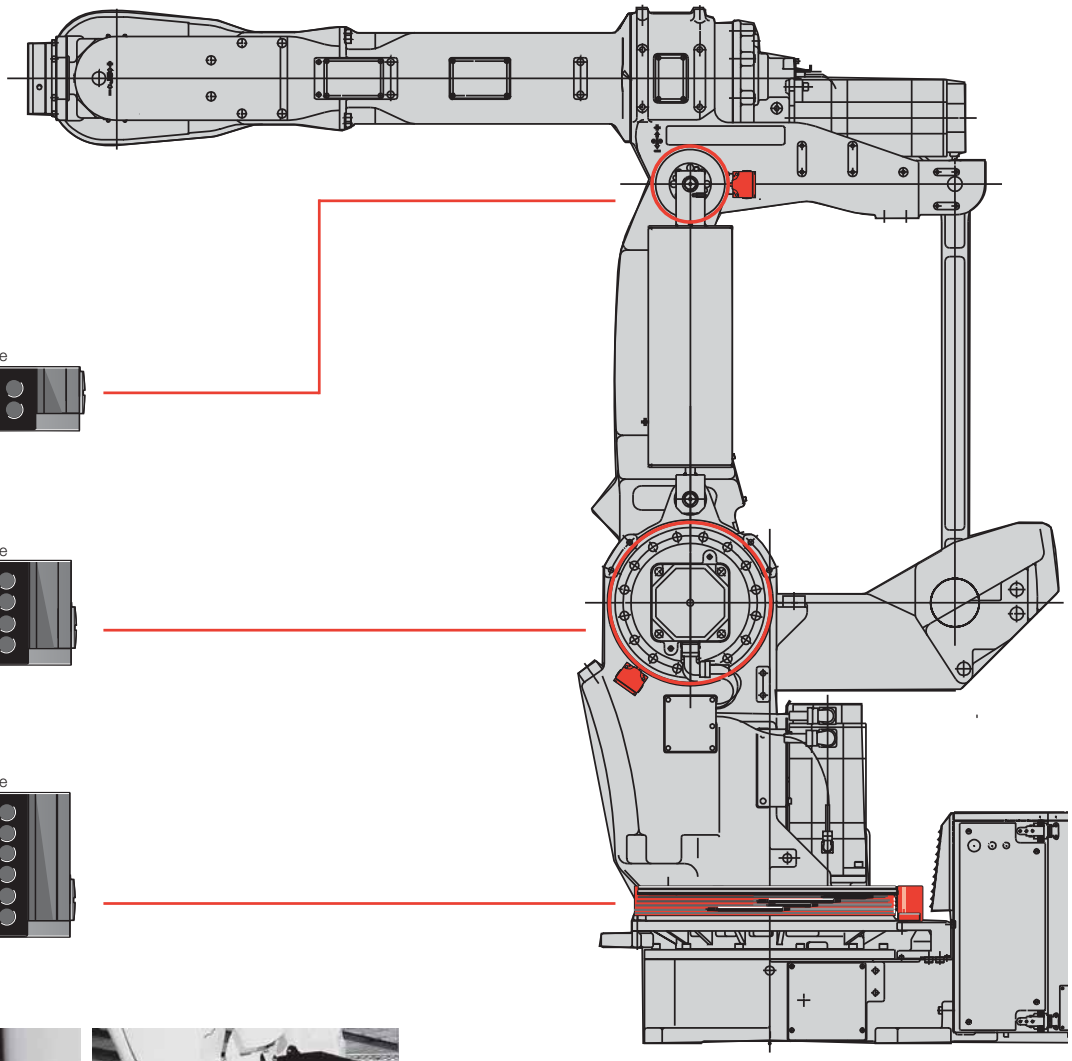
CCC Marking by the Chinese CQC.

Zone monitoring on robots

One task – two solutions

If two physical channels (1 normally and 1 normally closed) are powered by a switching power supply, this will enable cross-connection detection. In such a system different signals must be sent to the controller.

In case of error (short circuit, miswiring, ...) both signals are identical and are recognized by the controller as a cross-connection fault condition. Monitoring can be handled by a safety programmable controller or with a Pilz safety switching device.



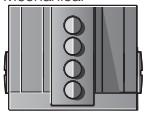
Axis 3

Mechanical

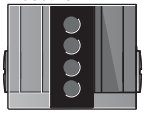
Inductive

Axis 2

Mechanical

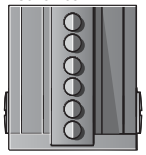


Inductive

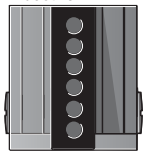


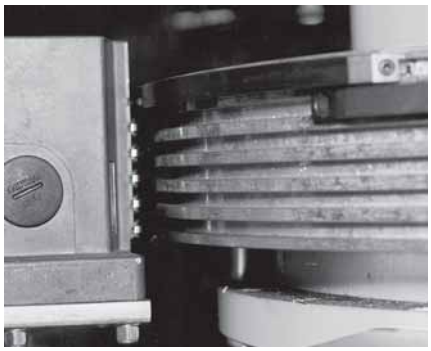
Axis 1

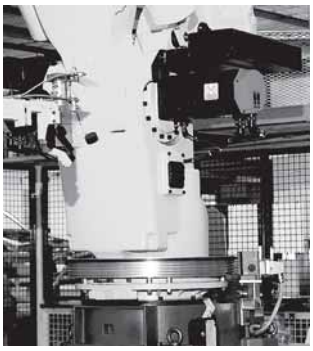
Mechanical



Inductive







Two solutions – simple installation and setup of the allowed zone

Solution 1
Mechanical switches – the classic solution

- Reliability assured by rugged cast housing for harsh industrial environments
- Safety ensured by switch elements with positive-opening contacts and rigid plungers as well as proper selection of the cam tracks
- Long service life thanks to maintenance-free, self-lubricating plunger guide with slide bearing bush

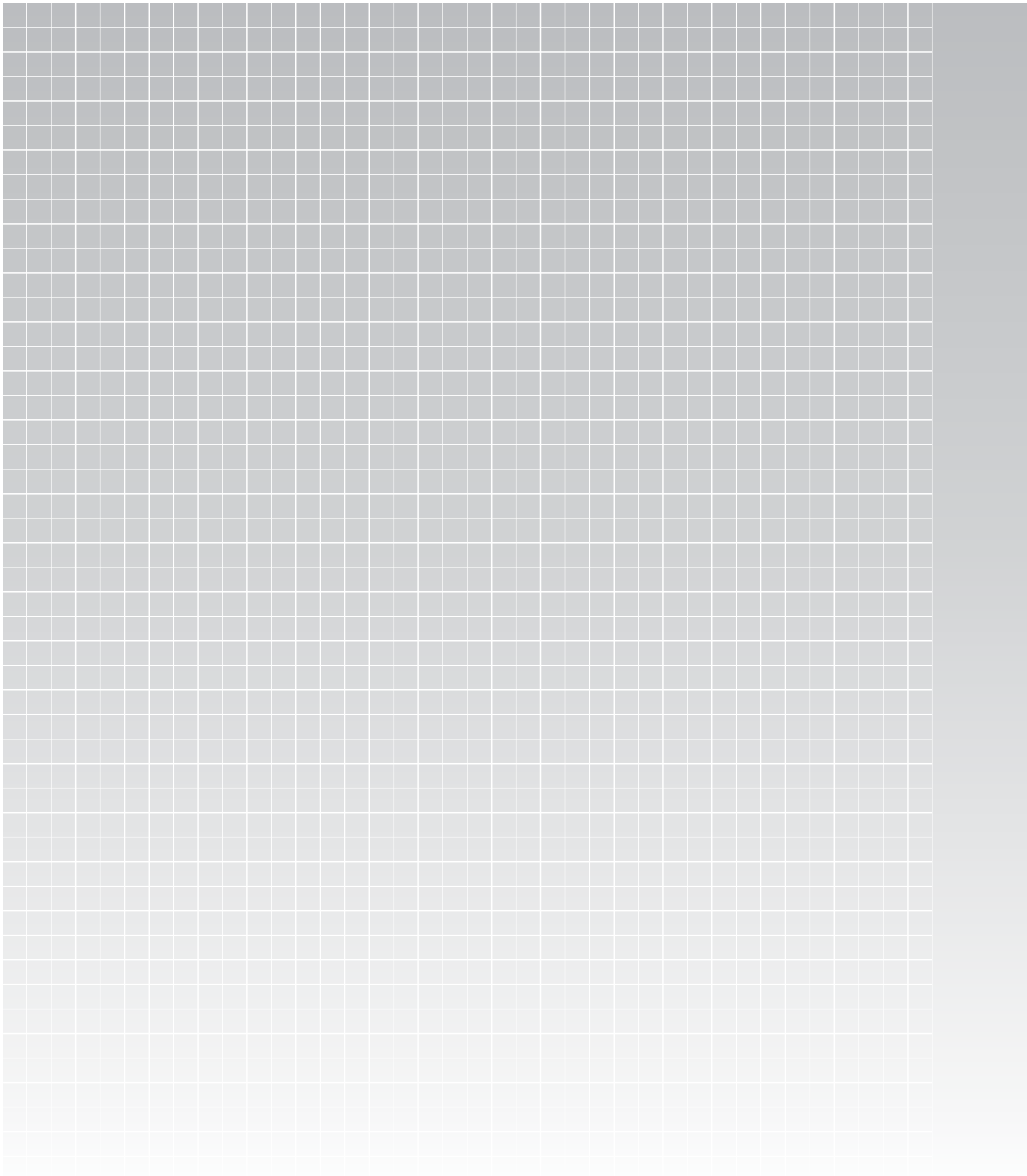
Solution 2
Inductive switch – the modern solution

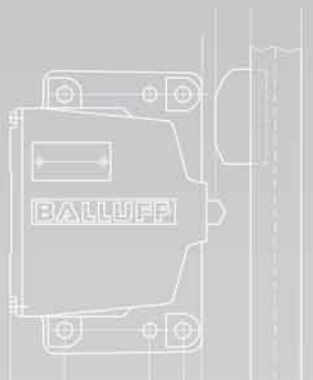
- Likewise in rugged cast housing for harsh industrial applications
- Function monitoring using safety controller with pulsed supply voltage for the switches
- Non-contacting, wear-free,
- For extremely high traverse speeds

	Seite			
Mechanical Single and Multiple Position Switches	Series 100 Seite 30 CE, CCC, CSA	Series 62 Seite 32 CE, CCC, CSA	Series 61 Seite 34 CE, CCC, CSA	
Mechanical Single and Multiple Position Switches with Safety Switch Positions acc. to DIN EN 60204-1/VDE 113	Series 100 Seite 48 CE, CCC, CSA	Series 62 Seite 50 CE, CCC, CSA	Series 61 Seite 52 CE, CCC, CSA	
Mechanical Single and Multiple Position Switches with Forced Opening				
Mechanical Multiple Position Switches with Quick-Change Plunger Unit	Series 100 Seite 68 CE		Series 61 Seite 72 CE	
Inductive Single and Multiple Position Switches	Series 602-11 Seite 80 CE, CCC		Series 610...613-11 Seite 82 CE, CCC	
Inductive Multiple Position Switches with Extended Switching Distance 4 mm	Series X603-...-602-11 Seite 97 CE, CCC		Series X603-...-610-11 Seite 98 CE, CCC	
Special Form Factors + High Temperature Rated	Series 602-11 Seite 102 CE, CCC		Series 610...613-11 Seite 102 CE, CCC	
Wireless System				
Mechanical and Inductive Replacement Switching Elements (Replacement Kits)	page 112...	page 112...	page 112...	
Cam Trays and Cams	page 120...	page 120...	page 120...	
Connectors and Function Indicators	page 128...	page 128...	page 128...	
Features	– Mounting and function dimensions per DIN 43697 – IO-Link on request	– Smaller flange dimensions compared with Series 100 – Smaller cable wiring chamber – IO-Link on request	– Compact housing with smaller cable wiring chamber – IO-Link on request	

	Series 72 page 36 CE, CCC, CSA	Series 46 page 38 CE, CCC, CSA	Series 40 page 40 CE, CCC, CSA	Series F 60 page 42 CE, CCC	Series 99/100 page 44 CE, CCC
	Series 72 page 54 CE, CCC, CSA			Series F 60 page 56 CE, CCC	
		Series 46 page 60 CE	Series 40 page 62 CE		Series 99/100 page 64 CE
	Series 605-11 page 84 CE, CCC	Series 603-11 page 86 CE, CCC	Series 650-11 page 88 CE, CCC	Series 161/160-H3 page 90 CE	Series 340/341/344/346-H2 page 90 CE
	Series X603-...-605-11 page 99 CE, CCC				
	Series 605-11 page 102 CE, CCC	Series 603-11 page 103 CE, CCC	Series 650-11 page 103 CE, CCC		
				Series F 60 page 108 CE	Series 99 page 108 CE
	page 112...	page 112...	page 112...	page 112...	page 112...
	page 120...	page 120...	page 120...	page 120...	page 120...
	page 128...	page 128...	page 128...	page 128...	page 128...
	– Horizontal plunger arrangement	– Small housing with mounting flange – Smallest axis distance (spacing) – Switch elements for low power – IO-Link on request	– Small housing – Smallest axis distance (spacing) – Switch elements for low power – IO-Link on request	– Mounting and function dimensions per DIN 43693 – Compact position switch	– Smallest form factor – Switch elements for low power

Not for new applications. Still available for replacements.





more added value

– Long service life
– Rugged housing for extreme applications

Mechanical multiple position switches

30 Series 100 per DIN 43697
32 Series 62
34 Series 61
36 Series 72
38 Series 46
40 Series 40

Mechanical single position switches

42 Series F 60 per DIN 43693
44 Series 99 and Series 100

Multiple position switches per DIN 43697 for standard applications

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with wiper plate

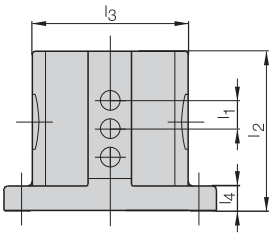
- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129)

Multiple position switches with function indication

- Function indication for dual voltage range option



Available sizes

Number of plungers		2	3	4	5	6	8	10	12
Dimension l_2 when	Dimension l_1 = 12 mm	70	80	90	105	120	140	170	200
	Dimension l_3	88	88	88	88	88	80	80	80
	Dimension l_4	14	14	14	14	14	20	20	20
	Dimension l_1 = 16 mm	70	90	105	120	140	170	200	240
	Dimension l_3	88	88	88	88	80	80	80	80
	Dimension l_4	14	14	14	14	20	20	20	20
Number of connectors	S80 without FD/FE	1	1	2	2	2			
	S80 with FD/FE	1	2	2	3	3			
	S90 without FD/FE	1	1	1	1	1	1	1	2
	S90 with FD/FE	1	1	1	1	1	1	2	2
	S4 without FD (IO-Link)	1	1	1	1	1	1	1	1
	S4 with FD (IO-Link)	1	1	1	1	1	1	1	1

Dimensions in mm

Ordering example:
BNS 819-D02-D16-100-10-FE-S80R

BNS 819-D_ _-_ _ _-100-10-_ _-_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

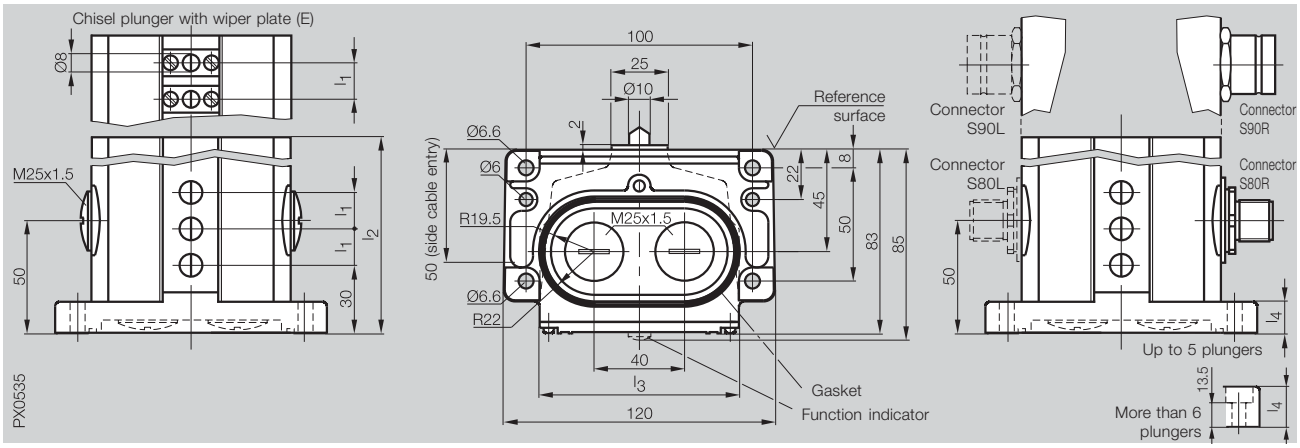
Plunger type
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

Plunger spacing
- **12** 12 mm
- **16** 16 mm

optional
Function indication
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left
- **S4R-I** 4-pin, right only for IO-Link
- **S4L-I** 4-pin, left only for IO-Link

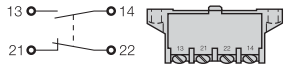
Type	Multiple position switch
Plunger spacing	12 mm or 16 mm
Mounting and function dimensions	per DIN 43697



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

IO-Link

You can find more information in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

With switch element	**BSE 30.0**
Ordering code	BNS 819-D_ _-_ _ _-100-**10**-_ _-_ _ _ _
Wiring diagram, style	

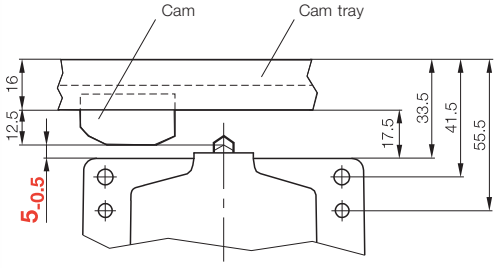
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		8 mm
Switchpoint to reference surface		6 mm
Maximum plunger travel D, K, R, L		5.5 mm
Maximum plunger travel E		4 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger E	30 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, E, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches for standard applications

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with wiper plate

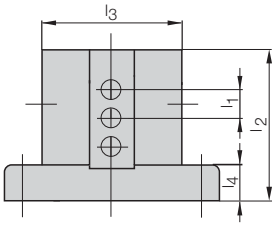
- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M20×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128)

Multiple position switches with function indication

- Function indication for dual voltage range option



Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when	Dimension l_1 = 12 mm	64	72	84	96	112	130	160
	Dimension l_3	88	88	88	88	88	80	80
	Dimension l_4	14	14	14	14	14	20	20
	Dimension l_1 = 16 mm	64	84	96	112	130	160	192
	Dimension l_3	88	88	88	88	80	80	80
	Dimension l_4	14	14	14	14	20	20	20
Number of connectors	S80 without FD/FE	1	1	2	2	2		
	S80 with FD/FE	1	2	2	3	3		
	S90 without FD/FE	1	1	1	1	1	1	1
	S90 with FD/FE	1	1	1	1	1	1	2
	S4 without FD (IO-Link)	1	1	1	1	1	1	1
	S4 with FD (IO-Link)	1	1	1	1	1	1	1

Dimensions in mm

Ordering example:
BNS 819-D04-D12-62-10-FD-S80R

BNS 819-D_ _-_ _ _-62-10-_ _-_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

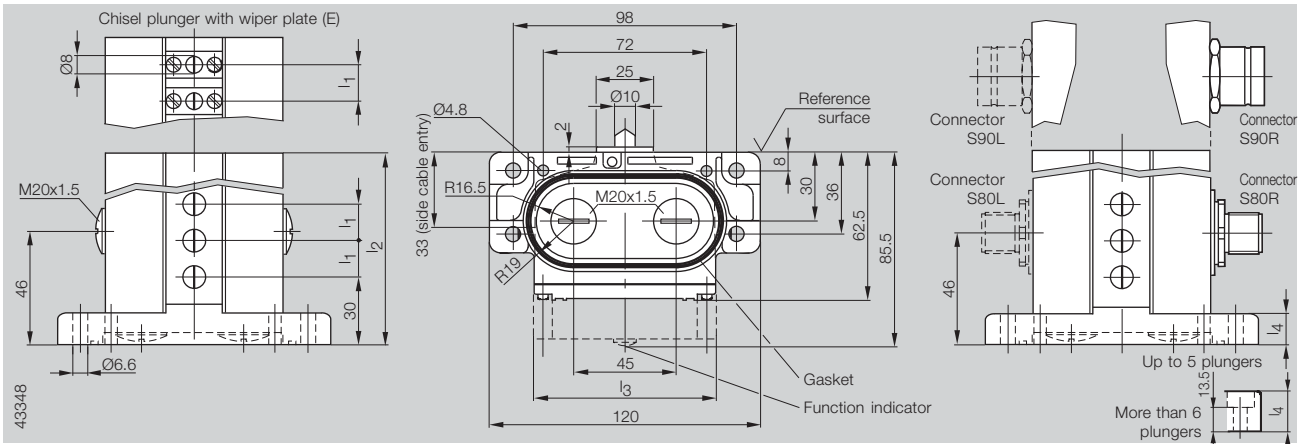
Plunger type
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

Plunger spacing
- **12** 12 mm
- **16** 16 mm

optional
Function indication
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left
- **S4R-I** 4-pin, right only for IO-Link
- **S4L-I** 4-pin, left only for IO-Link

Type	Multiple position switch
Plunger spacing	12 mm or 16 mm

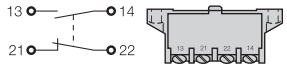


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

IO-Link

You can find more information in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

With switch element	**BSE 30.0**
Ordering code	BNS 819-D_ _-_ _ _-62-**10**-_ _-_ _ _ _
Wiring diagram, style	



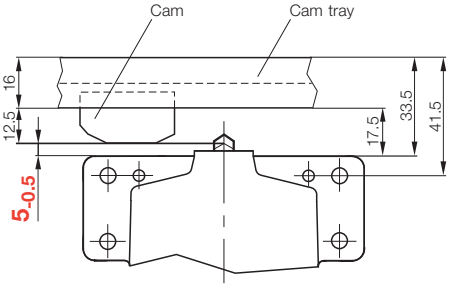
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		8 mm
Switchpoint to reference surface		6 mm
Maximum plunger travel D, K, R, L		5.5 mm
Maximum plunger travel E		4 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger E	30 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, E, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches for standard applications

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M20×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

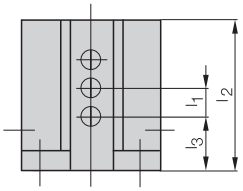
Multiple position switches with function indication

- Function indication for dual voltage range option

Available sizes

No. of plungers	Plunger spacing	Housing B Standard		Housing B		Housing C		Number of connectors S80 without FD/FE	Number of connectors S80 with FD/FE	Number of connectors S90 without FD/FE	Number of connectors S90 with FD/FE	Number of connectors S4 without FD (IO-Link)	Number of connectors S4 with FD (IO-Link)
	Dimension	Dimension		Dimension		Dimension							
	l_1	l_2	l_3	l_2	l_3	l_2	l_3						
2	12	36	12	60	30	48	24	1	1	1	1	1	1
						60	30						
3	12	48	12	60	24	60	24	1	2	1	1	1	1
4	12	60	12					2	2	1	1	1	1
5	12	72	12					2	3	1	1	1	1
6	12	84	12					2	3	1	1	1	1
2	16	48	16	60	30	60	30	1	1	1	1	1	1
3	16	72	16					1	2	1	1	1	1
4	16	84	16					2	2	1	1	1	1

Dimensions in mm



Ordering example:
BNS 819-B04-D12-61-12-10-FD-S80R

BNS 819-_ _ _-_ _ _-61-_ _-10-_ _-_ _ _ _

Housing style
- **B** Standard 2× M20×1.5 on side
- **B** 3× M20×1.5 on side and in flange
- **C** 2× M20×1.5 on side and cable entry in flange

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger type
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

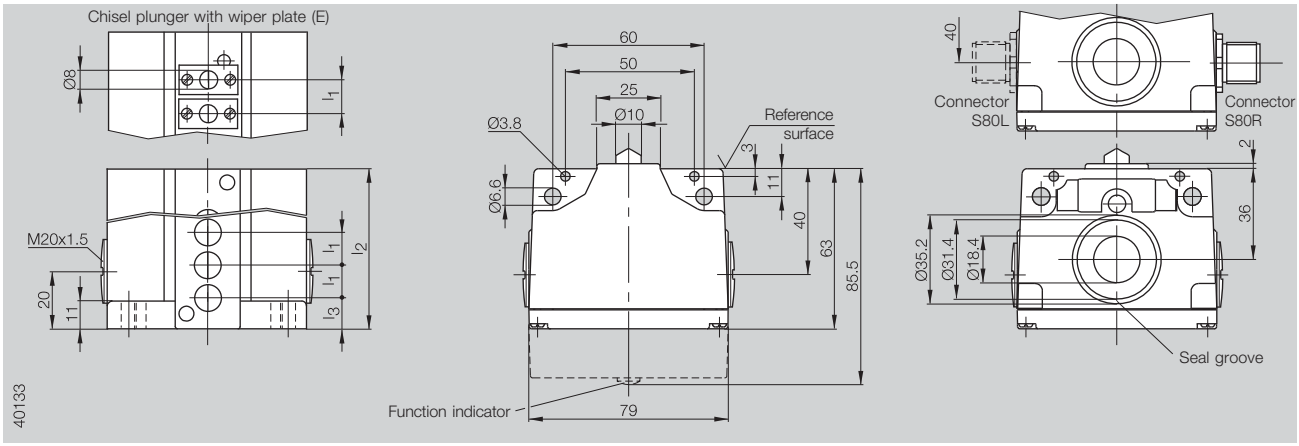
Plunger spacing
- **12** 12 mm
- **16** 16 mm

Distance l_3
- **12** 12 mm
- **16** 16 mm
- **24** 24 mm
- **30** 30 mm

optional **Function indication**
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

optional **Connector**
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left
- **S4R-I** 4-pin, right only for IO-Link
- **S4L-I** 4-pin, left only for IO-Link

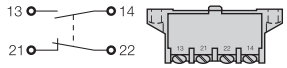
Type	Multiple position switch
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

IO-Link

You can find more information in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

With switch element	**BSE 30.0**
Ordering code	BNS 819-_ _ _-_ _ _-61-_ _-**10**-_ _-_ _ _ _
Wiring diagram, style	

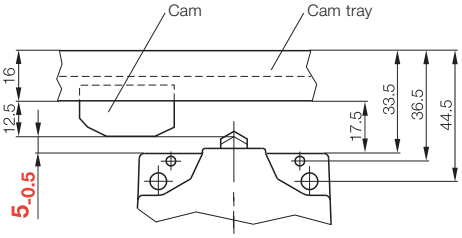
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		8 mm
Switchpoint to reference surface		6 mm
Maximum plunger travel D, K, R, L		5.5 mm
Maximum plunger travel E		4 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger E	30 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, E, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches for standard applications

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with wiper plate

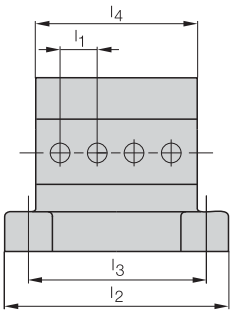
- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Multiple position switches with function indication

- Function indication for dual voltage range option



Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when l_1 = 12 mm		84	84	100	116	132	164	180
Dimension l_3 when l_1 = 12 mm		66	66	82	98	114	146	162
Dimension l_4 when l_1 = 12 mm		54	54	68	84	100	132	148
Dimension l_2 when l_1 = 16 mm		84	100	116	132	148	180	212
Dimension l_3 when l_1 = 16 mm		66	82	98	114	130	162	194
Dimension l_4 when l_1 = 16 mm		54	68	84	100	116	148	180
Number of connectors	S80 without FD/FE	1	1	2	2	2		
	S80 with FD/FE	1	2	2	3	3		
	S90 without FD/FE	1	1	1	1	1	1	2
	S90 with FD/FE	1	1	1	1	1	2	2

Dimensions in mm

Ordering example:
BNS 819-B04-D12-72-10-FD-S80R

BNS 819-B_ _-_ _ _-72-10-_ _-_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

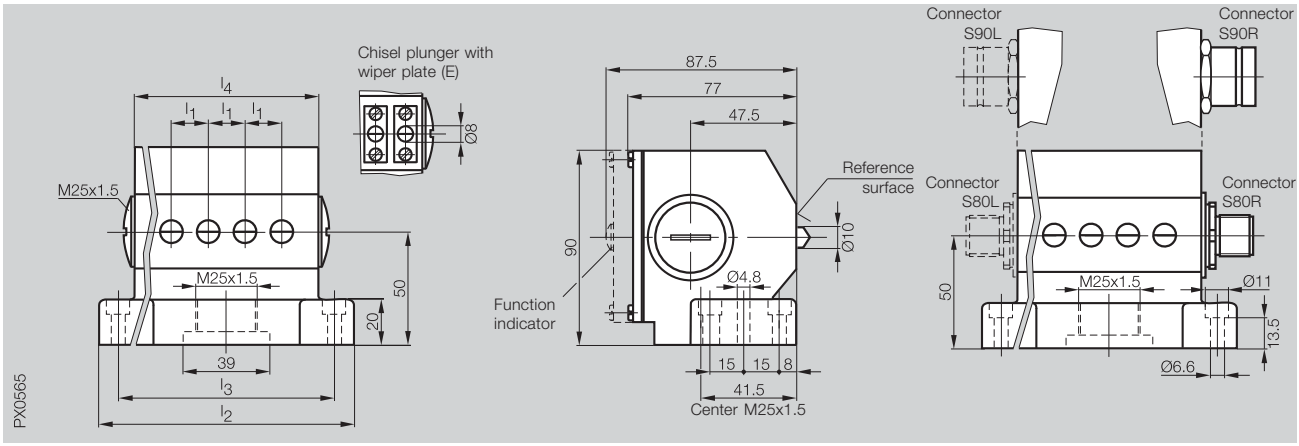
Plunger spacing
- **12** 12 mm
- **16** 16 mm

optional
Function indication
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left

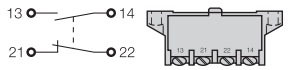
Not for new applications.
Still available for replacements.

Type	Multiple position switch
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

With switch element	**BSE 30.0**
Ordering code	BNS 819-B_ _-_ _ _-72-**10**-_ _-_ _ _ _
Wiring diagram, style	



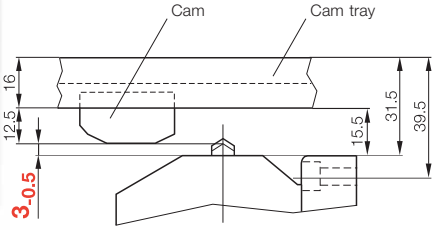
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		6 mm
Switchpoint to reference surface		4 mm
Maximum plunger travel D, K, R, L		5.5 mm
Maximum plunger travel E		4 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger E	30 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, E, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $3_{-0.5}$ is especially critical.

Multiple position switches for standard applications

- Smallest plunger spacing for mechanical multiple position switches (8 mm or 10 mm)
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with wiper plate

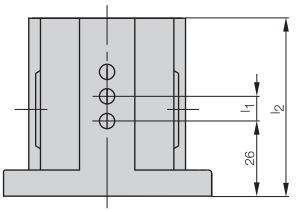
- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M16×1.5 on side and in flange (Scope of delivery: Seals and cover screws)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Switching elements for low-current applications

Snap switch elements BSE 73.1 or BSE 74.1 have specially formed gold contacts making them suitable for low currents ≥ 10 mA.



Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when	Dimension l_1 = 8 mm	49	59	64	72	80	96	112
	Dimension l_3	54	54	54	54	54	50	50
	Dimension l_1 = 10 mm	49	59	72	80	89	112	129
	Dimension l_3	54	54	54	54	50	50	50
Number of connectors	S80 without FC	1	1	2	2	2		
	S80 with FC	1	2	2	3	3		
	S4 without FC (IO-Link)	1	1	1	1	1	1	1
	S4 with FC (IO-Link)	1	1	1	1	1	1	1

Dimensions in mm
Size 12× with 8 mm spacing on request.

Ordering example:
BNS 819-B04-D08-46-11-FC-S80R

BNS 819-B_ _-_ _ _-46-1_-_ _-_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **E** Chisel with wiper plate

Plunger spacing
- **08** 8 mm
- **10** 10 mm

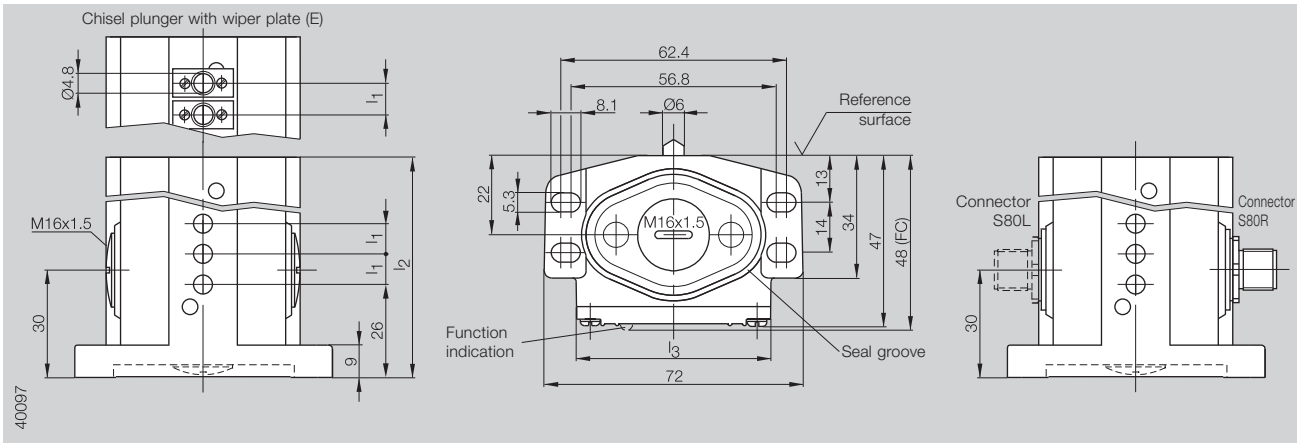
Switch elements
- **0** BSE 69.1
- **1** BSE 70.1
- **2** BSE 73.1
- **3** BSE 74.1

optional
Function indication
- **FC** 6...24 V DC

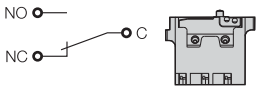
optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S4R-I** 4-pin, right only for IO-Link
- **S4L-I** 4-pin, left only for IO-Link

Only with BSE 69.1 or BSE 73.1.

Type	Multiple position switch
Plunger spacing	8 mm or 10 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...24 V DC (**FC**)

With switch element	**BSE 69.1**	**BSE 73.1**	**BSE 70.1**	**BSE 74.1**
Ordering code	BNS 819-...-46-1**0**	BNS 819-...-46-1**2**	BNS 819-...-46-1**1**	BNS 819-...-46-1**3**
Wiring diagram, style				

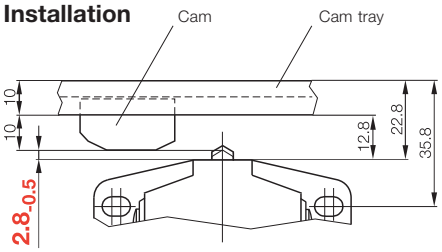
Switch element					
Contact material	Silver	Gold	Silver	Gold
Switching principle	Snap switch		Snap switch	
Contact system	Single-pole changeover		Single-pole changeover	
Connection type	Solder connection		Screw terminal	
Electrical data	see page113		see page 113	
Approval	UL, CSA, CCC		UL, CSA, CCC	

Mechanical data			
Plunger point to reference surface	4 mm	4 mm
Switchpoint to reference surface	3.5 mm	3.5 mm
Maximum plunger travel	3.5 mm	3.5 mm
Switching actuating force on plunger	min. 8 N	min. 8 N
Switching frequency	max. 200/min	max. 200/min
Approach speed — Plunger D	20 m/min	20 m/min
Approach speed — Plunger E	10 m/min	10 m/min
Approach speed — Plunger K	9 m/min	9 m/min
Approach speed — Plunger R	60 m/min	60 m/min
Repeatability — Plunger D, E	±0.02 mm	±0.02 mm
Repeatability — Plunger K	±0.03 mm	±0.03 mm
Repeatability — Plunger R	±0.05 mm	±0.05 mm

IO-Link

You can find more information in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

Installation



Note!
To ensure switching function, the dimension $2.8_{-0.5}$ is especially critical.

Multiple position switches for standard applications

- Smallest plunger spacing for electromechanical multiple position switches (8 mm)
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with wiper plate

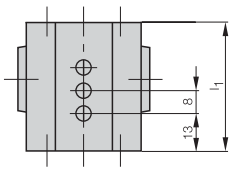
- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M16×1.5 on side (Scope of delivery: Seals and cover screws)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Switching elements for low-current applications

Snap switch elements BSE 73.1 or BSE 74.1 have specially formed gold contacts making them suitable for low currents ≥ 10 mA.



Available sizes

Number of plungers		2	3	4	5	6
Dimension l_1		34	42	50	58	66
Number of connectors	S80 without FC	1	1	2	2	2
	S80 with FC	1	2	2		
	S4 without FC (IO-Link)	1	1	1	1	1
	S4 with FC (IO-Link)	1	1	1	1	1

Dimensions in mm

Ordering example:
BNS 819-B04-D08-40-10-FC-S80R

BNS 819-B_ _-_ _ _-40-1_-_ _-_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **E** Chisel with wiper plate

Plunger spacing
- **08** 8 mm

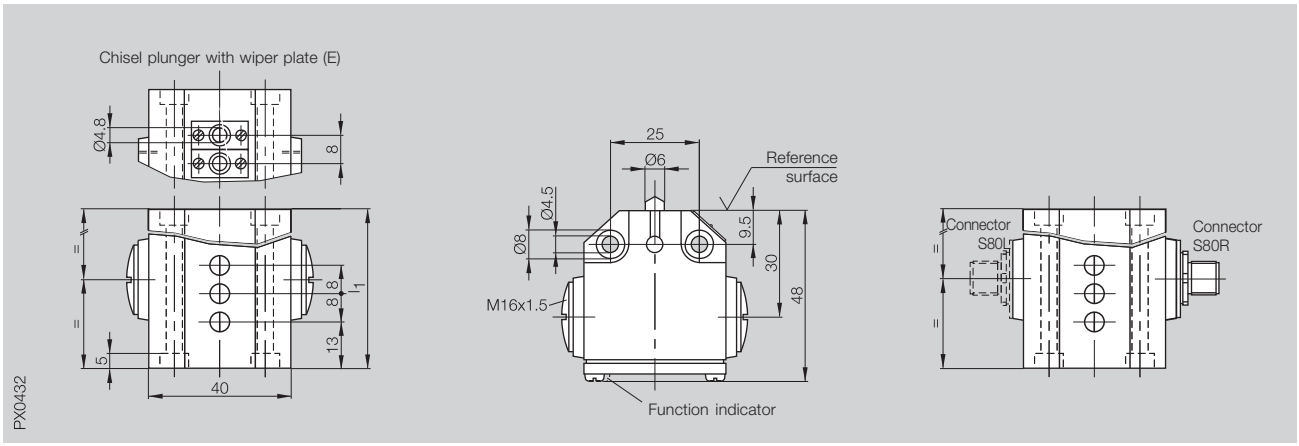
Switch elements
- **0** BSE 69.1
- **1** BSE 70.1
- **2** BSE 73.1
- **3** BSE 74.1

optional
Function indication
- **FC** 6...24 V DC

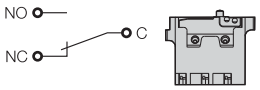
optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S4R-I** 4-pin, right only for IO-Link
- **S4L-I** 4-pin, left only for IO-Link

Only with BSE 69.1 or BSE 73.1.

Type	Multiple position switch
Plunger spacing	8 mm



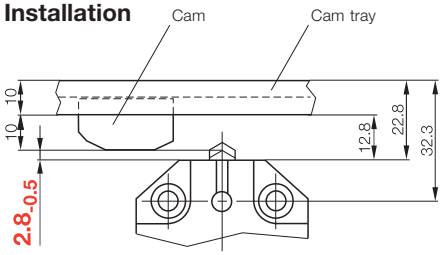
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...24 V DC (**FC**)

With switch element	**BSE 69.1**	**BSE 73.1**	**BSE 70.1**	**BSE 74.1**
Ordering code	BNS 819-...-40-1**0**	BNS 819-...-40-1**2**	BNS 819-...-40-1**1**	BNS 819-...-40-1**3**
Wiring diagram, style				

Switch element					
Contact material		Silver	Gold	Silver	Gold
Switching principle		Snap switch		Snap switch	
Contact system		Single-pole changeover		Single-pole changeover	
Connection type		Solder connection		Screw terminal	
Electrical data		see page113		see page 113	
Approval		UL, CSA, CCC		UL, CSA, CCC	
Mechanical data					
Plunger point to reference surface		4 mm		4 mm	
Switchpoint to reference surface		3.5 mm		3.5 mm	
Maximum plunger travel		3.5 mm		3.5 mm	
Switching actuating force on plunger		min. 8 N		min. 8 N	
Switching frequency		max. 200/min		max. 200/min	
Approach speed	Plunger D	20 m/min		20 m/min	
	Plunger E	10 m/min		10 m/min	
	Plunger K	9 m/min		9 m/min	
	Plunger R	60 m/min		60 m/min	
Repeata-bility	Plunger D, E	±0.02 mm		±0.02 mm	
	Plunger K	±0.03 mm		±0.03 mm	
	Plunger R	±0.05 mm		±0.05 mm	

IO-Link
For additional information see IO-Link brochure!

Installation



Note!
To ensure switching function, the dimension $2.8_{-0.5}$ is especially critical.

Single position switches per DIN 43693 for standard applications

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- Plunger can be rotated in two approach directions

Single position switch with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

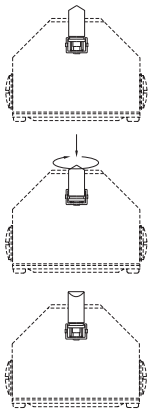
- Thread for cable gland M16×1.5
  (Scope of delivery: Seals and cover screws)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Single position switch with function indicator

- Function indication for dual voltage range option

Approach from two directions possible (parallel and diagonally)

Press plunger down and turn to desired direction; release plunger.



Ordering example:
BNS 819-FD-60-101-FE-S80R

BNS 819-F_-60-101-_ _-_ _ _ _

Plunger style

D	Chisel
K	Ball
R	Roller
L	Roller bearing
E	Chisel with wiper plate

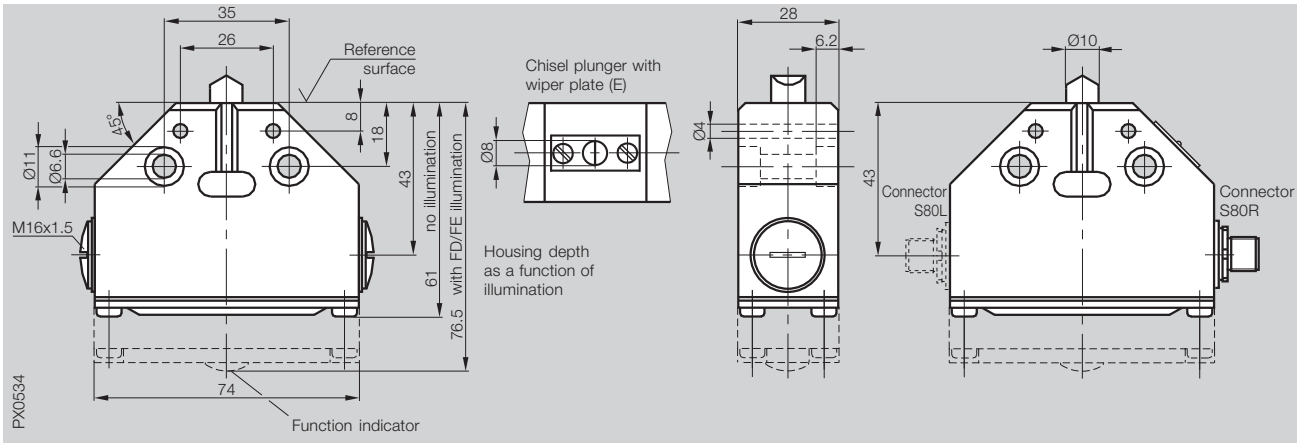
optional **Function indication**

FD	6...60 V AC/DC
FE	90...250 V AC/DC

optional **Connector**

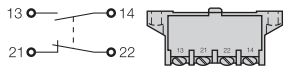
S80R	5-pin, right
S80L	5-pin, left

Type	Single position switch
Mounting and function dimensions	per DIN 43693



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

With switch element	**BSE 30.0**
Ordering code	BNS 819-F_-60-**101**-_ _-_ _ _ _
Wiring diagram, style	



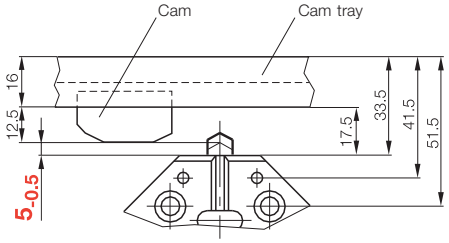
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		8 mm
Switchpoint to reference surface		6 mm
Maximum plunger travel D, K, R, L		7.5 mm
Maximum plunger travel E		4 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger E	30 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, E, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Single position switches for standard applications

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- Plunger can be rotated in two approach directions

Single position switch with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Switching elements for low-current applications

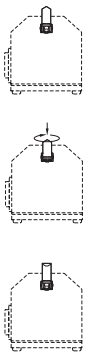
Snap switch elements BSE 73.1 or BSE 74.1 have specially formed gold contacts making them suitable for low currents ≥ 10 mA.

Connection variants

- Thread for cable gland M12×1.5 for series 99, Thread for cable gland M16×1.5 for series 100
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Approach from two directions possible (parallel and diagonally)

Press plunger down and turn to desired direction; release plunger.



Ordering example:
BNS 819-100-E-12-FC-S80

BNS 819-_ _ _-_-1_-_ _-_ _ _

Series
99 Series 99
100 Series 100

Plunger style
D Chisel
K Ball
R Roller
E Chisel with wiper plate

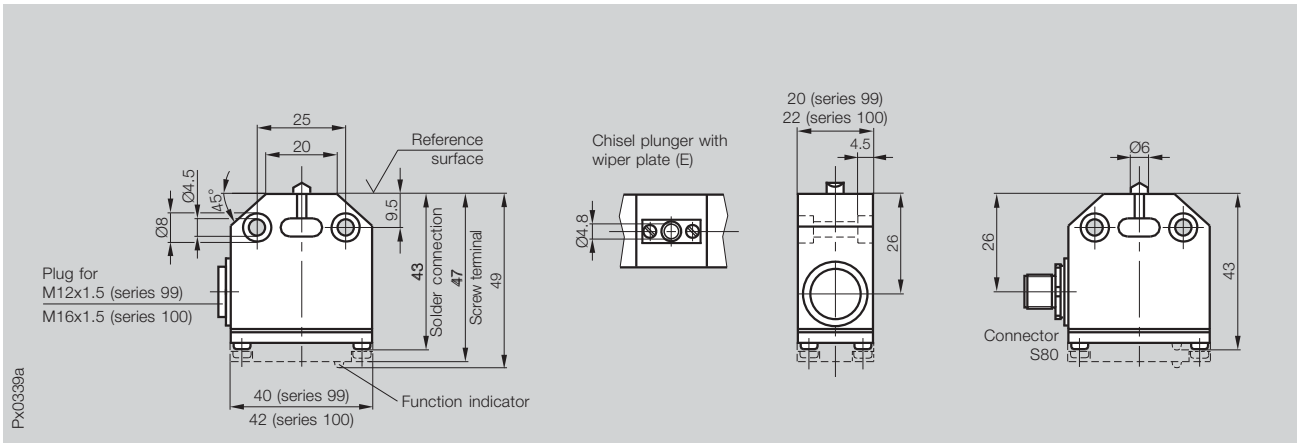
Switch elements
0 BSE 69.1
1 BSE 70.1
2 BSE 73.1
3 BSE 74.1

optional
Function indication
FC 6...24 V DC

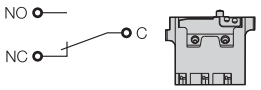
optional
Connector
S80 5-pin

Only with BSE 69.1 or BSE 73.1.

Type	Single position switch

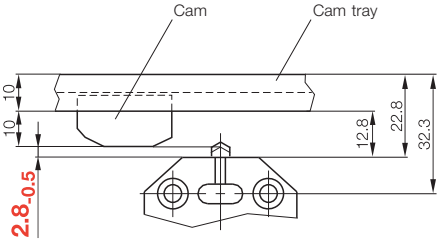


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	Cable gland (M12×1.5 series 99, M16×1.5 series 100) or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...24 V DC (**FC**)

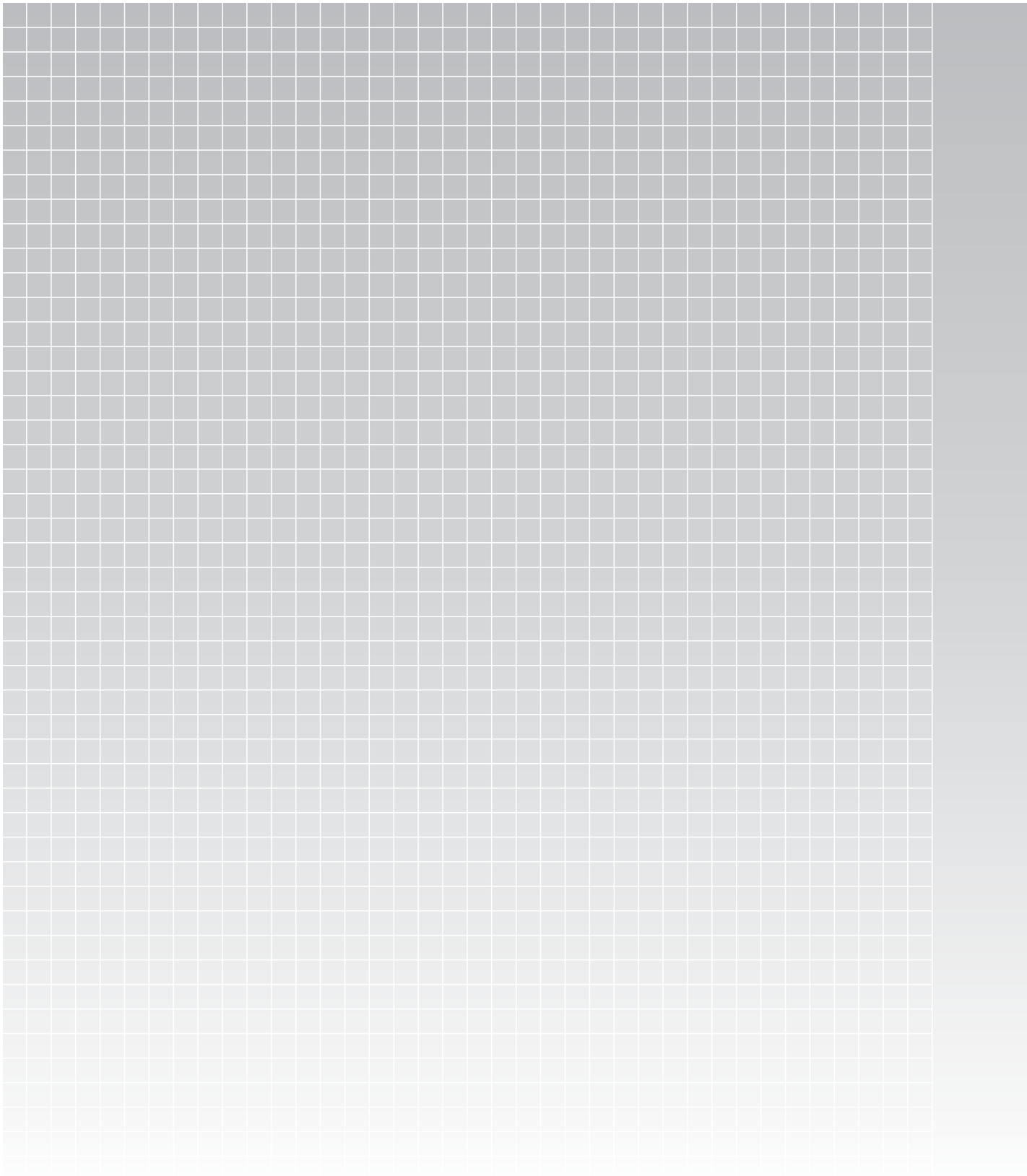
With switch element	**BSE 69.1**	**BSE 73.1**	**BSE 70.1**	**BSE 74.1**
Ordering code	BNS 819-99/100-_-1**0**	BNS 819-99/100-_-1**2**	BNS 819-99/100-_-1**1**	BNS 819-99/100-_-1**3**
Wiring diagram, style				

Switch element					
Contact material		Silver	Gold	Silver	Gold
Switching principle		Snap switch		Snap switch	
Contact system		Single-pole changeover		Single-pole changeover	
Connection type		Solder connection		Screw terminal	
Electrical data		see page 113		see page 113	
Approval		UL, CSA, CCC		UL, CSA, CCC	
Mechanical data					
Plunger point to reference surface		4 mm		4 mm	
Switchpoint to reference surface		3.5 mm		3.5 mm	
Maximum plunger travel		3.5 mm		3.5 mm	
Switching actuating force on plunger		min. 8 N		min. 8 N	
Switching frequency		max. 200/min		max. 200/min	
Approach speed	Plunger D	20 m/min		20 m/min	
	Plunger E	10 m/min		10 m/min	
	Plunger K	9 m/min		9 m/min	
	Plunger R	60 m/min		60 m/min	
Repeata-bility	Plunger D, E	±0.02 mm		±0.02 mm	
	Plunger K	±0.03 mm		±0.03 mm	
	Plunger R	±0.05 mm		±0.05 mm	

Installation



Note!
To ensure switching function, the dimension 2.8$^{-0.5}$ is especially critical.



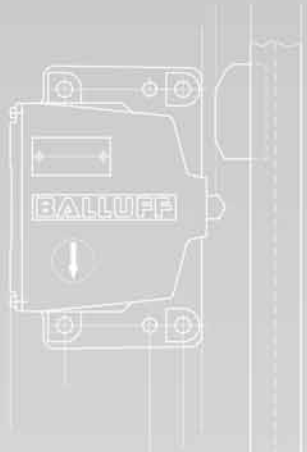
DIN EN 60204-1 VDE 0113

Mechanical multiple position switches with safety switch positions

48 Series 100 per DIN 43697
50 Series 62
52 Series 61
54 Series 72

Mechanical single position switches with safety switch position

56 Series F 60 per DIN 43693



more added value

– Long service life
– Positive-opening contacts for increased security

Multiple position switches per DIN 43697 with safety switch positions per DIN EN 60204-1/ VDE 0113

- Positive-opening contacts and rigid plungers for additional security per DIN EN 60204-1/VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with function indicator

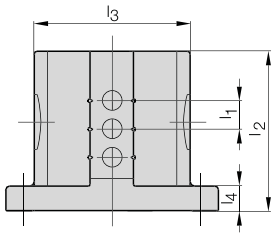
- Function indication for selectable three voltage ranges

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

Number of plungers		2	3	4	5	6	8	10	12
Dimension l_2 when	Dimension l_1 = 12 mm	70	80	90	105	120	140	170	200
	Dimension l_3	88	88	88	88	88	80	80	80
	Dimension l_4	14	14	14	14	14	20	20	20
	Dimension l_1 = 16 mm	70	90	105	120	140	170	200	240
	Dimension l_3	88	88	88	88	80	80	80	80
	Dimension l_4	14	14	14	14	20	20	20	20
Number of connectors*	S80 without FD/FE	1	1	2	2	2			
	S80 with FD/FE	1	2	2	3	3			
	S90 without FD/FE	1	1	1	1	1	1	1	2
	S90 with FD/FE	1	1	1	1	1	1	2	2

Dimensions in mm
*Number of connectors BSE 85 on request.

Ordering example:
BNS 813-D04-D12-100-20-03-FE-S80R

BNS 813-D_ _-_ _ _-100-_ _-_ _-_ _ -_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

Plunger spacing
- **12** 12 mm
- **16** 16 mm

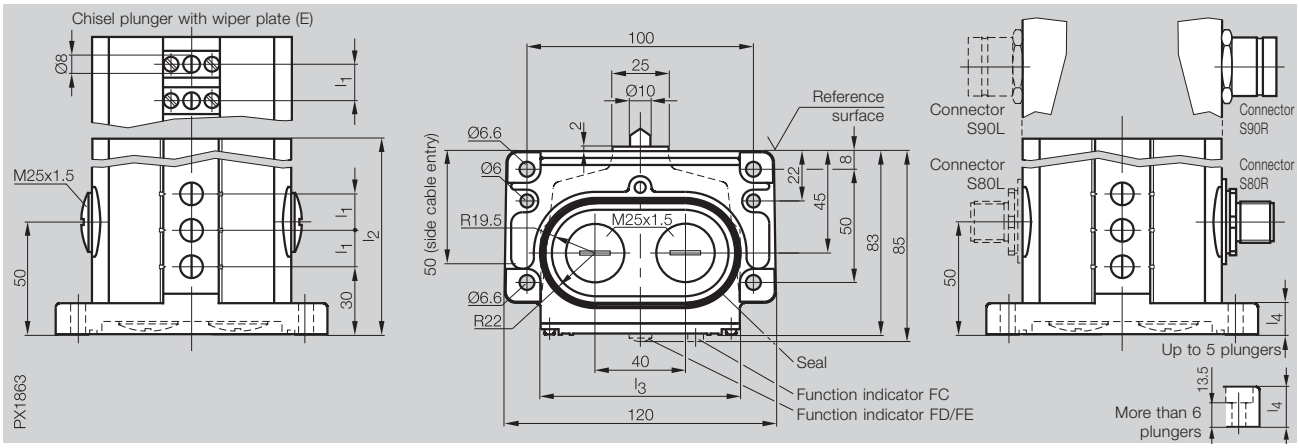
Switch elements
- **10** BSE 61 Remaining switch positions BSE 30.0
- **12** only BSE 61
- **20** BSE 85 Remaining switch positions BSE 30.0
- **22** only BSE 85

Safety switch elements
- No. from flange

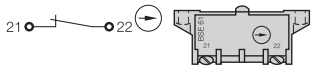
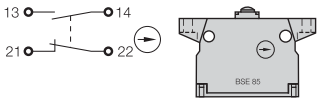
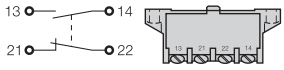
optional **Function indication**
- **FD** 6...60 V AC/DC (for BSE 30.0 and BSE 61)
- **FE** 90...250 V AC/DC (for BSE 30.0 and BSE 61)
- **FC** 6...24 V DC (only for BSE 85)

optional **Connector**
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left

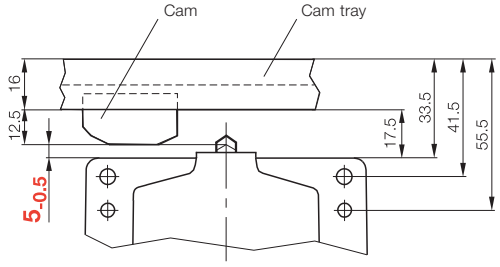
Type	Multiple position switch with positive-opening contacts
Plunger spacing	12 mm or 16 mm
Mounting and function dimensions	per DIN 43697



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**	**BSE 30.0**
Ordering code	BNS 813-D_ _ _ _-100-**1**_ _ _	BNS 813-D_ _ _ _-100-**2**_ _ _	BNS 813-D_ _ _ _-100-**0**_ _ _
Wiring diagram, style			
Switch element			
Contact material	Silver	Silver	Silver, gold plated
Switching principle	Creep switch, Positive-opening	Snap switch, positive opening (normally-closed)	Snap switch
Contact system	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double interruption), all galvanically isolated	dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112	see page 112	see page 112
Approval	CSA, CCC	cULus, CSA, CCC	UL, CSA, CCC
Mechanical data			
Plunger point to reference surface	8 mm	8 mm	8 mm
Switchpoint to reference surface	7 mm	6.5 mm	6 mm
Maximum plunger travel	4 mm	4 mm	5.5 mm
Assured opening after plunger travel	2.5 mm	2.5 mm	
Switching actuating force on plunger	min. 15 N	min. 30 N	min. 20 N
Switching frequency	max. 300/min	max. 160/min	max. 300/min
Approach speed – Plunger D	40 m/min	40 m/min	40 m/min
Approach speed – Plunger E	30 m/min	30 m/min	30 m/min
Approach speed – Plunger K	10 m/min	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min	120 m/min
Repeatability – Plunger D, E, K	±0.002 mm	±0.02 mm	±0.002 mm
Repeatability – Plunger R, L	±0.01 mm	±0.02 mm	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

1.2
Multiple position switches series
100
62
61
72
Single position switches series
F 60
5.1
5.2
5.3

Multiple position switches with safety switch positions per DIN EN 60204-1/VDE 0113

- Positive-opening contacts and rigid plungers for additional security per DIN EN 60204-1/VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with function indicator

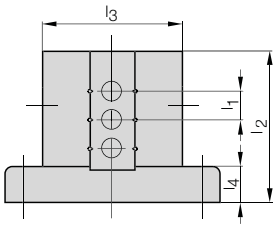
- Function indication for selectable three voltage ranges

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M20×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when	Dimension l_1 = 12 mm	64	72	84	96	112	130	160
	Dimension l_3	88	88	88	88	88	80	80
	Dimension l_4	14	14	14	14	14	20	20
	Dimension l_1 = 16 mm	64	84	96	112	130	160	192
	Dimension l_3	88	88	88	88	80	80	80
	Dimension l_4	14	14	14	14	20	20	20
Number of Connector*	S80 without FD/FE	1	1	2	2	2		
	S80 with FD/FE	1	2	2	3	3		
	S90 without FD/FE	1	1	1	1	1	1	2
	S90 with FD/FE	1	1	1	1	1	2	2

Dimensions in mm
*Number of connectors BSE 85 on request.

Ordering example:
BNS 813-D04-R12-62-10-02-FD-S80R

BNS 813-D_ _-_ _ _-62-_ _-_ _-_ _-_ _-_ _ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

Plunger spacing
- **12** 12 mm
- **16** 16 mm

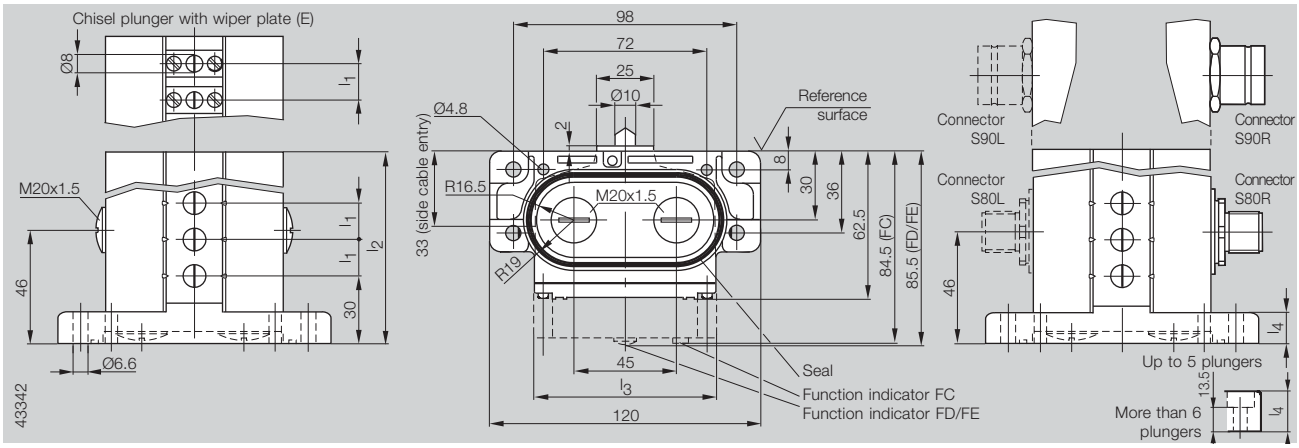
Switch elements
- **10** BSE 61 Remaining switch positions BSE 30.0
- **12** only BSE 61
- **20** BSE 85 Remaining switch positions BSE 30.0
- **22** only BSE 85

Safety switch elements
- No. from flange

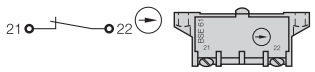
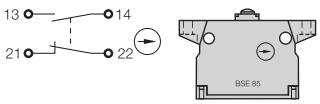
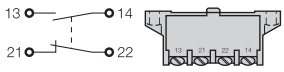
optional **Function indication**
- **FD** 6...60 V AC/DC (for BSE 30.0 and BSE 61)
- **FE** 90...250 V AC/DC (for BSE 30.0 and BSE 61)
- **FC** 6...24 V DC (only for BSE 85)

optional **Connector**
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left

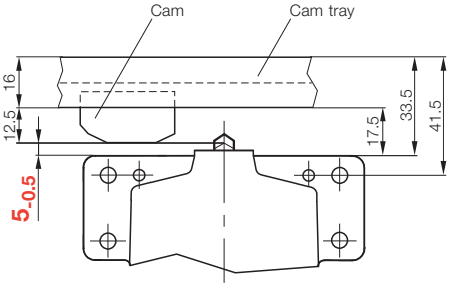
Type	Multiple position switch with positive-opening contacts
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**	**BSE 30.0**
Ordering code	BNS 813-D_ _-_ _ _-62-**1**_ _-_ _ _	BNS 813-D_ _-_ _ _-62-**2**_ _-_ _ _	BNS 813-D_ _-_ _ _-62-**0**_ _-_ _ _
Wiring diagram, style			
Switch element			
Contact material	Silver	Silver	Silver, gold plated
Switching principle	Creep switch, positive-opening	Snap switch, positive opening (normally-closed)	Snap switch
Contact system	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double interruption), all galvanically isolated	dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112	see page 112	see page 112
Approval	CSA, CCC	cULus, CSA, CCC	UL, CSA, CCC
Mechanical data			
Plunger point to reference surface	8 mm	8 mm	8 mm
Switchpoint to reference surface	7 mm	6,5 mm	6 mm
Maximum plunger travel	4 mm	4 mm	5.5 mm
Assured opening after plunger travel	2.5 mm	2.5 mm	
Switching actuating force on plunger	min. 15 N	min. 30 N	min. 20 N
Switching frequency	max. 300/min	max. 160/min	max. 300/min
Approach speed – Plunger D	40 m/min	40 m/min	40 m/min
Approach speed – Plunger E	30 m/min	30 m/min	30 m/min
Approach speed – Plunger K	10 m/min	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min	120 m/min
Repeatability – Plunger D, E, K	±0.002 mm	±0.02 mm	±0.002 mm
Repeatability – Plunger R, L	±0.01 mm	±0.02 mm	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches with safety switch positions per DIN EN 60204-1/VDE 0113

- Positive-opening contacts and rigid plungers for additional security per DIN EN 60204-1/ VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with function indicator

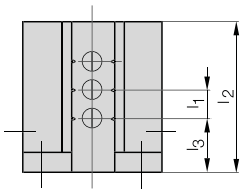
- Function indication for selectable three voltage ranges

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M20×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

No. of plungers	Plunger spacing Dimension	Housing B Standard Dimension		Housing B Dimension		Housing C Dimension		Number of connectors* S80 without FD/FE	Number of connectors* S80 with FD/FE	Number of connectors* S90 without FD/FE	Number of connectors* S90 with FD/FE
	l_1	l_2	l_3	l_2	l_3	l_2	l_3				
2	12	36	12	60	30	48	24	1	1	1	1
						60	30				
3	12	48	12	60	24	60	24	1	2	1	1
4	12	60	12					2	2	1	1
5	12	72	12					2	3	1	1
6	12	84	12					2	3	1	1
2	16	48	16	60	30	60	30	1	1	1	1
3	16	72	16					1	2	1	1
4	16	84	16					2	2	1	1

Dimensions in mm

*Number of connectors BSE 85 on request.

Ordering example:
BNS 813-B06-K12-61-A-12-02-FE-S80R

BNS 813-_ _ _-_ _ _-61-_-_ _-_ _-_ _ _ _

Housing style
- **B** Standard 2× M20×1.5 on side
- **B** 3× M20×1.5 on side and in flange
- **C** 2× M20×1.5 on side and cable entry in flange

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing
- **E** Chisel with wiper plate

Plunger spacing
- **12** 12 mm
- **16** 16 mm

Distance l_3
- **A** 12 mm
- **B** 16 mm
- **C** 24 mm
- **D** 30 mm

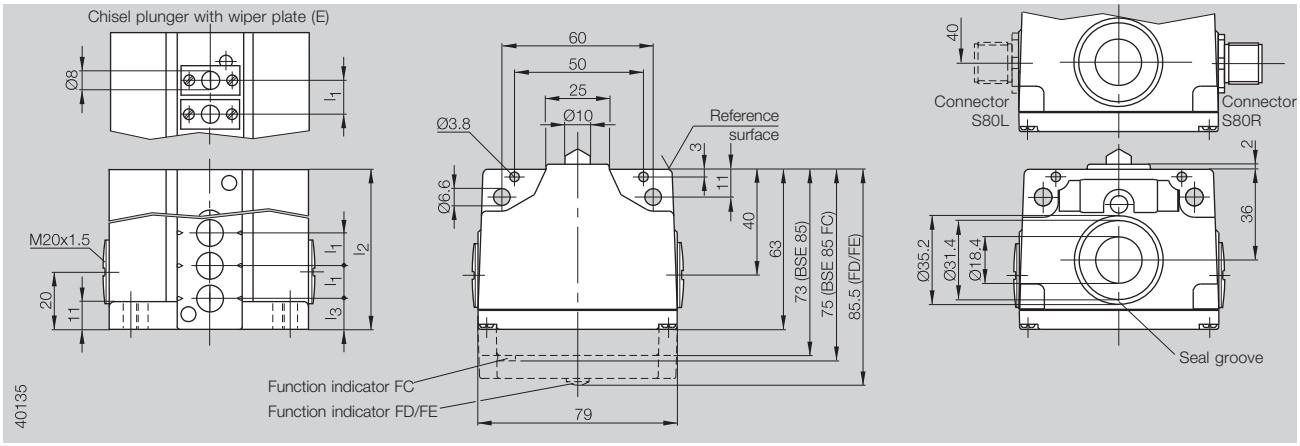
Switching elements
- **10** BSE 61 Remaining switch positions BSE 30.0
- **12** only BSE 61
- **20** BSE 85 Remaining switch positions BSE 30.0
- **22** only BSE 85

Safety switch elements
- No. from flange

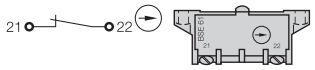
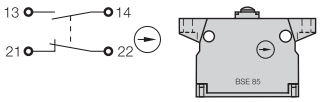
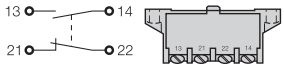
optional **Function indication**
- **FD** 6...60 V AC/DC (for BSE 30.0 and BSE 61)
- **FE** 90...250 V AC/DC (for BSE 30.0 and BSE 61)
- **FC** 6...24 V DC (only for BSE 85)

optional **Connector**
- **S80R** 5-pin, right
- **S80L** 5-pin, link
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left

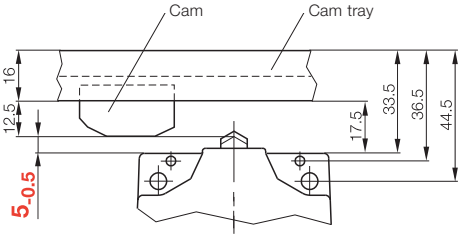
Type	Multiple position switch with positive-opening contacts
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**	**BSE 30.0**
Ordering code	BNS 813-_ _ _ _-61-**1**_ _ _	BNS 813-_ _ _ _-61-**2**_ _ _	BNS 813-_ _ _ _-61-**0**_ _
Wiring diagram, style			
Switch element			
Contact material	Silver	Silver	Silver, gold plated
Switching principle	Creep switch, positive-opening	snap switch, positive opening (normally-closed)	Snap switch
Contact system	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double interruption), all galvanically isolated	dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112	see page 112	see page 112
Approval	CSA, CCC	cULus, CSA, CCC	UL, CSA, CCC
Mechanical data			
Plunger point to reference surface	8 mm	8 mm	8 mm
Switchpoint to reference surface	7 mm	6.5 mm	6 mm
Maximum plunger travel	4 mm	4 mm	5.5 mm
Assured opening after plunger travel	2.5 mm	2.5 mm	
Switching actuating force on plunger	min. 15 N	min. 30 N	min. 20 N
Switching frequency	max. 300/min	max. 160/min	max. 300/min
Approach speed – Plunger D	40 m/min	40 m/min	40 m/min
Approach speed – Plunger E	30 m/min	30 m/min	30 m/min
Approach speed – Plunger K	10 m/min	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min	120 m/min
Repeatability – Plunger D, E, K	±0.002 mm	±0.02 mm	±0.002 mm
Repeatability – Plunger R, L	±0.01 mm	±0.02 mm	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

1.2
Multiple position switches series
100
62
61
72
Single position switches series
F 60
5.1
5.2
5.3

Multiple position switches with safety switch positions per DIN EN 60204-1/VDE 0113

- Positive-opening contacts and rigid plungers for additional security per DIN EN 60204-1/VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Multiple position switches with function indicator

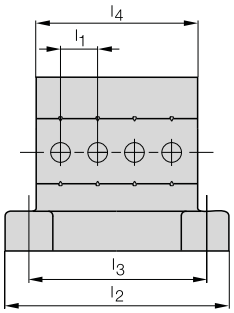
- Function indication for selectable three voltage ranges

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when l_1 = 12 mm		84	84	100	116	132	164	180
Dimension l_3 when l_1 = 12 mm		66	66	82	98	114	146	162
Dimension l_4 when l_1 = 12 mm		54	54	68	84	100	132	148
Dimension l_2 when l_1 = 16 mm		84	100	116	132	148	180	212
Dimension l_3 when l_1 = 16 mm		66	82	98	114	130	162	194
Dimension l_4 when l_1 = 16 mm		54	68	84	100	116	148	180
Number of Connector*	S80 without FD/FE	1	1	2	2	2		
	S80 with FD/FE	1	2	2	3	3		
	S90 without FD/FE	1	1	1	1	1	1	1
	S90 with FD/FE	1	1	1	1	1	1	2

Dimensions in mm
*Number of connectors BSE 85 on request.

Ordering example:
BNS 813-B04-R12-72-10-01-FD-S80R

BNS 813-B_ _-_ _ _-72-_ _-_ _-_ _-_ _ _ _

No. of plungers
02 2×
03 3×
04 4×
...

Plunger style
D Chisel
K Ball
R Roller
L Roller bearing
E Chisel with wiper plate

Plunger spacing
12 12 mm
16 16 mm

Switch elements
10 BSE 61 Remaining switch positions BSE 30.0
12 only BSE 61
20 BSE 85 Remaining switch positions BSE 30.0
22 only BSE 85

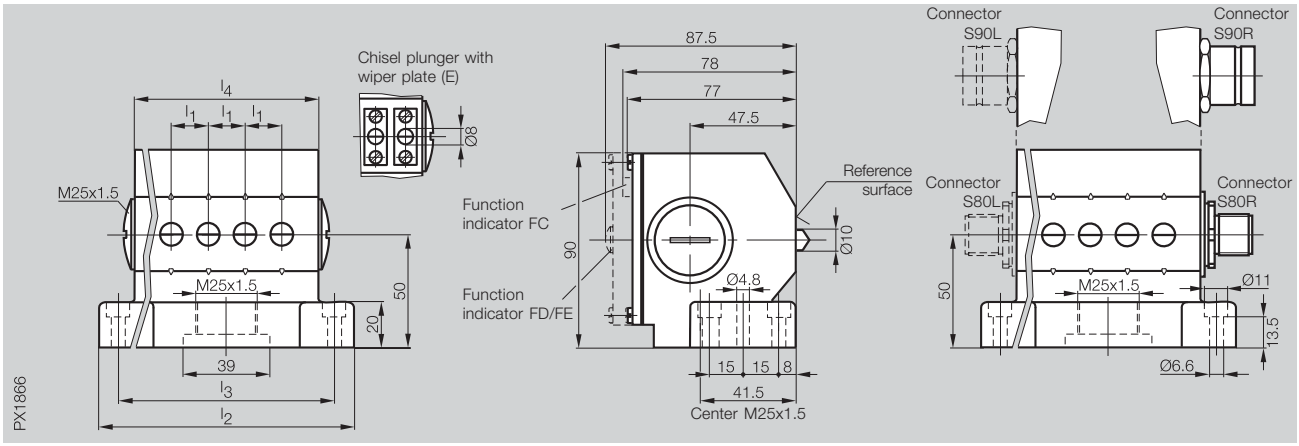
Safety switch elements
No. from flange

optional **Function indication**
FD 6...60 V AC/DC (for BSE 30.0 and BSE 61)
FE 90...250 V AC/DC (for BSE 30.0 and BSE 61)
FC 6...24 V DC (only for BSE 85)

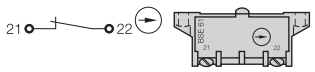
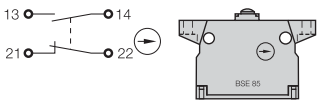
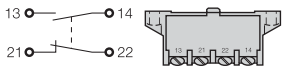
optional **Connector**
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left

Not for new applications.
Still available for replacements.

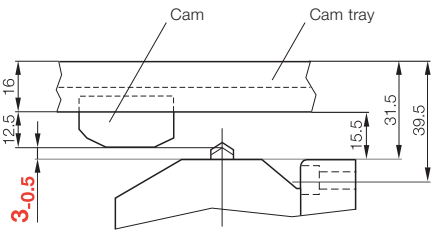
Type	Multiple position switch with positive-opening contacts
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**	**BSE 30.0**
Ordering code	BNS 813-B_ _ _ _-72-**1**_ _ _	BNS 813-B_ _ _ _-72-**2**_ _ _	BNS 813-B_ _ _ _-72-**0**_ _ _
Wiring diagram, style			
Switch element			
Contact material	Silver	Silver	Silver, gold plated
Switching principle	Creep switch, positive-opening	snap switch, positive opening (normally-closed)	Snap switch
Contact system	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double interruption), all galvanically isolated	dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112	see page 112	see page 112
Approval	CSA, CCC	cULus, CSA, CCC	UL, CSA, CCC
Mechanical data			
Plunger point to reference surface	6 mm	6 mm	6 mm
Switchpoint to reference surface	5 mm	4,5 mm	4 mm
Maximum plunger travel	4 mm	4 mm	5.5 mm
Assured opening after plunger travel	2.5 mm	2.5 mm	
Switching actuating force on plunger	min. 15 N	min. 30 N	min. 20 N
Switching frequency	max. 300/min	max. 160/min	max. 300/min
Approach speed – Plunger D	40 m/min	40 m/min	40 m/min
Approach speed – Plunger E	30 m/min	30 m/min	30 m/min
Approach speed – Plunger K	10 m/min	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min	120 m/min
Repeatability – Plunger D, E, K	±0.002 mm	±0.02 mm	±0.002 mm
Repeatability – Plunger R, L	±0.01 mm	±0.02 mm	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $3_{-0.5}$ is especially critical.

Single position switches per DIN 43693 with safety switch positions per DIN EN 60204-1/ VDE 0113

- Positive-opening contacts and rigid plungers for additional security per DIN EN 60204-1/VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- Plunger not rotatable, approach direction cannot be changed (see ordering code)

Single position switch with function indicator

- Function indication for selectable three voltage ranges

Single position switch with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M16×1.5 (Scope of delivery: Seals and cover screws)
- Connector (note permissible operating voltage for the connectors, see page 128)

* When using BNS... 186/187 with illumination, an S80 plug is not possible.

Ordering example:
BNS 813-FD-60-183-FD-S80R

BNS 813-F_-60-18_-_ _-_ _ _ _

Plunger style

D	Chisel
K	Ball
R	Roller
L	Roller bearing
E	Chisel with wiper plate

Switch elements

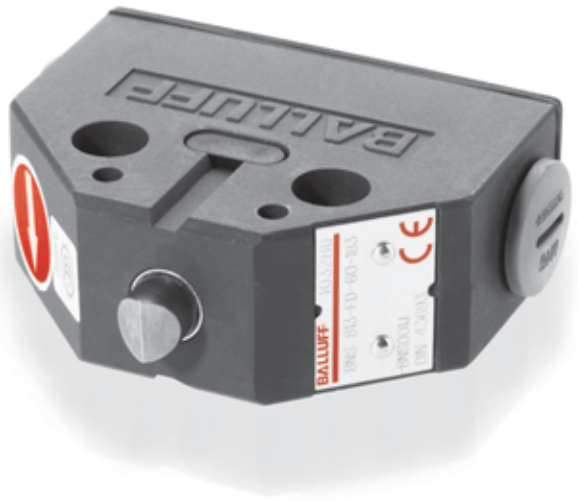
3	BSE 61 Approach direction longitudinal, parallel to mounting surface
5	BSE 61 Approach direction lateral, 90° to mounting surface
6	BSE 85* Approach direction longitudinal, parallel to mounting surface
7	BSE 85* Approach direction lateral, 90° to mounting surface

optional
Function indication

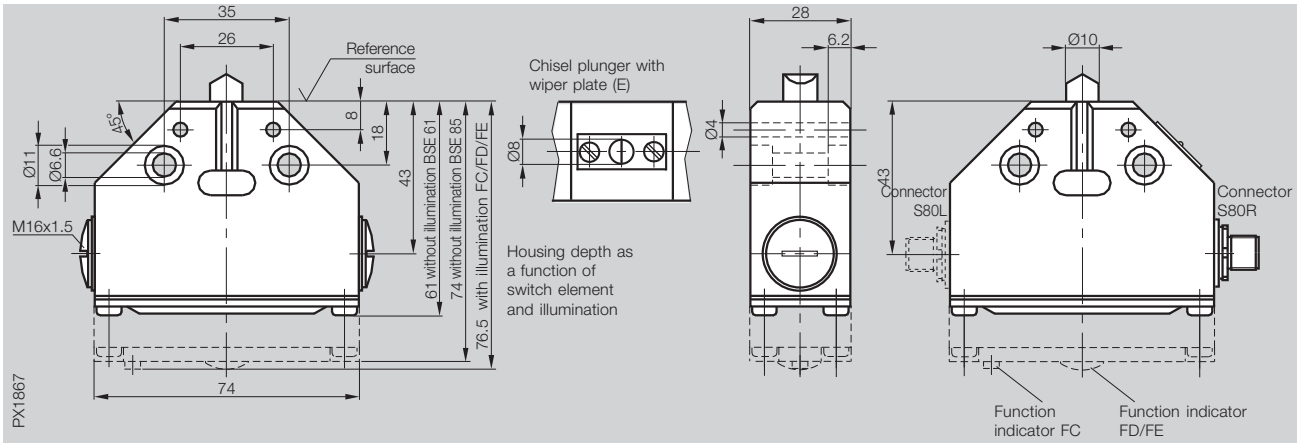
FD	6...60 V AC/DC (for BSE 61)
FE	90...250 V AC/DC (for BSE 61)
FC	6...24 V DC (for BSE 85)

optional
Connector

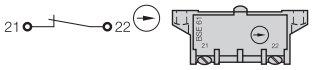
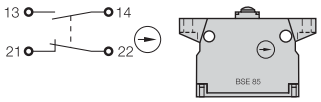
S80R	5-pin, right
S80L	5-pin, left



Type	Single position switch with positive-opening contacts
Mounting and function dimensions	per DIN 43693



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**
Ordering code	BNS 813-F_-60-**183/185**-_ _-_ _ _ _	BNS 813-F_-60-**186/187**-_ _-_ _ _ _
Wiring diagram, style		

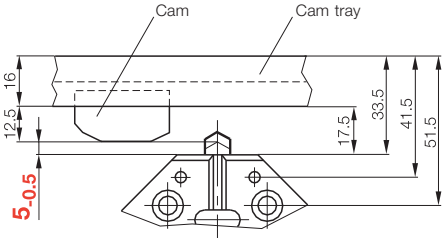
Switch element

Contact material		Silver	Silver
Switching principle		Creep switch, positive-opening	Snap switch, positive opening (normally-closed)
Contact system		Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double-interruption), all galvanically isolated
Electrical data		see page 112	see page 112
Approval		CSA, CCC	cULus, CSA, CCC

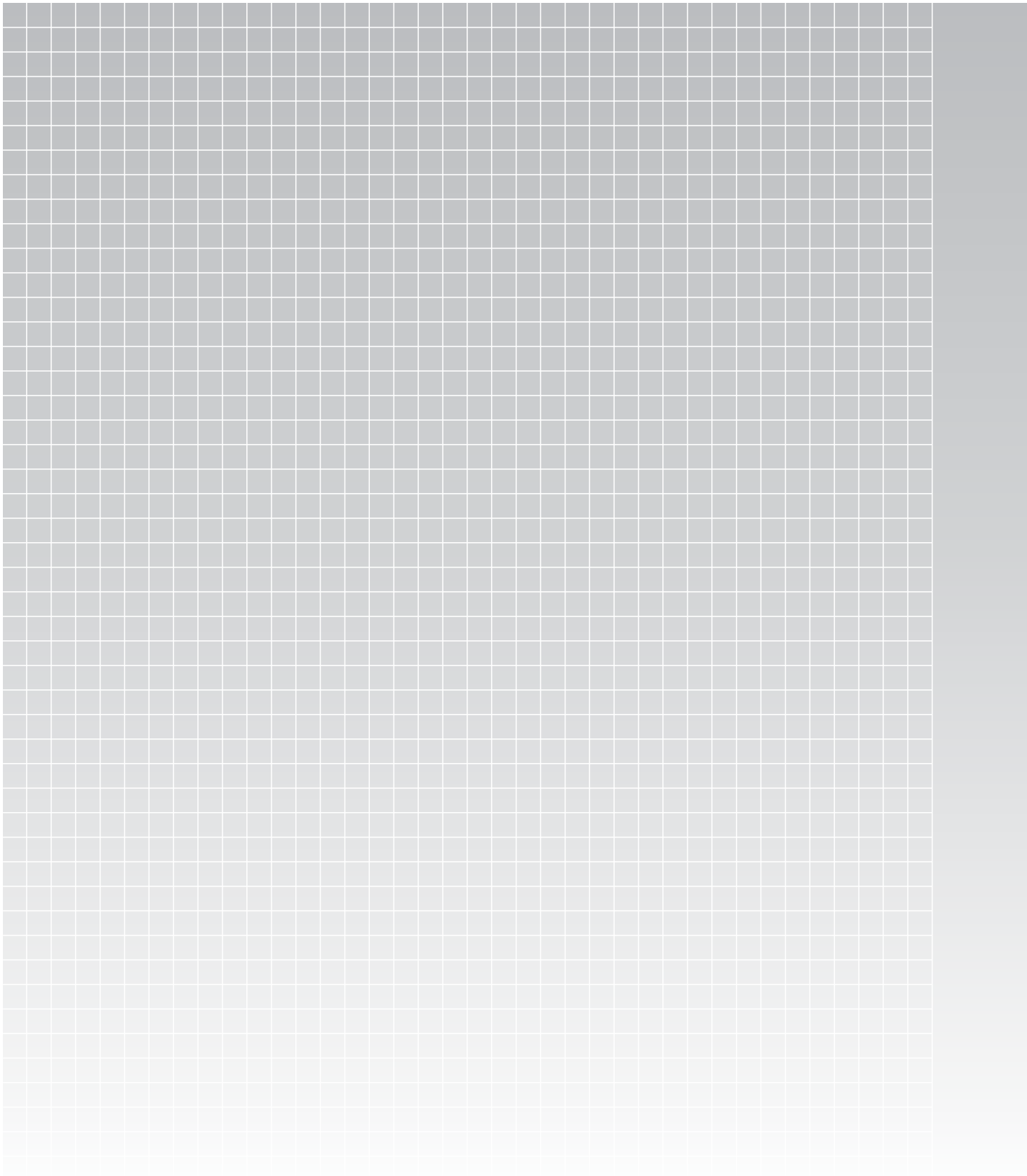
Mechanical data

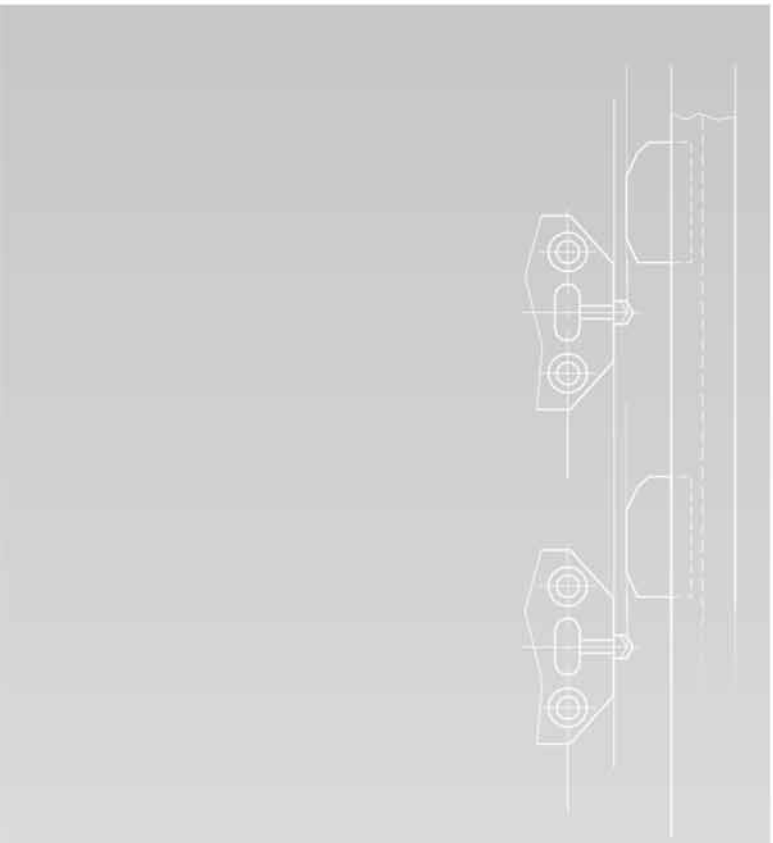
Plunger point to reference surface		8 mm	8 mm
Switchpoint to reference surface		7 mm	4.5 mm
Maximum plunger travel		4 mm	6.5 mm
Assured opening after plunger travel		2.5 mm	2.5 mm
Switching actuating force on plunger		min. 15 N	min. 30 N
Switching frequency		max. 300/min	max. 160/min
Approach speed	Plunger D	40 m/min	40 m/min
	Plunger E	30 m/min	30 m/min
	Plunger K	10 m/min	10 m/min
	Plunger R	60 m/min	60 m/min
	Plunger L	120 m/min	80 m/min
Repeata-bility	Plunger D, E, K	±0.002 mm	±0.02 mm
	Plunger R, L	±0.01 mm	±0.02 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.





Mechanical single and multiple position switches with forced opening

60 Series 46
62 Series 40

Mechanical single position switches with forced opening

64 Series 99 and 100

more added value

– Long service life
– Compact form factor for ease of installation

Multiple position switches with forced opening

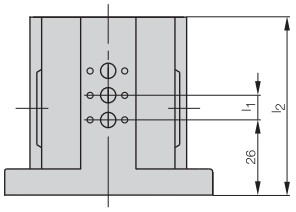
- Smallest plunger spacing for mechanical multiple position switches (8 mm)
- Switch element with forced opening
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- All switch positions with forced opening: Rigid plungers

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M16×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when	Dimension l_1 = 8 mm	49	59	64	72	80	96	112
	Dimension l_3	54	54	54	54	54	50	50
	Dimension l_1 = 10 mm	49	59	72	80	89	112	129
	Dimension l_3	54	54	54	54	50	50	50
Number of connectors	S80 without FC	1	1	2	2	2	3	3
	S80 withFC	1	2	2	3	3		

Dimensions in mm
Size 12x with 8 mm spacing on request.

Ordering example:
BNS 813-B02-D08-46-49-01-FC-S80R

BNS 813-B_ _-_ _ _-46-_ _-_ _-_ _-_ _-_ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **E** Chisel with wiper plate

Plunger spacing
- **08** 8 mm
- **10** 10 mm

Switch elements
- **30** BSE 63, remaining switch positions BSE 69.1
- **32** BSE 63, remaining switch positions BSE 73.1
- **39** all BSE 63
- **41** BSE 64, remaining switch positions BSE 70.1
- **43** BSE 64, remaining switch positions BSE 74.1
- **49** all BSE 64

Switch elements with forced opening
No. from flange

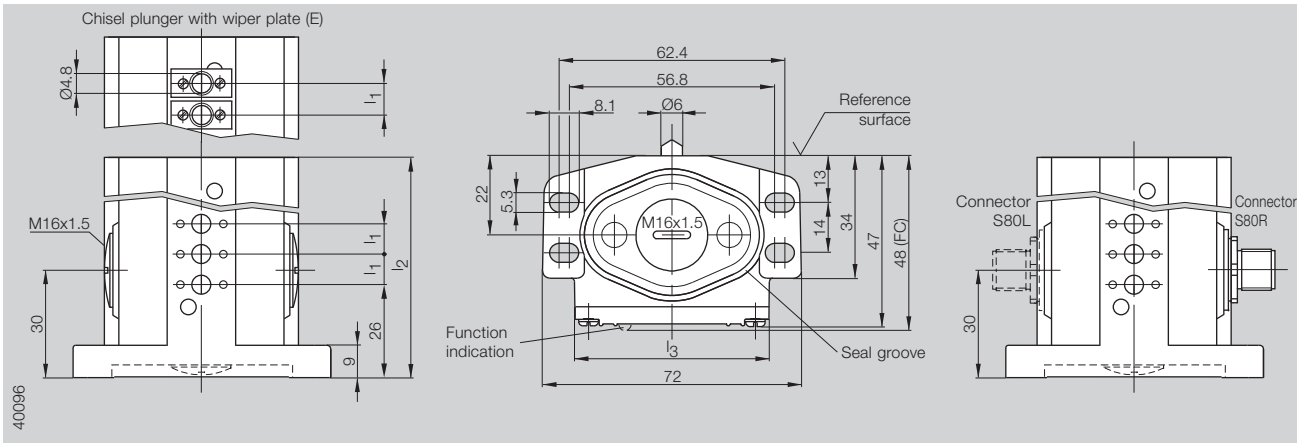
optional
Function indication
- **FC** 6...24 V DC

optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left

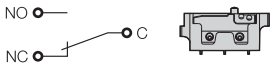
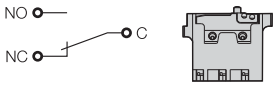
Only with BSE 69.1, BSE 73.1 or BSE 63.

With plug version, only normally closed contact connected.

Type	Multiple position switch with forced opening contacts
Plunger spacing	8 mm or 10 mm



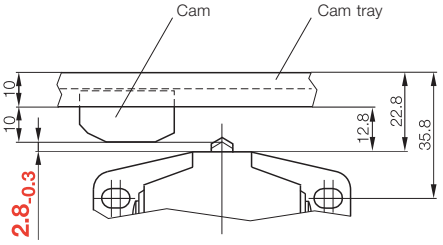
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...24 V DC (**FC**)

With switch element	**BSE 63**	**BSE 64**
Ordering code	BNS 813-...-46-3_	BNS 813-...-46-4_
Wiring diagram, style		

Switch element			
Contact material		Silver	Silver
Switching principle		Snap switch	Snap switch
Contact system		Single-pole change-over, NO with snap function, NC with forced opening	Single-pole change-over, NO with snap function, NC with forced opening
Connection type		Solder connection	Screw terminal
Electrical data		see page 113	see page 113
Approvals		UL, CSA, CCC	UL, CSA, CCC

Mechanical data			
Plunger point to reference surface		4 mm	4 mm
Switchpoint to reference surface		3.5 mm	3.5 mm
Maximum plunger travel		2.1 mm	2.1 mm
Assured separation after plunger travel		1 mm	1 mm
Switching actuating force on plunger		min. 8 N	min. 8 N
Switching frequency		max. 200/min	max. 200/min
Approach speed	Plunger D	20 m/min	20 m/min
	Plunger E	10 m/min	10 m/min
	Plunger K	9 m/min	9 m/min
	Plunger R	60 m/min	60 m/min
Repeata-bility	Plunger D, E	±0.02 mm	±0.02 mm
	Plunger K	±0.03 mm	±0.03 mm
	Plunger R	±0.05 mm	±0.05 mm

Installation



Note!
To ensure switching function, the dimension $2.8_{-0.3}$ is especially critical.

Multiple position switches with forced opening

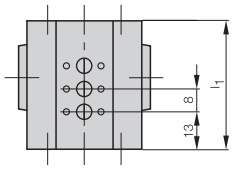
- Smallest plunger spacing for mechanical multiple position switches (8 mm)
- Switch element with forced opening
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- All switch positions with forced opening: Rigid plungers

Multiple position switches with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M16×1.5 on side (Scope of delivery: Seals and cover screws)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

No. of plungers	2	3	4	5	6
Dimension l_1	34	42	50	58	66
S80 without FC	1	1	2	2	2
S80 with FC	1	2	2		

Dimensions in mm

Ordering example:
BNS 813-B04-D08-40-49-01-FC-S80R

BNS 813-B_ _-_ _ _-40-_ _-_ _-_ _-_ _-_ _ _

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **E** Chisel with wiper plate

Plunger spacing
- **08** 8 mm

Switch elements
- **30** BSE 63, remaining switch positions BSE 69.1
- **32** BSE 63, remaining switch positions BSE 73.1
- **39** all BSE 63
- **41** BSE 64, remaining switch positions BSE 70.1
- **43** BSE 64, remaining switch positions BSE 74.1
- **49** all BSE 64

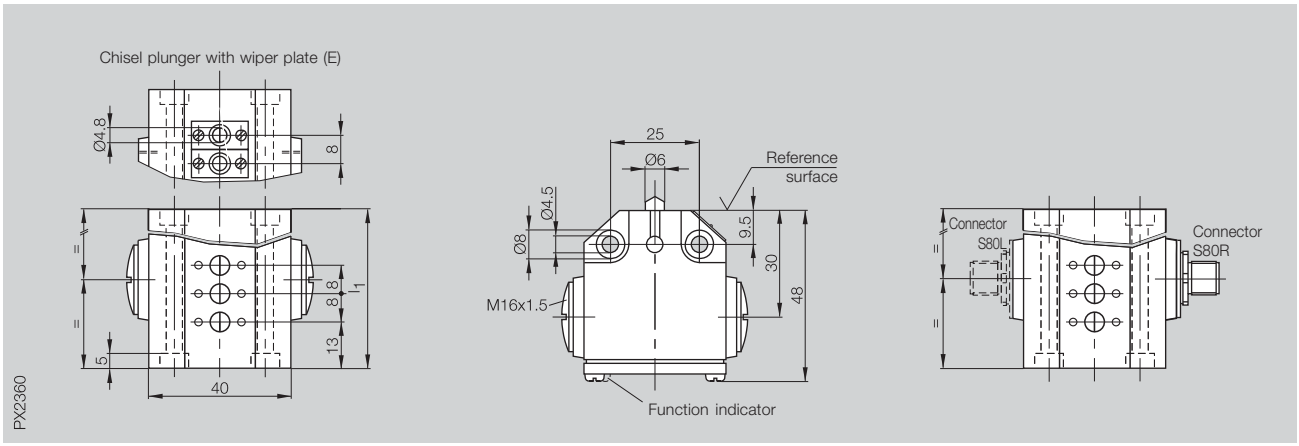
Switch elements with forced opening
- No. from flange

optional
Function indication
- **FC** 6...24 V DC

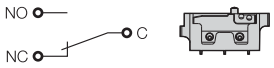
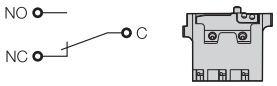
optional
Connector
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left

Only with BSE 69.1, BSE 73.1 or BSE 63.

Type	Multiple position switch with forced opening contacts
Plunger spacing	8 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...24 V DC (**FC**)

With switch element	**BSE 63**	**BSE 64**
Ordering code	BNS 813-...-40-3_	BNS 813-...-40-4_
Wiring diagram, style		

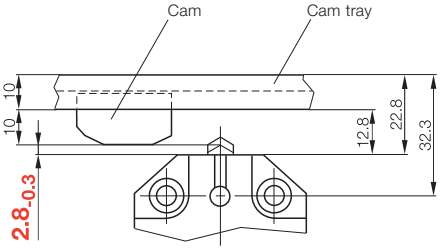
Switch element

Contact material	Silver	Silver
Switching principle	Snap switch	Snap switch
Contact system	Single-pole change-over, NO with snap function, NC with forced opening	Single-pole change-over, NO with snap function, NC with forced opening
Connection type	Solder connection	Screw terminal
Electrical data	see page 113	see page 113
Approval	UL, CSA, CCC	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		4 mm	4 mm
Switchpoint to reference surface		3.5 mm	3.5 mm
Maximum plunger travel		2.1 mm	2.1 mm
Assured separation after plunger travel		1 mm	1 mm
Switching actuating force on plunger		min. 8 N	min. 8 N
Switching frequency		max. 200/min	max. 200/min
Approach speed	Plunger D	20 m/min	20 m/min
	Plunger E	10 m/min	10 m/min
	Plunger K	9 m/min	9 m/min
	plunger R	60 m/min	60 m/min
Repeata-bility	Plunger D, E	±0.02 mm	±0.02 mm
	Plunger K	±0.03 mm	±0.03 mm
	Plunger R	±0.05 mm	±0.05 mm

Installation



Note!
To ensure switching function, the dimension $2.8_{-0.3}$ is especially critical.

Single position switches with forced opening

- Switch element with forced opening
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing
- Switch position with forced opening: Rigid plunger
- Plunger not rotatable, approach direction cannot be changed (see ordering code)

Single position switch with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

Connection options

- Thread for cable gland M12×1.5 for Series 99, Thread for cable gland M16×1.5 for Series 100
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Bestellbeispiel:
BNS 813-100-E-49-FC-S80

BNS 813-_ _ _-_-_ _-_ _-_ _ _

Series
99 Series 99
100 Series 100

Plunger style
D Chisel
K Ball
R Roller
E Chisel with wiper plate

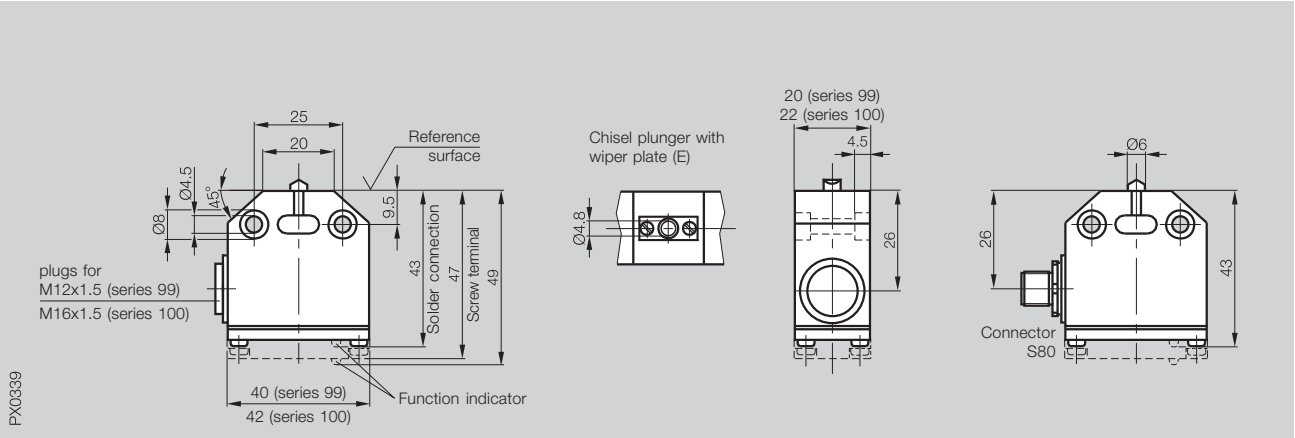
Switch elements
38 BSE 63
Approach direction lateral, 90° to mounting surface
39 BSE 63
Approach direction longitudinal, parallel to mounting surface
48 BSE 64
Approach direction lateral, 90° to mounting surface
49 BSE 64
Approach direction longitudinal, parallel to mounting surface

optional
Function indicator
FC 6...24 V DC

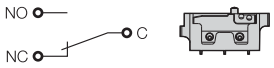
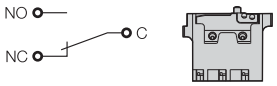
optional
Connector
S80 5-pin

Only with BSE 63.

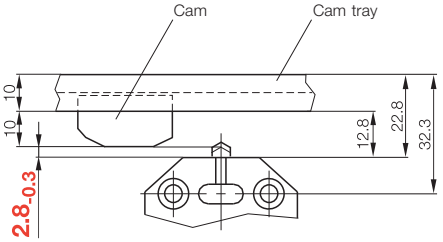
Type	Single position switch with forced opening contacts



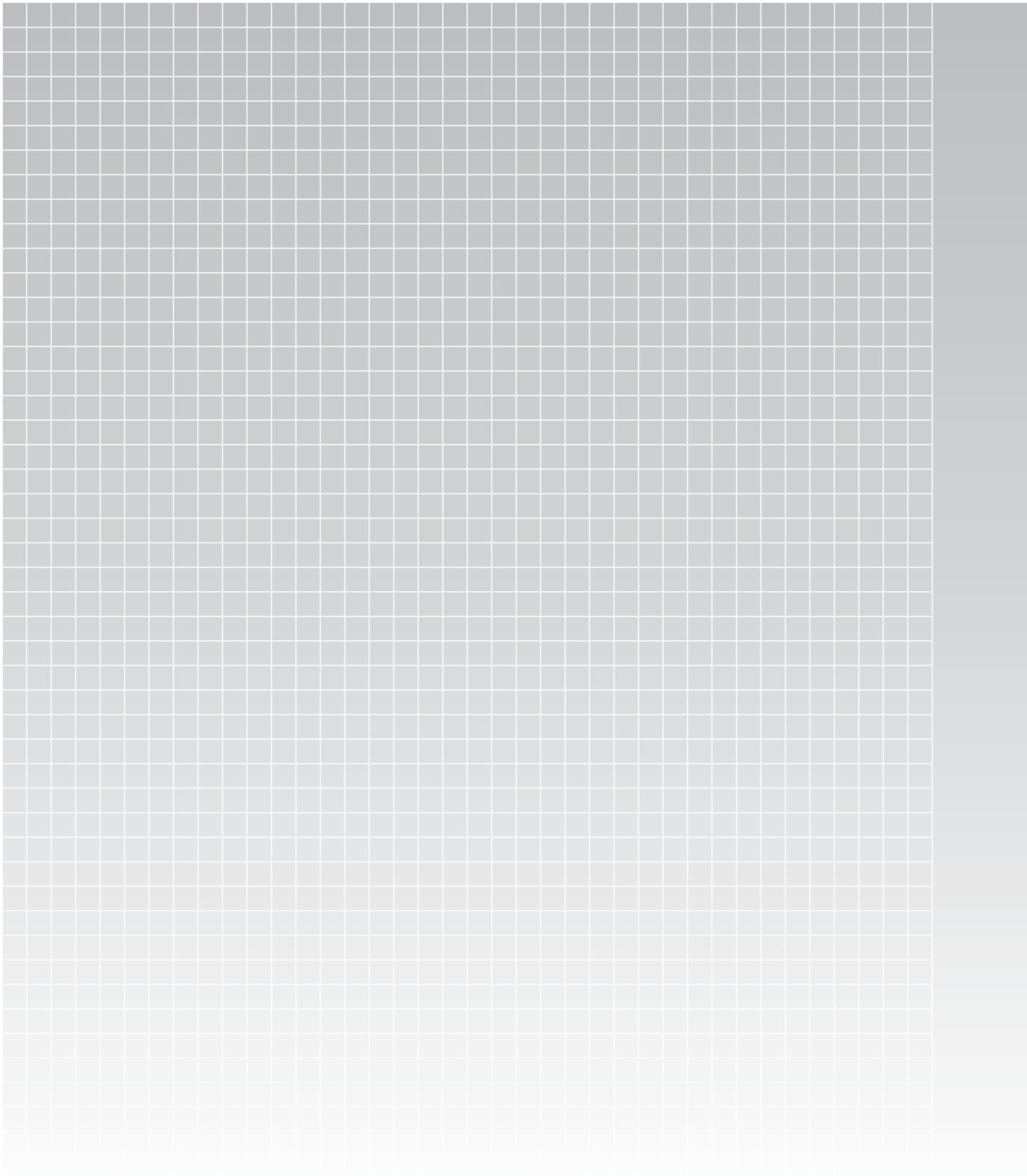
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	Cable gland (M12×1.5 series 99, M16×1.5 series 100) or connector
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...24 V DC (**FC**)

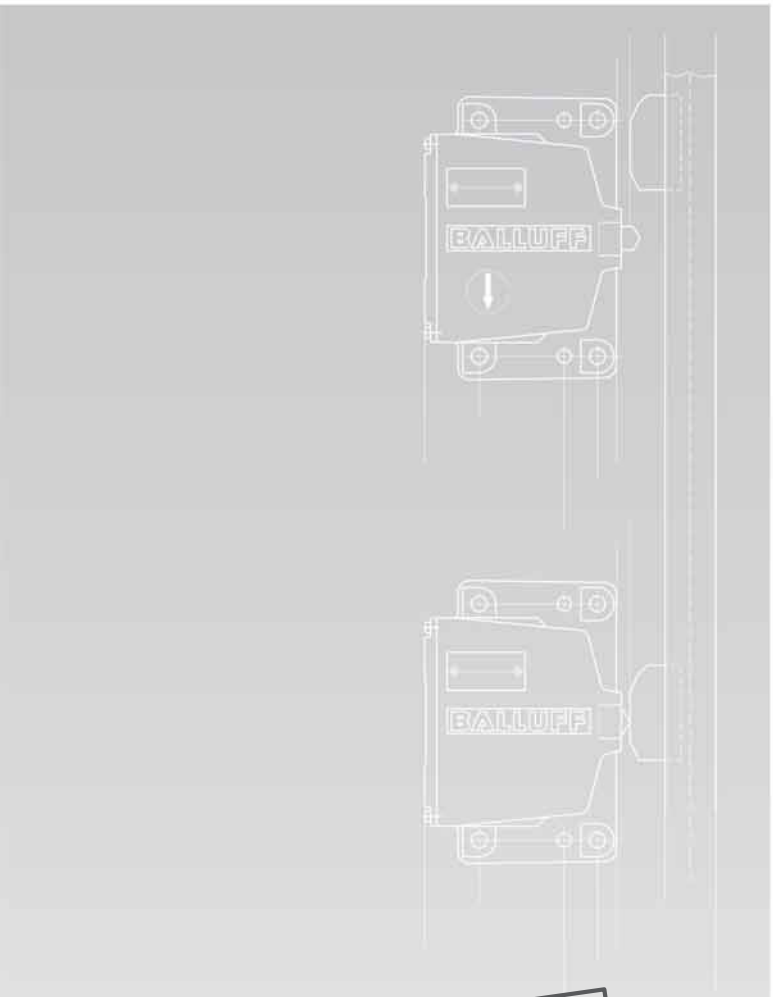
With switch element	**BSE 63**	**BSE 64**
Ordering code	BNS 813-99/100-_-3_-_ _-_ _ _	BNS 813-99/100-_-4_-_ _-_ _ _
Wiring diagram, style		
Switch element		
Contact material	Silver	Silver
Switching principle	Snap switch	Snap switch
Contact system	Single-pole change-over, NO with snap function, NC with forced opening	Single-pole change-over, NO with snap function, NC with forced opening
Connection type	Solder connection	Screw terminal
Electrical data	see page 113	see page 113
Approval	UL, CSA, CCC	UL, CSA, CCC
Mechanical data		
Plunger point to reference surface	4 mm	4 mm
Switchpoint to reference surface	3.5 mm	3.5 mm
Maximum plunger travel	2.1 mm	2.1 mm
Assured separation after plunger travel	1 mm	1 mm
Switching actuating force on plunger	min. 8 N	min. 8 N
Switching frequency	max. 200/min	max. 200/min
Approach speed – Plunger D	20 m/min	20 m/min
Approach speed – Plunger E	10 m/min	10 m/min
Approach speed – Plunger K	9 m/min	9 m/min
Approach speed – Plunger R	60 m/min	60 m/min
Repeatability – Plunger D, E	±0.02 mm	±0.02 mm
Repeatability – Plunger K	±0.03 mm	±0.03 mm
Repeatability – Plunger R	±0.05 mm	±0.05 mm

Installation



Note!
To ensure switching function, the dimension $2.8_{-0.3}$ is especially critical.





more added value

– For the most extreme applications
– Long service life
– Quick-change plunger unit for short service time

Mechanical multiple position switches with quick-change plunger unit

68 Series 100 per DIN 43697
70 Series 100 per DIN EN 60204-1/ VDE 0113
72 Series 61
74 Series 61 per DIN EN 60204-1/ VDE 0113
76 Quick-change block for series 100
77 Quick-change block for series 61

Multiple position switches per DIN 43697 for standard applications with quick-change plunger unit

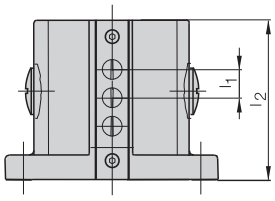
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Multiple position switches with function indication

- Function indication for dual voltage range option



Available sizes

No. of plungers		2	3	4	5	6
Dimension	l_1 = 12 mm	70	80	90	105	120
l_2 when	l_1 = 16 mm	70	90	105	120	
Number of	S80 without FD/FE	1	1	2	2	2
Connector	S80 with FD/FE	1	2	2	3	3
	S90 without FD/FE	1	1	1	1	1
	S90 with FD/FE	1	1	1	1	1
	S4 without FD (IO-Link)	1	1	1	1	1
	S4 with FD (IO-Link)	1	1	1	1	1

Dimensions in mm

Ordering example:
BNS 829-D02-D16-100-10-FE-S80R

BNS 829-D_ _-_ _ _-100-10-_ _-_ _ _ _

No. of plungers
02 2×
...
06 6×

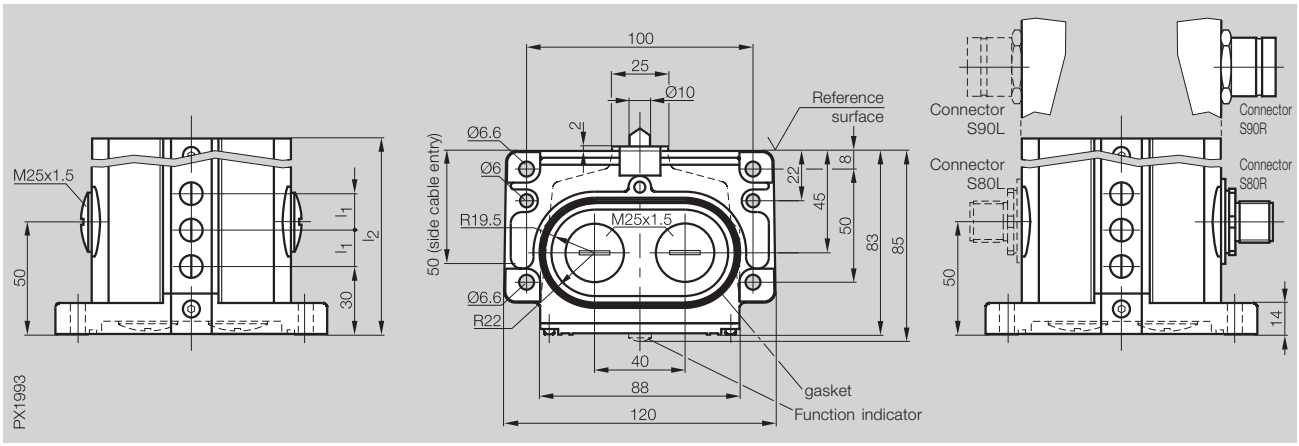
Plunger style
D Chisel
K Ball
R Roller
L Roller bearing

Plunger spacing
12 12 mm
16 16 mm

optional
Function indicator
FD 6...60 V AC/DC
FE 90...250 V AC/DC

optional
Connector
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left
S4R-I 4-pin, right only for IO-Link
S4L-I 4-pin, left only for IO-Link

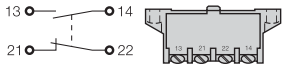
Type	Multiple position switch
Plunger spacing	12 mm or 16 mm
Mounting and function dimensions	per DIN 43697



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

IO-Link

You can find more information in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

With switch element	**BSE 30.0**
Ordering code	BNS 829-D_ _-_ _ _-100-**10**-_ _-_ _ _ _
Wiring diagram, style	

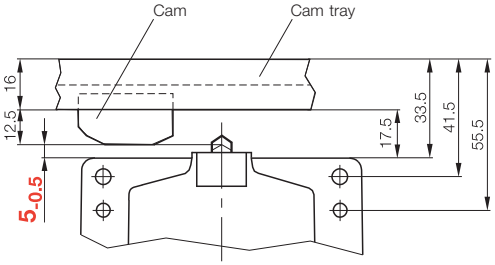
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		8 mm
Switchpoint to reference surface		6 mm
Maximum plunger travel		5.5 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches per DIN 43697 with safety switch positions per DIN EN 60240-1/ VDE 0113 and quick-change plunger unit

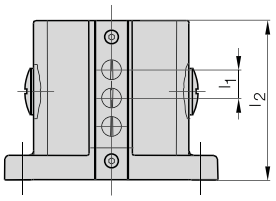
- Forced-opening contacts and rigid plungers for additional security per DIN EN 60204-1/VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Multiple position switches with function indication

- Function indication for selectable three voltage ranges



Available sizes

No. of plungers		2	3	4	5	6
Dimension	l_1 = 12 mm	70	80	90	105	120
l_2 when	l_1 = 16 mm	70	90	105	120	
Number of	S80 without FD/FE	1	1	2	2	2
Connector*	S80 with FD/FE	1	2	2	3	3
	S90 without FD/FE	1	1	1	1	1
	S90 with FD/FE	1	1	1	1	1

Dimensions in mm
*Number of connectors with BSE 85 on request.

Ordering example:
BNS 823-D02-D12-100-20-03-FE-S80R

BNS 823-D_ _-_ _ _-100-_ _-_ _-_ _ -_ _ _ _

No. of plungers
02 2×
...
06 6×

Plunger style
D Chisel
K Ball
R Roller
L Roller bearing

Plunger spacing
12 12 mm
16 16 mm

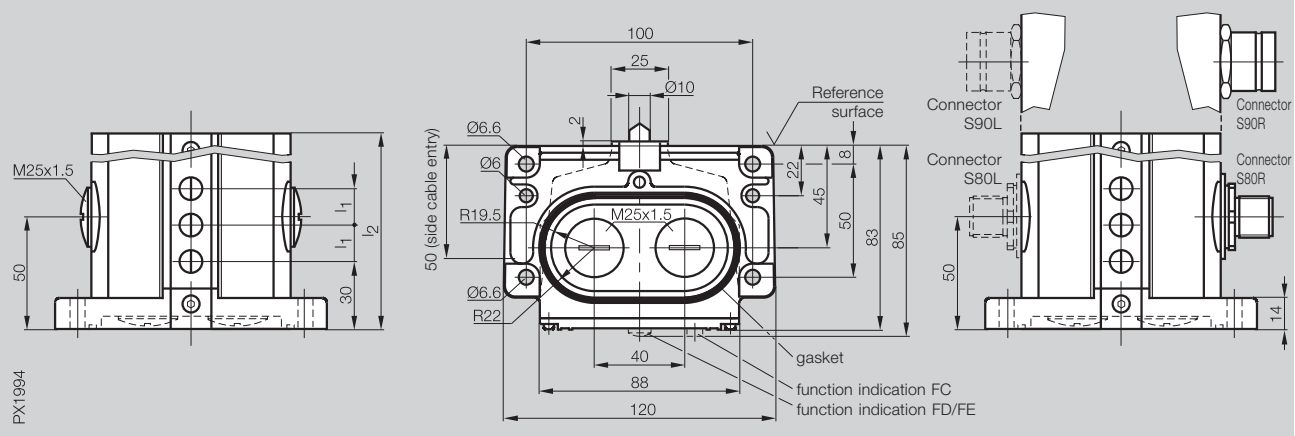
Switch elements
10 BSE 61 Remaining switch positions BSE 30.0
12 only BSE 61
20 BSE 85 Remaining switch positions BSE 30.0
22 only BSE 85

Safety switch elements
No. from flange

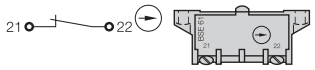
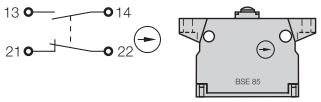
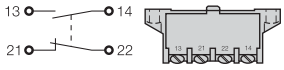
optional
Function indication
FD 6...60 V AC/DC (for BSE 30.0 and BSE 61)
FE 90...250 V AC/DC (for BSE 30.0 and BSE 61)
FC 6...24 V DC (only for BSE 85)

optional
Connector
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left

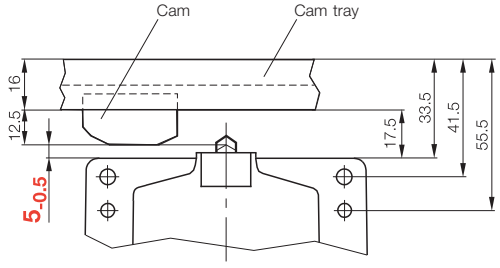
Type	Multiple position switch with forced-opening contacts
Plunger spacing	12 mm or 16 mm
Mounting and function dimensions	per DIN 43697



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**	**BSE 30.0**
Ordering code	BNS 823-D_ _-_ _ _-100-**1**_ _-_ _ _ _	BNS 823-D_ _-_ _ _-100-**2**_ _-_ _ _ _	BNS 823-D_ _-_ _ _-100-_**0**-_ _ _ _
Wiring diagram, style			
Switch element			
Contact material	Silver	Silver	Silver, gold plated
Switching principle	creep switch, forced-opening	snap switch, forced-opening (normally-closed)	Snap switch
Contact system	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double interruption), all galvanically isolated	dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112	see page 112	see page 112
Approval	CSA, CCC	cULus, CSA, CCC	UL, CSA, CCC
Mechanical data			
Plunger point to reference surface	8 mm	8 mm	8 mm
Switchpoint to reference surface	7 mm	6,5 mm	6 mm
Maximum plunger travel	4 mm	4 mm	5.5 mm
Assured opening after plunger travel	2.5 mm	2.5 mm	
Switching actuating force on plunger	min. 15 N	min. 30 N	min. 20 N
Switching frequency	max. 300/min	max. 160/min	max. 300/min
Approach speed – Plunger D	40 m/min	40 m/min	40 m/min
Approach speed – Plunger K	10 m/min	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min	120 m/min
Repeatability – Plunger D, K	±0.002 mm	±0.02 mm	±0.002 mm
Repeatability – Plunger R, L	±0.01 mm	±0.02 mm	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches for standard applications with quick-change plunger block

- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Connection options

- Thread for cable gland M20×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

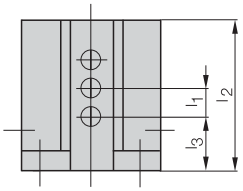
Multiple position switches with function indication

- Function indication for dual voltage range option

Available sizes

No. of plungers	Plunger spacing	Housing B Standard		Housing B		Housing C		Number of connectors S80 without FD/FE	Number of connectors S80 with FD/FE	Number of connectors S90 without FD/FE	Number of connectors S90 with FD/FE	Number of connectors S4 without FD (IO-Link)	Number of connectors S4 with FD (IO-Link)
	Dimension	Dimension		Dimension		Dimension							
	l_1	l_2	l_3	l_2	l_3	l_2	l_3						
2	12	36	12	60	30	48	24	1	1	1	1	1	1
						60	30						
3	12	48	12	60	24	60	24	1	2	1	1	1	1
4	12	60	12					2	2	1	1	1	1
5	12	72	12					2	3	1	1	1	1
6	12	84	12					2	3	1	1	1	1
2	16	48	16	60	30	60	30	1	1	1	1	1	1
3	16	72	16					1	2	1	1	1	1
4	16	84	16					2	2	1	1	1	1

Dimensions in mm



Ordering example:
BNS 829-B02-D12-61-12-10-FD-S80R

BNS 829-_ _ _-_ _ _-61-_ _-10-_ _-_ _ _ _

Housing style
- **B** Standard 2× M20×1.5 on side
- **B** 3× M20×1.5 on side and in flange
- **C** 2× M20×1.5 on side and cable entry in flange

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing

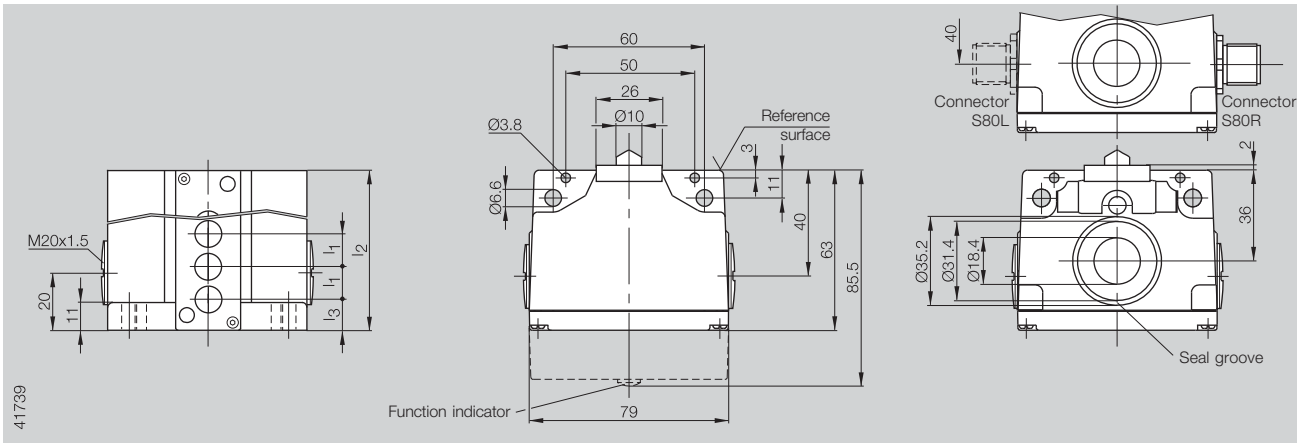
Plunger spacing
- **12** 12 mm
- **16** 16 mm

Distance l_3
- **12** 12 mm
- **16** 16 mm
- **24** 24 mm
- **30** 30 mm

optional **Function indicator**
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

optional **Connector**
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left
- **S4R-I** 4-pin, right only for IO-Link
- **S4L-I** 4-pin, left only for IO-Link

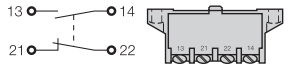
Type	Multiple position switch
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**) or 90...250 V AC/DC (**FE**)

IO-Link

You can find more information in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

With switch element	**BSE 30.0**
Ordering code	BNS 829-_ _ _-_ _ _-61-_ _-**10**-_ _-_ _ _ _
Wiring diagram, style	

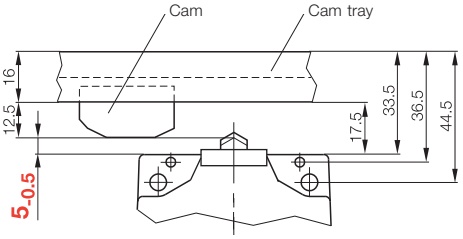
Switch element

Contact material	Silver, gold plated
Switching principle	Snap switch
Contact system	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112
Approval	UL, CSA, CCC

Mechanical data

Plunger point to reference surface		8 mm
Switchpoint to reference surface		6 mm
Maximum plunger travel		5.5 mm
Switching actuating force on plunger		min. 20 N
Switching frequency		max. 300/min
Approach speed	Plunger D	40 m/min
	Plunger K	10 m/min
	Plunger R	60 m/min
	Plunger L	120 m/min
Repeata-bility	Plunger D, K	±0.002 mm
	Plunger R, L	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Multiple position switches with safety switch positions per DIN EN 60204-1/VDE 0113 and quick-change plunger unit

- Positive-opening contacts and rigid plungers for additional security per DIN EN 60204-1/VDE 0113
- Dual-chamber system with IP 67 protection: wear-free membrane with hermetic sealing from plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Connection options

- Thread for cable gland M20×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

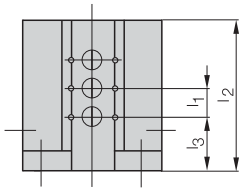
Multiple position switches with function indication

- Function indication for selectable three voltage ranges

Available sizes

No. of plungers	Plunger spacing dimension	Housing B standard dimension		Housing B dimension		Housing C dimension		Number of connectors* S80 without FD/FE	Number of connectors* S80 with FD/FE	Number of connectors* S90 without FD/FE	Number of connectors* S90 with FD/FE
	l_1	l_2	l_3	l_2	l_3	l_2	l_3				
2	12	36	12	60	30	48	24	1	1	1	1
						60	30				
3	12	48	12	60	24	60	24	1	2	1	1
4	12	60	12					2	2	1	1
5	12	72	12					2	3	1	1
6	12	84	12					2	3	1	1
2	16	48	16	60	30	60	30	1	1	1	1
3	16	72	16					1	2	1	1
4	16	84	16					2	2	1	1

Dimensions in mm
*Number of connectors with BSE 85 on request.



Ordering example:
BNS 823-B02-K12-61-A-12-02-FE-S80R

BNS 823-_ _ _-_ _ _-61-_-_ _-_ _-_ _-_ _ _ _

Housing style
- **B** Standard 2× M20×1.5 on side
- **B** 3× M20×1.5 on side and in flange
- **C** 2× M20×1.5 on side and cable entry in flange

No. of plungers
- **02** 2×
- **03** 3×
- **04** 4×
- **...**

Plunger style
- **D** Chisel
- **K** Ball
- **R** Roller
- **L** Roller bearing

Plunger spacing
- **12** 12 mm
- **16** 16 mm

Distance l_3
- **A** 12 mm
- **B** 16 mm
- **C** 24 mm
- **D** 30 mm

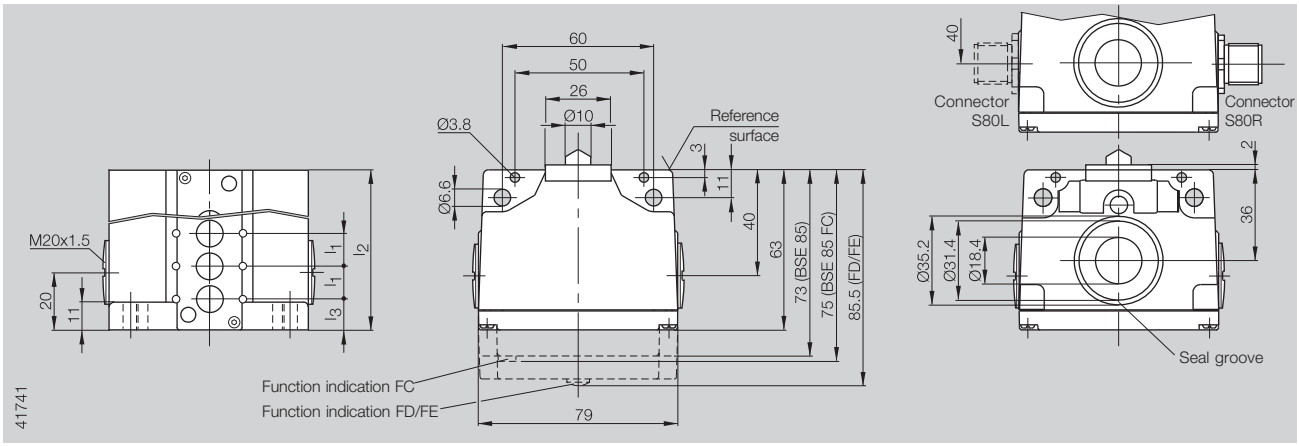
Switch elements
- **10** BSE 61 Remaining switch positions BSE 30.0
- **12** only BSE 61
- **20** BSE 85 Remaining switch positions BSE 30.0
- **22** only BSE 85

Safety switch elements
- No. from flange

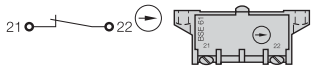
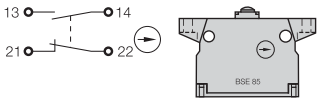
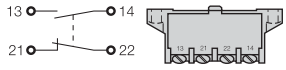
optional **Function indication**
- **FD** 6...60 V AC/DC (for BSE 30.0 and BSE 61)
- **FE** 90...250 V AC/DC (for BSE 30.0 and BSE 61)
- **FC** 6...24 V DC (only for BSE 85)

optional **Connector**
- **S80R** 5-pin, right
- **S80L** 5-pin, left
- **S80S** 5-pin, right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left

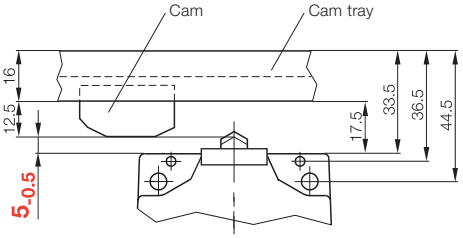
Type	Multiple position switch with forced-opening contacts
Plunger spacing	12 mm or 16 mm



Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED 6...60 V AC/DC (**FD**), 90...250 V AC/DC (**FE**) or 6...24 V DC (**FC**)

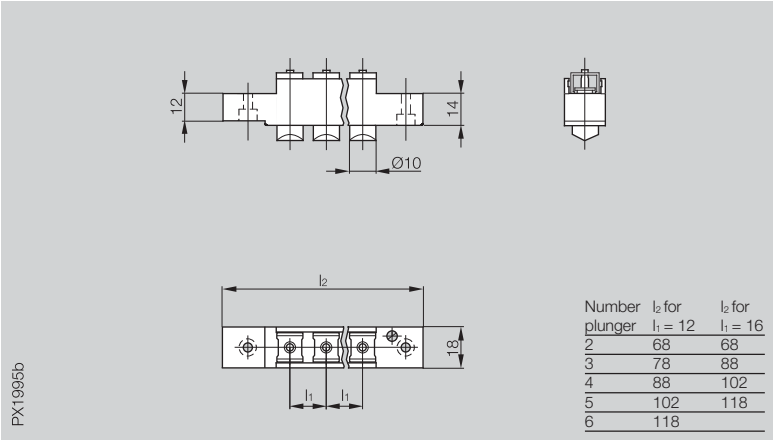
With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 per DIN EN 60204-1/VDE 0113**	**BSE 30.0**
Ordering code	BNS 823-_ _ _ _-61-**1**_ - _	BNS 823-_ _ _ _-61-**2**_ - _	BNS 823-_ _ _ _-61-_**0**- _
Wiring diagram, style			
Switch element			
Contact material	Silver	Silver	Silver, gold plated
Switching principle	Creep switch, positive-opening	Snap switch, forced-opening (normally-closed)	Snap switch
Contact system	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Forced-opening (double interruption), all galvanically isolated	Dual changeover, one normally-open and one normally-closed, galvanically isolated, double interruption
Electrical data	see page 112	see page 112	see page 112
Approval	CSA, CCC	cULus, CSA, CCC	UL, CSA, CCC
Mechanical data			
Plunger point to reference surface	8 mm	8 mm	8 mm
Switchpoint to reference surface	7 mm	6,5 mm	6 mm
Maximum plunger travel	4 mm	4 mm	5.5 mm
Assured opening after plunger travel	2.5 mm	2.5 mm	
Switching actuating force on plunger	min. 15 N	min. 30 N	min. 20 N
Switching frequency	max. 300/min	max. 160/min	max. 300/min
Approach speed – Plunger D	40 m/min	40 m/min	40 m/min
Approach speed – Plunger K	10 m/min	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min	120 m/min
Repeatability – Plunger D, K	±0.002 mm	±0.02 mm	±0.002 mm
Repeatability – Plunger R, L	±0.01 mm	±0.02 mm	±0.01 mm

Installation



Note!
To ensure switching function, the dimension $5_{-0.5}$ is especially critical.

Type	BNP quick-change block/Plunger
Plunger spacing	12 mm or 16 mm



Number plunger	l_2 for l_1 = 12	l_2 for l_1 = 16
2	68	68
3	78	88
4	88	102
5	102	118
6	118	

Ordering code	BNP 2_-_ _-_ _ _-100
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Cam tray material	aluminum, barrel finished, blue anodized finish

Ordering example for standard application:
BNP 29-04-D12-100

BNP 29-_ _-_ _ _-100

No. of plungers		Plunger style		Plunger spacing l_1	
02	2×	**D**	Chisel	**12**	12 mm
...		**K**	Ball	**16**	16 mm
06	6×	**R**	Roller		
		L	Roller bearing		

Ordering example for safety application:
BNP 23-04-D12-100-01

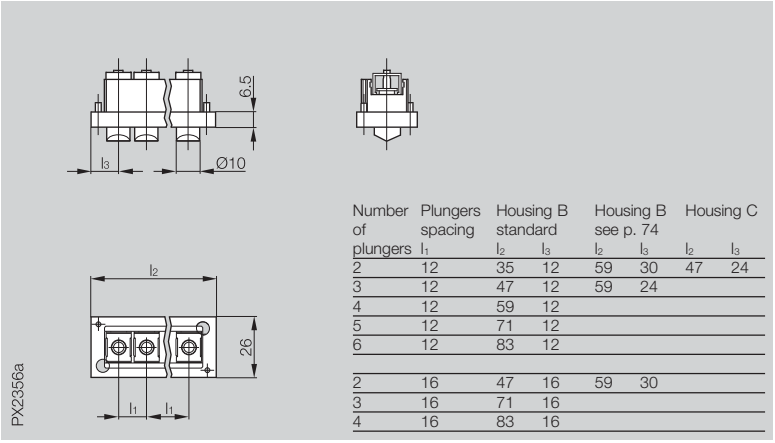
BNP 23-_ _-_ _ _-100-_ _

No. of plungers		Plunger style		Plunger spacing l_1		Safety switch elements
02	2×	**D**	Chisel	**12**	12 mm	No. from flange
...		**K**	Ball	**16**	16 mm	
06	6×	**R**	Roller			
		L	Roller bearing			

Note!

Safety switch positions to DIN EN 60204-1/ VDE 0113 may only be operated with a rigid plunger.

Type	BNP quick-change block/Plunger
Plunger spacing	12 mm or 16 mm



Number of plungers	Plungers spacing l_1	Housing B standard l_2	Housing B standard l_3	Housing B see p. 74 l_2	Housing B see p. 74 l_3	Housing C l_2	Housing C l_3
2	12	35	12	59	30	47	24
3	12	47	12	59	24		
4	12	59	12				
5	12	71	12				
6	12	83	12				
2	16	47	16	59	30		
3	16	71	16				
4	16	83	16				

Ordering code	BNP 2_-_ _-_ _ _-61-_ _
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Cam tray material	Aluminum, barrel finished, blue anodized finish

Ordering example for standard application:
BNP 29-04-D12-61-12

BNP 29-_ _-_ _ _-61-_ _

No. of plungers		Plunger style		Plunger spacing l_1		Distance l_3	
02	2×	**D**	Chisel	**12**	12 mm	**12**	12 mm
...		**K**	Ball	**16**	16 mm	**16**	16 mm
06	6×	**R**	Roller			**24**	24 mm
		L	Roller bearing			**30**	30 mm

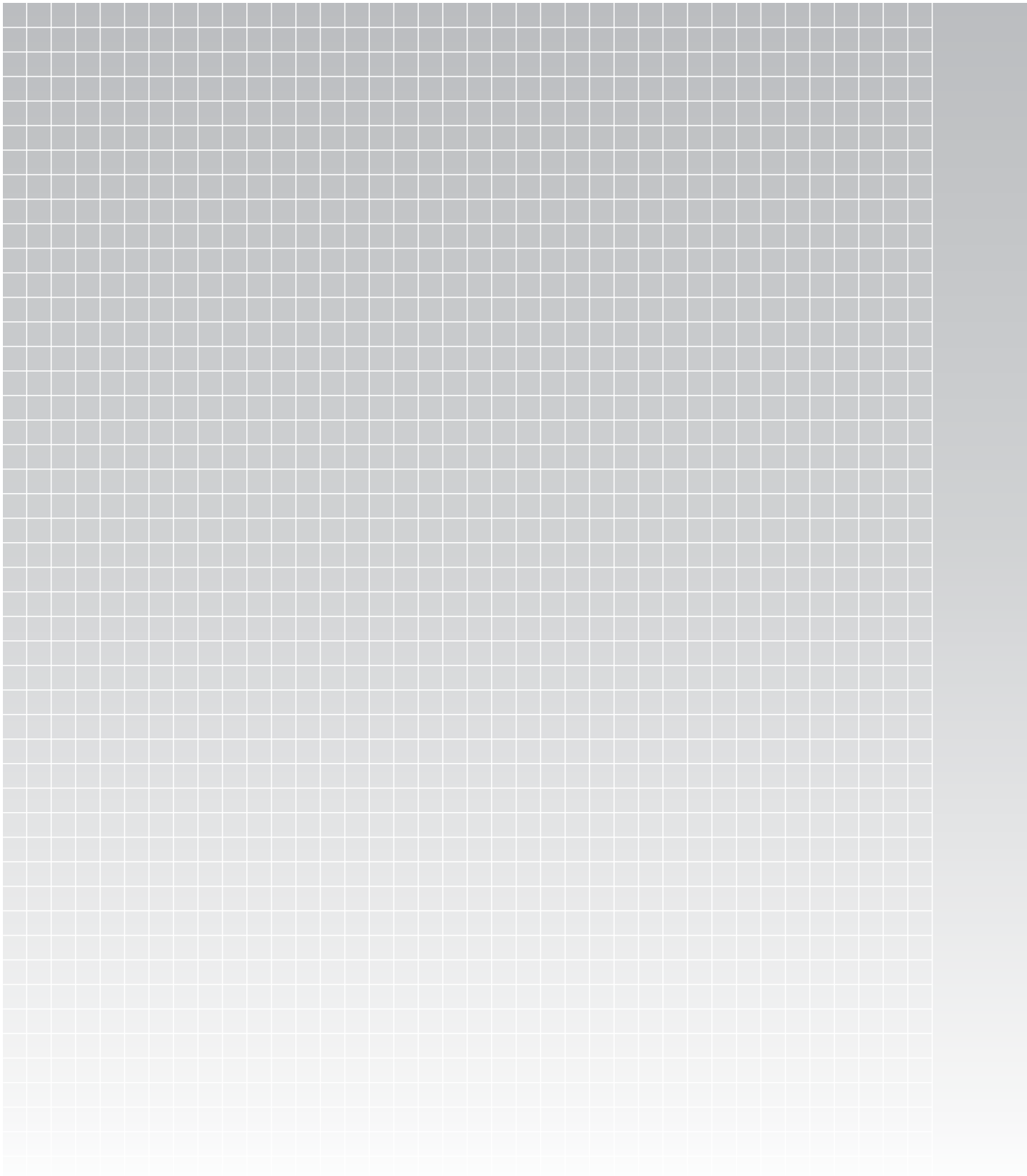
Ordering example for safety application:
BNP 23-04-D12-61-A-01

BNP 23-_ _-_ _ _-61-_-_ _

No. of plungers		Plunger style		Plunger spacing l_1		Distance l_3		Safety switch elements
02	2×	**D**	Chisel	**12**	12 mm	**A**	12 mm	No. from flange
...		**K**	Ball	**16**	16 mm	**B**	16 mm	
06	6×	**R**	Roller			**C**	24 mm	
		L	Roller bearing			**D**	30 mm	

Note!

Safety switch positions to DIN EN 60204-1/ VDE 0113 may only be operated with a rigid plunger.

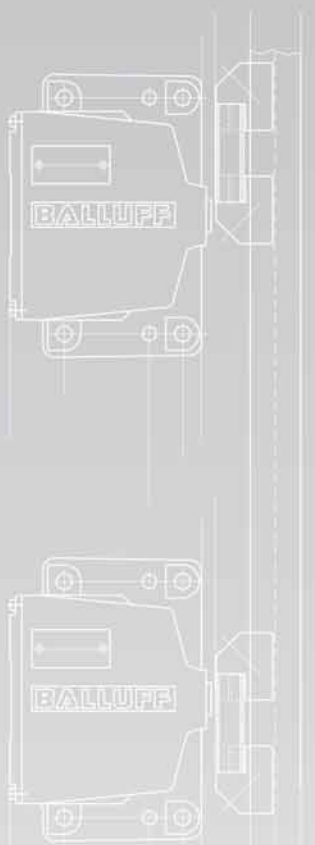


Inductive multiple position switches

80 Series 602-11
per DIN 43697
82 Series 610-11
Series 611-11
Series 612-11
Series 613-11
84 Series 605-11
86 Series 603-11
88 Series 650-11

Inductive single position switches

90 Series H2 and H3
92 DC connectors
M12 connection (S4),
M8 connection (S49)
for Series H2



more added value

– Long service life
– Non-contacting, wear-free,
– Compatible with mechanical switches

Multiple position switches per DIN 43697 for standard applications

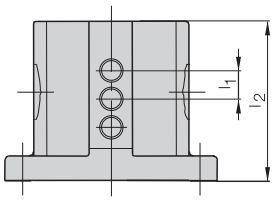
- Can be used under extreme conditions such as shock, temperature fluctuations and coolant flooding
- Reliability comparable with inductive sensors

Multiple position switches with function indication

- The inductive switch elements are equipped standard with an LED. The light is highly visible on the housing cover.

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

Number of switch positions		2	3	4	5	6	8	10	12
Dimension l_2 when	Dimension l_1 = 12 mm	70	80	90	105	120	140	170	200
	Dimension l_4	88	88	88	88	88	80	80	80
	Dimension l_5	14	14	14	14	14	20	20	20
	Dimension l_1 = 16 mm	70	90	105	120	140	170	200	240
	Dimension l_4	88	88	88	88	80	80	80	80
	Dimension l_5	14	14	14	14	20	20	20	20
Number of connectors	S80	on request							
	S90	on request							
Dimension l_3	4 mm for inductive switch elements with sensing head Ø 10 mm								
	2 mm for inductive switch elements with sensing head Ø 15.5 mm								

Dimensions in mm

Ordering example:
BNS 816-B12-THA-16-602-11-S80R

BNS 816-B_ _-_ _ _-_ _-602-11-_ _ _ _

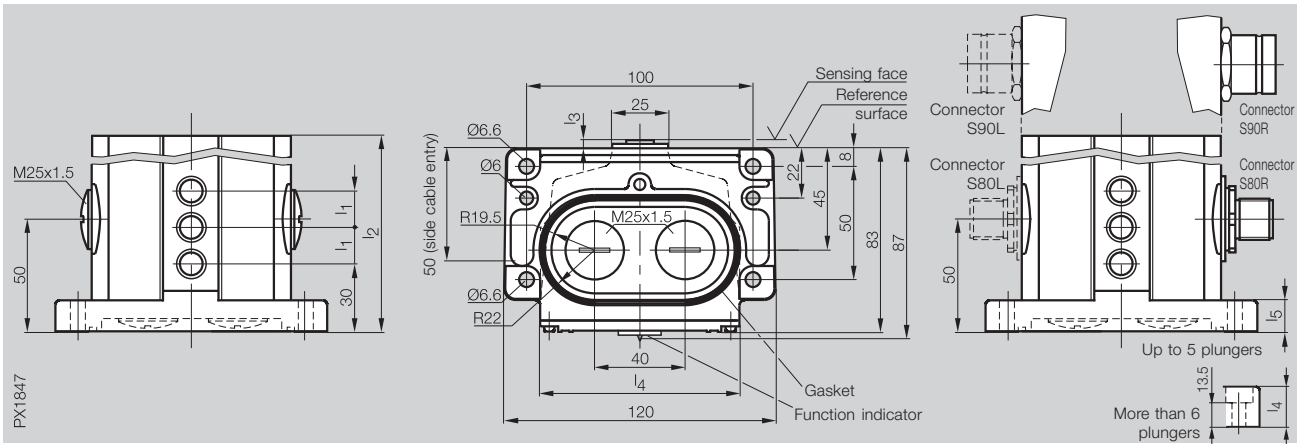
No. of switch positions
02 2×
03 3×
04 4×
...

Code for switch elements
(see table at right)

Plunger spacing
12 12 mm
16 16 mm

optional
Connector
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left

Type	Multiple position switch
Switch position spacing	12 mm or 16 mm
Mounting and function dimensions	per DIN 43697



Ordering code	BNS 816-B_ _-_ _ _-_ _-602-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements with sensing head ∅ 10 mm, for use with switch position spacing 12 and 16 mm

Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
PA	BES 517-110	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	BES 517-108	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	BES 517-410	NO, up to 250 V AC	2 mm	0...1.6 mm
WO	BES 517-421	NC, up to 250 V AC	2 mm	0...1.6 mm
KHG	BES 517-560-H	2-wire, NO, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
KHH	BES 517-561-H	2-wire, NC, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
NG	BES 516-314-N	2-wire, NAMUR, 7.7... 9 V DC	2 mm	0...1.6 mm

Inductive switch elements with sensing head ∅ 15.5 mm, for use with switch position spacing 16 mm

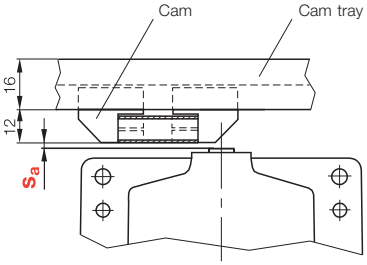
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
THA	BES 517-142-Y	PNP, complementary, 10...30 V DC, short circuit protected	5 mm	0...4 mm
EJA	BES 517-463	NO, up to 250 V AC	5 mm	0...4 mm
AAA	BES 517-464	NC, up to 250 V AC	5 mm	0...4 mm

Hybrid switch element with sensing head 15.5 mm, for use with switch position spacing 16 mm

Code	Ordering code for replacement switch elements	Electrical version	
DH	BES 516-110-D	PNP, complementary, 10...30 V DC	Additional information on request!

For additional electrical data see pages 114 to 117.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

Multiple position switches for standard applications

- Can be used under extreme conditions such as shock, temperature fluctuations and coolant flooding
- Reliability comparable with inductive sensors

Multiple position switches with function indication

- The inductive switch elements are equipped standard with an LED. The light is highly visible on the housing cover.

Connection options

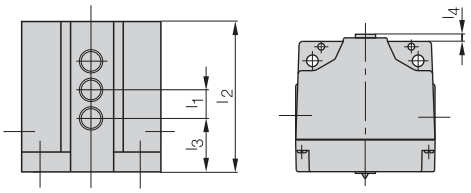
- Thread for cable gland M20×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).

Available sizes

No. of Switch positions	No. of connectors S80/S90	Switch position spacing Dimension	Series 610 Housing B Standard Dimension		Series 611 Housing B Standard Dimension		Series 612 Housing B Dimension		Series 612 housing C Dimension		Series 613 Housing B Dimension		Series 613 housing C Dimension	
		l_1	l_2	l_3	l_2	l_3	l_2	l_3	l_2	l_3	l_2	l_3	l_2	l_3
2		12	36	12					48	24	60	30	60	30
3		12	48	12			60	24	60	24				
4	on	12	60	12										
5	request	12	72	12										
6		12	84	12										
2		16			48	16					60	30	60	30
3		16			72	16								
4		16			84	16								

Dimensions in mm

Dimension l_4 = 4 mm for inductive switch elements with sensing head Ø 10 mm
Dimension l_4 = 2 mm for inductive switch elements with sensing head Ø 15.5 mm



Ordering example:
BNS 816-B04-KHG-12-610-11-S80R

BNS 816-_ _ _-_ _ _-_ _-_ _ _-11-_ _ _

Housing style

B Standard 2× M20×1.5 on side
B 3× M20×1.5 on side and in flange
C 2× M20×1.5 on side and cable entry in flange

No. of switch positions

02 2×
03 3×
04 4×
...

Code for switch elements

(see table at right)

Plunger spacing

12 12 mm
16 16 mm

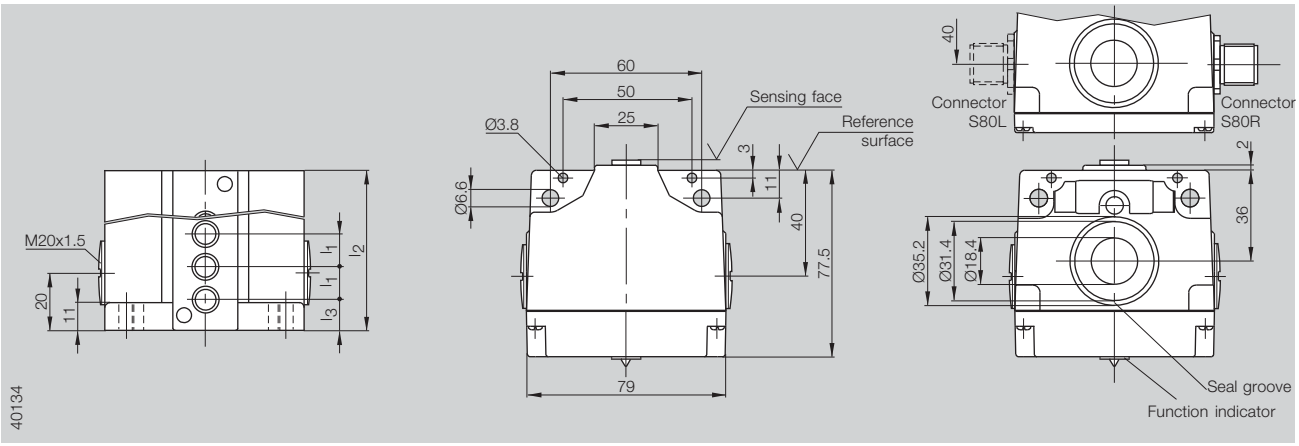
Distance l_3

610 12 mm
611 16 mm
612 24 mm
613 30 mm

optional
Connector

S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left

Type	Multiple position switch
Switch position spacing	12 mm or 16 mm



Ordering code	BNS 816-B_ _-_ _ _-_ _-610/611/612/613-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements with sensing head ∅ 10 mm, for use with switch position spacing 12 and 16 mm

Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
PA	BES 517-110	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	BES 517-108	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	BES 517-410	NO, up to 250 V AC	2 mm	0...1.6 mm
WO	BES 517-421	NC, up to 250 V AC	2 mm	0...1.6 mm
KHG	BES 517-560-H	2-wire, NO, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
KHH	BES 517-561-H	2-wire, NC, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
NG	BES 516-314-N	2-wire, NAMUR, 7.7... 9 V DC	2 mm	0...1.6 mm

Inductive switch elements with sensing head ∅ 15.5 mm, for use with switch position spacing 16 mm

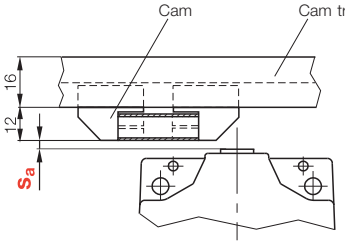
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
THA	BES 517-142-Y	PNP, complementary, 10...30 V DC, short circuit protected	5 mm	0...4 mm
EJA	BES 517-463	NO, up to 250 V AC	5 mm	0...4 mm
AAA	BES 517-464	NC, up to 250 V AC	5 mm	0...4 mm

Hybrid switch element with sensing head 15.5 mm, for use with switch position spacing 16 mm

Code	Ordering code for replacement switch elements	Electrical version	
DH	BES 516-110-D	PNP, complementary, 10...30 V DC	Additional information on request!

For additional electrical data see pages 114 to 117.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

Multiple position switches for standard applications

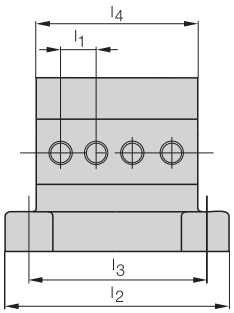
- Can be used under extreme conditions such as shock, temperature fluctuations and coolant flooding
- Reliability comparable with inductive sensors

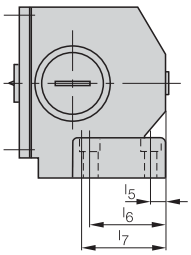
Multiple position switches with function indication

- The inductive switch elements are equipped standard with an LED. The light is highly visible on the housing cover.

Connection options

- Thread for cable gland M25×1.5 on side and in flange (Gaskets and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128/129).





Available sizes

Number of switch positions		2	3	4	5	6	7	8	10	12
Dimension l_2 for	l_1 = 12 mm	84	84	100	116	132	148	164	180	
Dimension l_3 for	l_1 = 12 mm	66	66	82	98	114	130	146	162	
Dimension l_4 for	l_1 = 12 mm	54	54	68	84	100	116	132	148	
Dimension l_2 for	l_1 = 16 mm	84	100	116	132	148	164	180	212	244
Dimension l_3 for	l_1 = 16 mm	66	82	98	114	130	146	162	194	226
Dimension l_4 for	l_1 = 16 mm	54	68	84	100	116	132	148	180	212
Number of connectors	S80	on request								
	S90	on request								

Dimensions when using inductive switch elements with sensing head Ø 10 mm	
Dimension l_5	10 mm
Dimension l_6	40 mm
Dimension l_7	43.5 mm

Dimensions when using inductive switch elements with sensing head Ø 15.5 mm	
Dimension l_5	8 mm
Dimension l_6	38 mm
Dimension l_7	41.5 mm

Dimensions in mm

Ordering example:
BNS 816-B10-THA-12-605-11-S80R

BNS 816-B_ _-_ _ _-_ _-605-11-_ _ _ _

No. of switch positions
02 2×
03 3×
04 4×
...

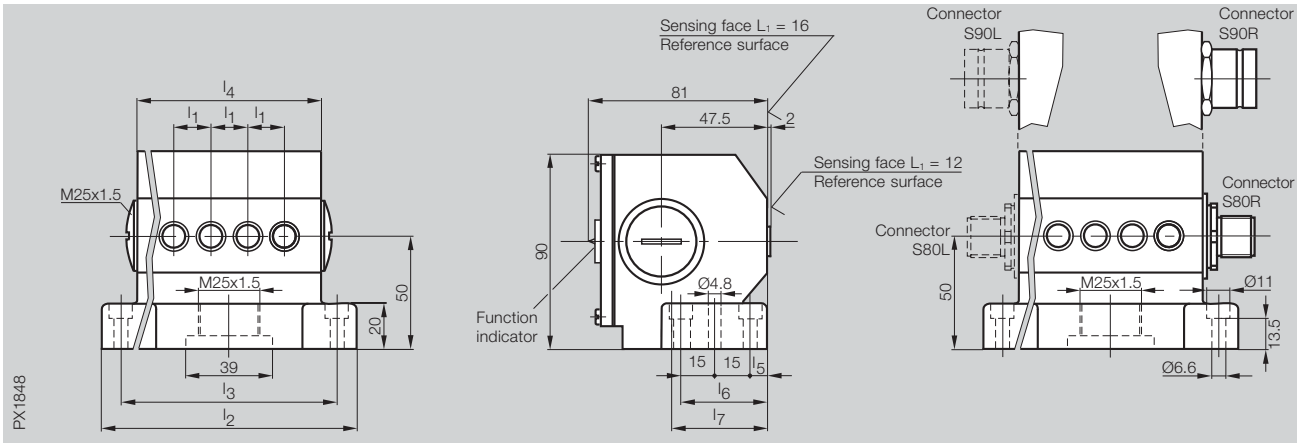
Code for switch elements
(see table at right)

Plunger spacing
12 12 mm
16 16 mm

optional
Connector
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left

Not for new applications. Still available for replacements.

Type	Multiple position switch
Switch position spacing	12 mm or 16 mm



Ordering code	BNS 816-B_ _-_ _ _-_ _-605-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements with sensing head ∅ 10 mm, for use with switch position spacing 12 and 16 mm

Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
PA	BES 517-110	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	BES 517-108	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	BES 517-410	NO, up to 250 V AC	2 mm	0...1.6 mm
WO	BES 517-421	NC, up to 250 V AC	2 mm	0...1.6 mm
KHG	BES 517-560-H	2-wire, NO, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
KHH	BES 517-561-H	2-wire, NC, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
NG	BES 516-314-N	2-wire, NAMUR, 7.7... 9 V DC	2 mm	0...1.6 mm

Inductive switch elements with sensing head ∅ 15.5 mm, for use with switch position spacing 16 mm

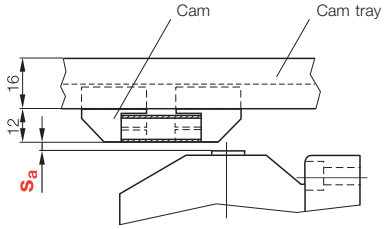
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
THA	BES 517-142-Y	PNP, complementary, 10...30 V DC, short circuit protected	5 mm	0...4 mm
EJA	BES 517-463	NO, up to 250 V AC	5 mm	0...4 mm
AAA	BES 517-464	NC, up to 250 V AC	5 mm	0...4 mm

Hybrid switch element with sensing head 15.5 mm, for use with switch position spacing 16 mm

Code	Ordering code for replacement switch elements	Electrical version	
DH	BES 516-110-D	PNP, complementary, 10...30 V DC	Additional information on request!

For additional electrical data see pages 114 to 117.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

Multiple position switches for standard applications

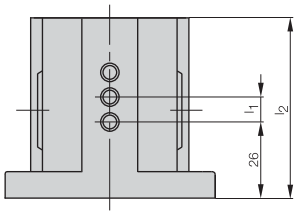
- Smallest plunger spacing for inductive multiple position switches (8 mm or 10 mm)
- Can be used under extreme conditions such as shock, temperature fluctuations and coolant flooding
- Reliability comparable with inductive sensors

Multiple position switches with function indication

- The inductive switch elements are equipped standard with an LED. The light is highly visible on the housing cover.

Connection options

- Thread for cable gland M16×1.5 on side and in flange (seals and plugs included)
- Connector (note permissible operating voltage for the connectors, see page 128).



Available sizes

Number of switch positions		2	3	4	5	6	8	10
Dimension l_2 for	Dimension l_1 = 8 mm	49	59	64	72	80	96	112
	Dimension l_3	54	54	54	54	54	50	50
	Dimension l_1 = 10 mm	49	59	72	80	89	112	129
	Dimension l_3	54	54	54	54	50	50	50
Number of connectors	S80	on request						

Dimensions in mm
Size 12x with 8 mm spacing on request.

Ordering example:
BNS 816-B04-TOB-08-603-11-S80R

BNS 816-B_ _-_ _ _-_ _-603-11-_ _ _ _

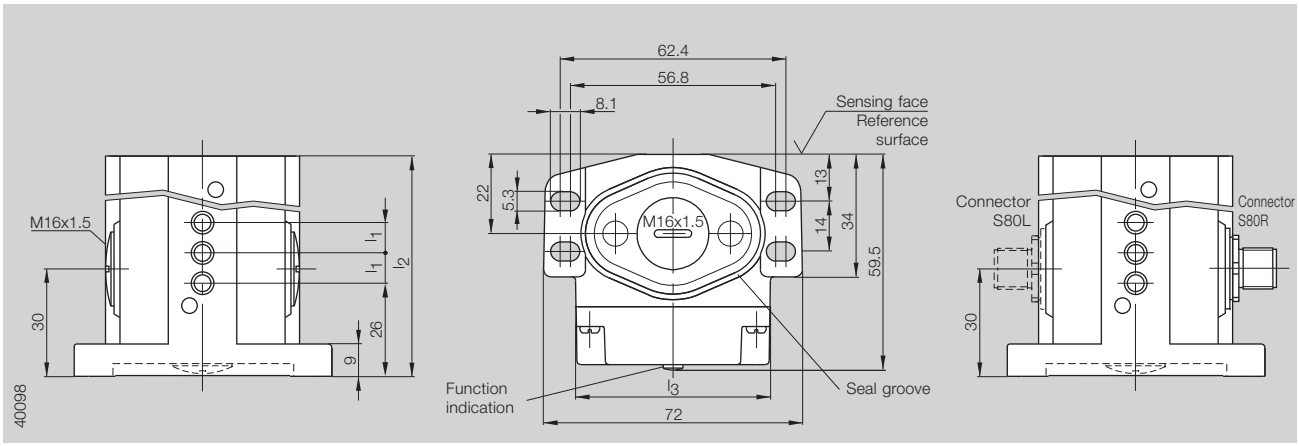
No. of switch positions
02 2×
03 3×
04 4×
...

Code for switch elements
(see table at right)

Plunger spacing
08 8 mm
10 10 mm

optional
Connector
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left

Type	Multiple position switch
Switch position spacing	8 mm or 10 mm



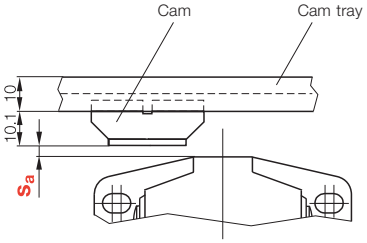
Ordering code	BNS 816-B_ _-_ _ _-_ _-603-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements

Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
TOB	BES 517-312-Y	PNP, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm
TNB	BES 517-311-Y	NPN, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm

For additional electrical data see page 114.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

Multiple position switches for standard applications

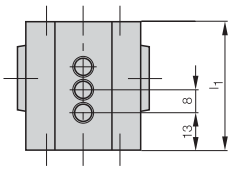
- Smallest plunger spacing for inductive multiple position switches (8 mm)
- Can be used under extreme conditions such as shock, temperature fluctuations and coolant flooding
- Reliability comparable with inductive sensors

Multiple position switches with function indicator

- The inductive switch elements are equipped standard with an LED. The light is highly visible on the housing cover.

Connection options

- Thread for cable gland M16×1.5 on side (Scope of delivery: Seals and cover screws)
- Connector (note permissible operating voltage for the connectors, see page 128/129).



Available sizes

Number of switch positions	2	3	4	5	6
Dimension l_1	34	42	50	58	66
Number of connectors S80	on request				

Dimensions in mm

Ordering example:
BNS 816-B04-TNB-08-650-11-S80R

BNS 816-B_ _-_ _ _-_ _-650-11-_ _ _ _

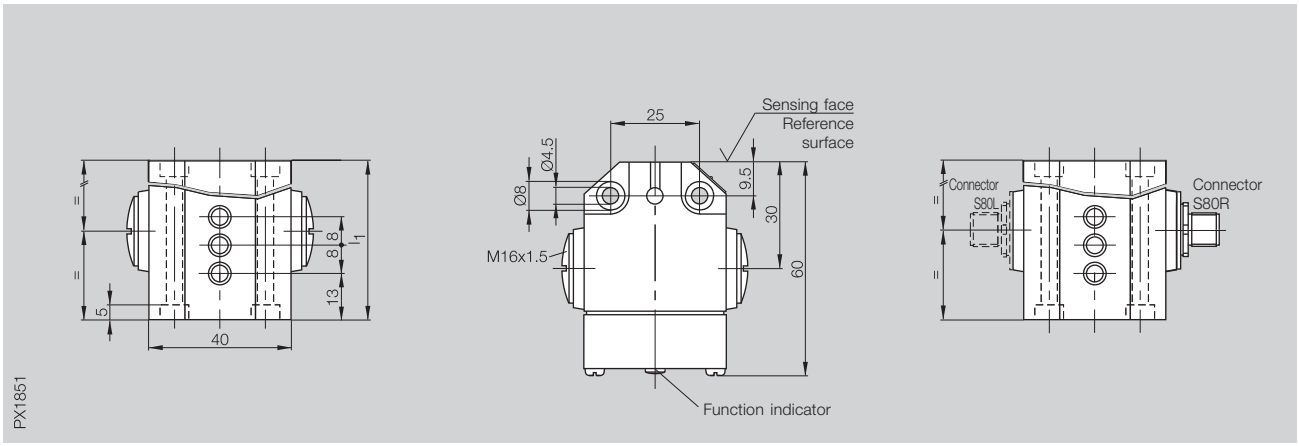
No. of switch positions
02 2×
03 3×
04 4×
...

Code for switch elements
(see table at right)

Plunger spacing
08 8 mm

optional
Connector
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left

Type	Multiple position switch
Switch position spacing	8 mm



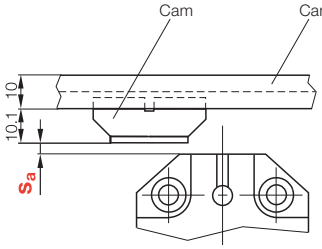
Ordering code	BNS 816-B_ _-_ _ _-_ _-650-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements

Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
TOB	BES 517-312-Y	PNP, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm
TNB	BES 517-311-Y	NPN, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm

For additional electrical data see page 114.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

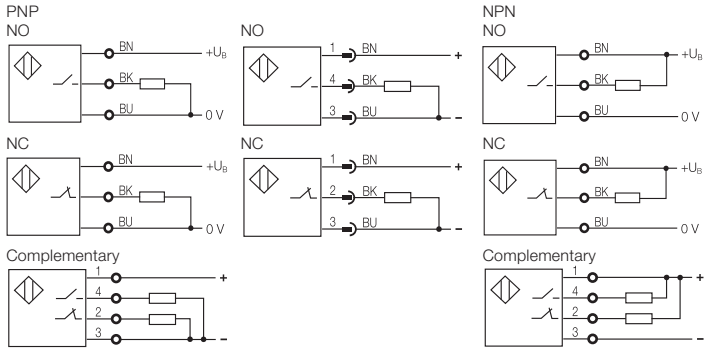
These series offer the combined advantages of the inductive system with the benefits of our mechanical housing series for position switches.

The basis for all electrical versions is the wide variety of tubular sensors.

Features

- Reliable inductive operating principle
- All switches equipped with LEDs
- The mounting dimensions of standardized mechanical housing styles can be used
- Simple combination with bus-compatible systems using customer-specific connectors

Wiring diagrams



Housing size		
Mounting		
Rated operating distance s_n		
Assured operating distance s_a		

CE

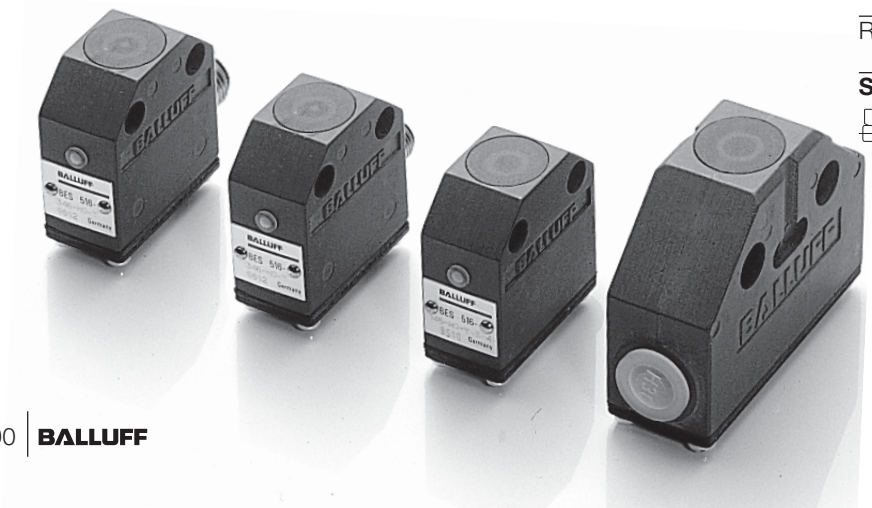
PNP	NO	**Ordering code** Part number
	NC	**Ordering code** Part number
	Complementary	**Ordering code** Part number

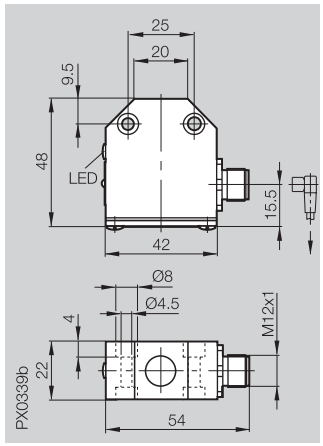
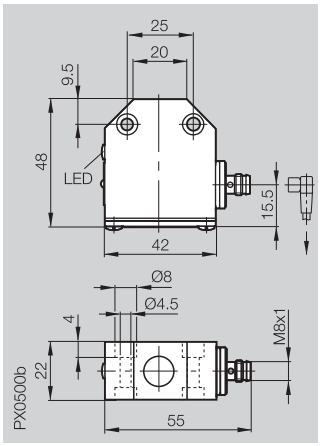
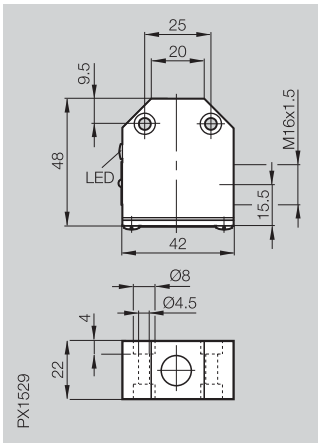
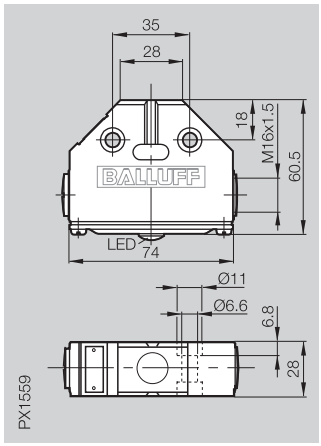
NPN	NO	**Ordering code** Part number
	NC	**Ordering code** Part number
	Complementary	**Ordering code** Part number

Supply voltage U_B	
Voltage drop U_d at I_e	
Rated insulation voltage U_i	
Rated operational current I_e	
No-load supply current I_0 max.	
Polarity reversal protected	
Short circuit protected	
Repeat accuracy R	
Ambient temperature range T_a	
Switching frequency f	
Utilization category	
Function indicator	
Degree of protection per IEC 60529	
Housing material	
Material of sensing face	
Connection type	
max. conductor cross-section	
Recommended connector	5 m, straight 5 m, right-angle

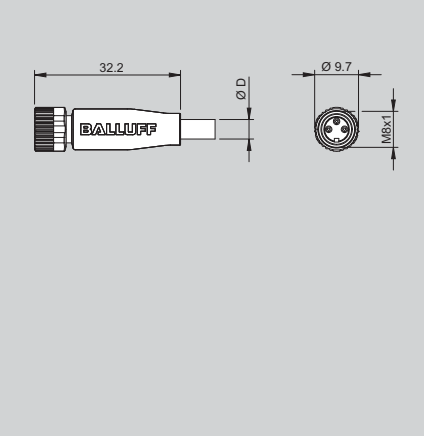
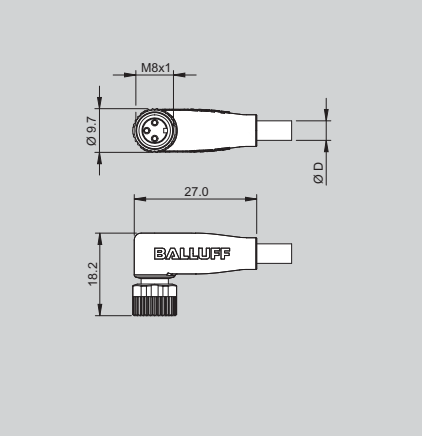
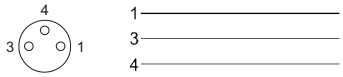
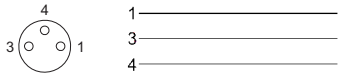
See next page for connectors

Connector orientation



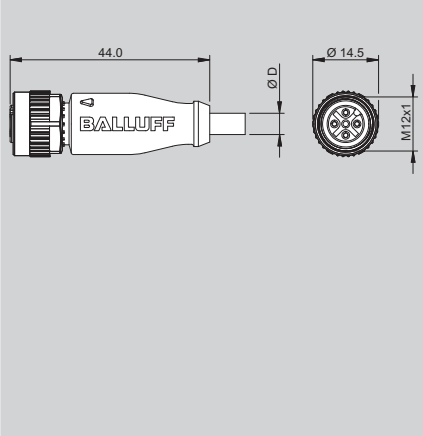
	42×48×22 mm	42×48×22 mm	42×48×22 mm	74×60.5×28 mm
	Flush	Flush	Flush	Flush
	5 mm	5 mm	5 mm	7 mm
	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...5.7 mm
				
	BES01FE BES 516-346-H2-Y-S4 **BES01EW** BES 516-341-H2-Y-S4	**BES01FF** BES 516-346-H2-Y-S49	**BES01FC** BES 516-346-H2-Y **BES01EU** BES 516-341-H2-Y	**BES017M** BES 516-161-H3-L
			BES01ZK BES 516-344-H2-Y **BES01ET** BES 516-340-H2-Y	**BES017L** BES 516-160-H3-L
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 3.5 V	≤ 3.5 V	≤ 3.5 V	≤ 1.5 V
	75 V DC	75 V DC	75 V DC	75 V DC
	130 mA	130 mA	130 mA	400 mA
	≤ 25 mA	≤ 25 mA	≤ 25 mA	≤ 30 mA
	yes	yes	yes	yes
	yes	yes	yes	no
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	500 Hz	500 Hz	500 Hz	300 Hz
	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67
	Anodized GD-Al	Anodized GD-Al	Anodized GD-Al	Anodized GD-Al
	PA 12	PA 12	PA 12	PA 12
	Connectors	Connectors	Screw terminals up to 2.5 mm²	Screw terminals up to 2.5 mm²
	BCC032H BCC032Z	BCC02M9 BCC02MM		

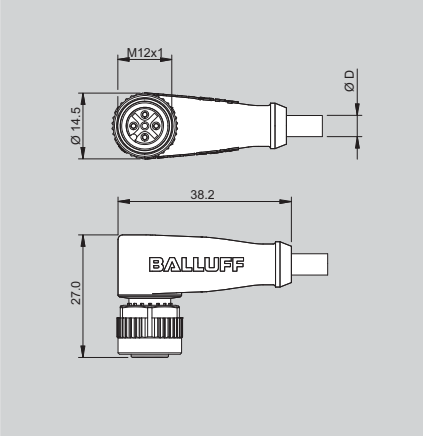
2.1
Multiple position switches series
602-11
610-11
611-11
612-11
613-11
605-11
603-11
650-11
Single position switches series
H2 and H3
5.1
5.2
5.3

Connector			**BCC**	**BCC**
Version			M8 female straight	M8 female right-angle
Use			Position switch S49	Position switch S49
				
3-pin PUR	2 m	**Ordering code**	**BCC02M8**	**BCC02ML**
		Part number	BCC M313-0000-10-001-PX0334-020	BCC M323-0000-10-001-PX0334-020
	5 m	**Ordering code**	**BCC02M9**	**BCC02MM**
		Part number	BCC M313-0000-10-001-PX0334-050	BCC M323-0000-10-001-PX0334-050
	10 m	**Ordering code**	**BCC02MA**	**BCC02MN**
		Part number	BCC M313-0000-10-001-PX0334-100	BCC M323-0000-10-001-PX0334-100
Supply voltage max. AC U_B			60 V AC	60 V AC
Supply voltage max. DC U_B			60 V DC	60 V DC
Cable			Molded	Molded
No. of wires × conductor cross-section			3×0.34 mm²	3×0.34 mm²
Degree of protection per IEC 60529			IP 67	IP 67
Ambient temperature range T_a			–25...+80 °C	–25...+80 °C
Use			Normally open (NO)	Normally open (NO)
Connector diagram and wiring				

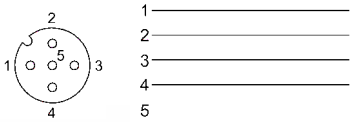
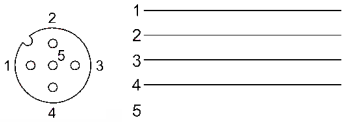
Other cable lengths and cable qualities on request.

Connector	BCC	BCC
Version	M12 female straight	Female right-angle
Use	BNS ...-S4_-I (IO-Link)	BNS ...-S4_-I (IO-Link)



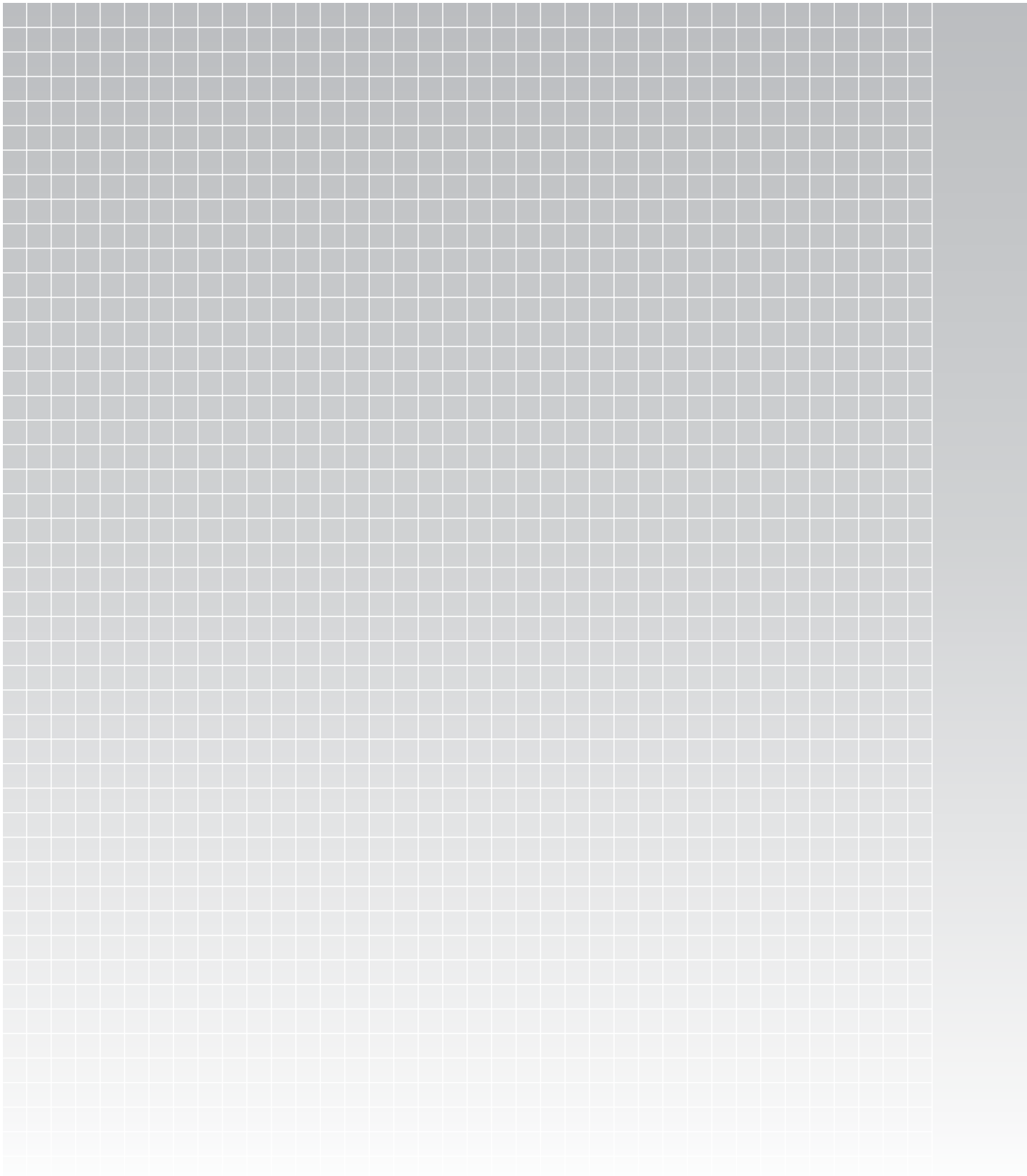


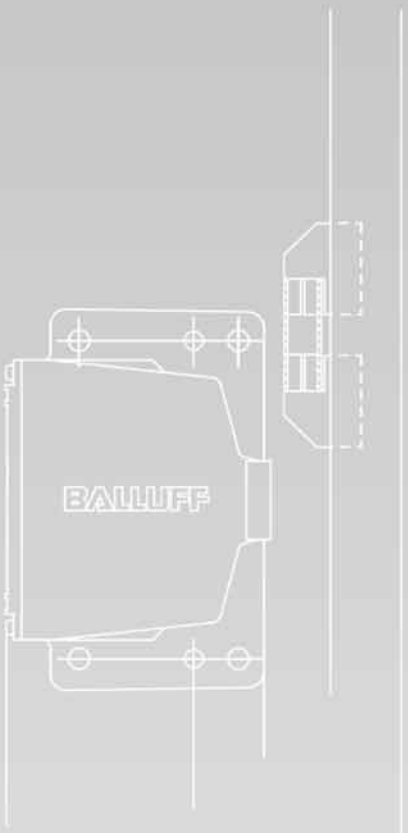
4-pin PUR	2 m	**Ordering code**	**BCC032F**	**BCC032Y**
		Part number	BCC M415-0000-1A-003-PX0434-020	BCC M425-0000-1A-003-PX0434-020
	5 m	**Ordering code**	**BCC032H**	**BCC032Z**
		Part number	BCC M415-0000-1A-003-PX0434-050	BCC M425-0000-1A-003-PX0434-050
	10 m	**Ordering code**	**BCC032J**	**BCC0330**
		Part number	BCC M415-0000-1A-003-PX0434-100	BCC M425-0000-1A-003-PX0434-100

Supply voltage max. AC U_B	250 V AC	250 V AC
Supply voltage max. DC U_B	250 V DC	250 V DC
Cable	Molded	Molded
No. of wires × conductor cross-section	4×0.34 mm²	4×0.34 mm²
Degree of protection per IEC 60529	IP 68	IP 68
Ambient temperature range T_a	–25...+80 °C	–25...+80 °C
Use	Antivalent (NO/NC)	Antivalent (NO/NC)
Connector diagram and wiring		

You can find additional connectors in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

2.1
Multiple position switches series
602-11
610-11
611-11
612-11
613-11
605-11
603-11
650-11
Single position switches series
H2 and H3
5.1
5.2
5.3





more added value

– Very long service life
– Highly reliable, especially for robotic applications

Inductive multiple position switches with extended switching distance 4 mm

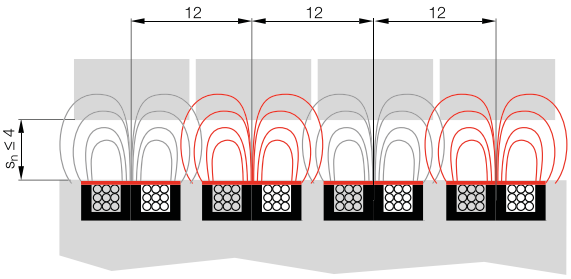
96 Principles
97 Series 602-11 per DIN 43697
98 Series 610-11
99 Series 605-11

Inductive multiple position switches in this series are characterized by a compact housing and generous switching distances. The result is a non-contacting, wear-free sensor.

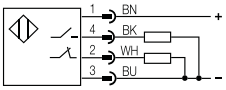
The tuned sending frequencies of the inductive switch elements allow them to be located very close to each other.

Mutual interference is precluded at 12 mm spacing and 4 mm switching distance.

The inductive switch elements are already factory installed.



Complementary inductive switch elements can be used as normally open or normally closed.

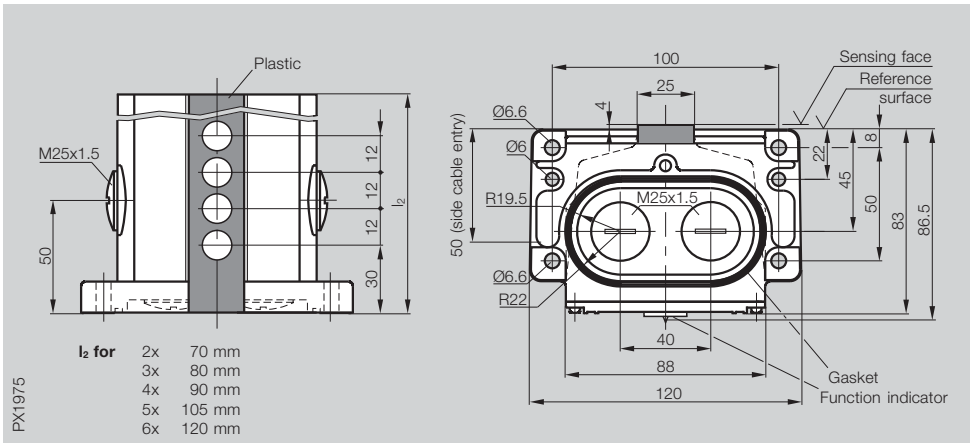


Robot Movement Safety

If two physical channels (1 normally and 1 normally closed) are powered by a switching power supply, this will enable cross-connection detection.
In such a system different signals must be sent to the controller.

In case of error (short circuit, miswiring, ...) both signals are identical and are recognized by the controller as a cross-connection fault condition. Monitoring can be handled by a safety programmable controller or with a Pilz type safety switching device.

Type	Multiple position switch
Switch position spacing	12 mm
Mounting and function dimensions	per DIN 43697



Ordering code	BNS 816-X603-B_ _-00-12-602-11
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements with head ∅ 10 mm

Inductive switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
BES 517-100-S42, ...-S43, ...-S44	PNP, complementary, 10...60 V DC, short circuit protected	4 mm	0...3.2 mm

Ordering example:
BNS 816-X603-B04-00-12-602-11

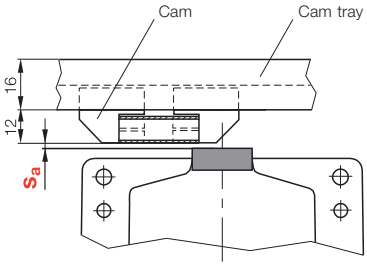
BNS 816-X603-B_ _-00-12-602-11

No. of switch positions

02 2×
03 3×
04 4×
05 5×
06 6×

Other sizes and connectors on request.

Installation

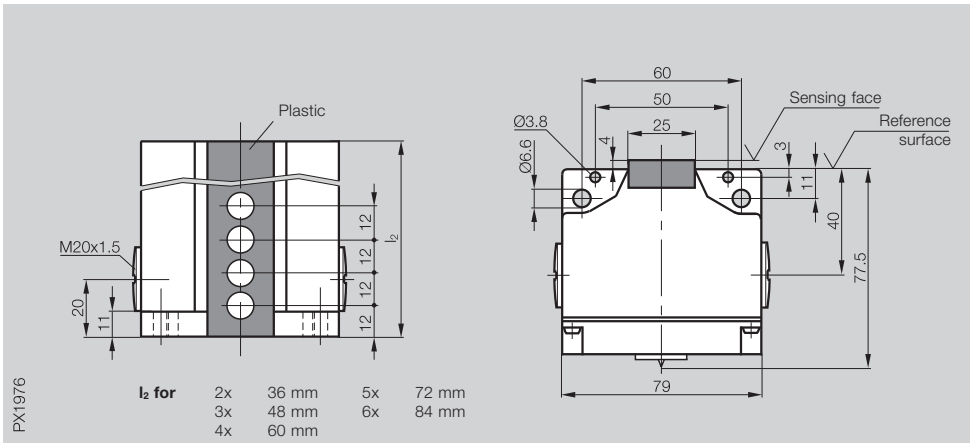


Caution!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

Inductive Multiple Position Switches with Extended Switching Distance 4 mm

Series 610-11

Type	Multiple position switch
Switch position spacing	12 mm



Ordering code	BNS 816-X603-B _ _-00-12-610-11
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements with head ∅ 10 mm

Inductive switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
BES 517-100-S42, ...-S43, ...-S44	PNP, complementary, 10...60 V DC, short circuit protected	4 mm	0...3.2 mm

Ordering example:
BNS 816-X603-B04-00-12-610-11

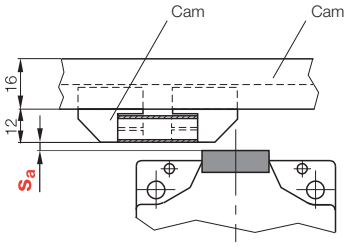
BNS 816-X603-B _ _-00-12-610-11

No. of switch positions

02 2×
03 3×
04 4×
05 5×
06 6×

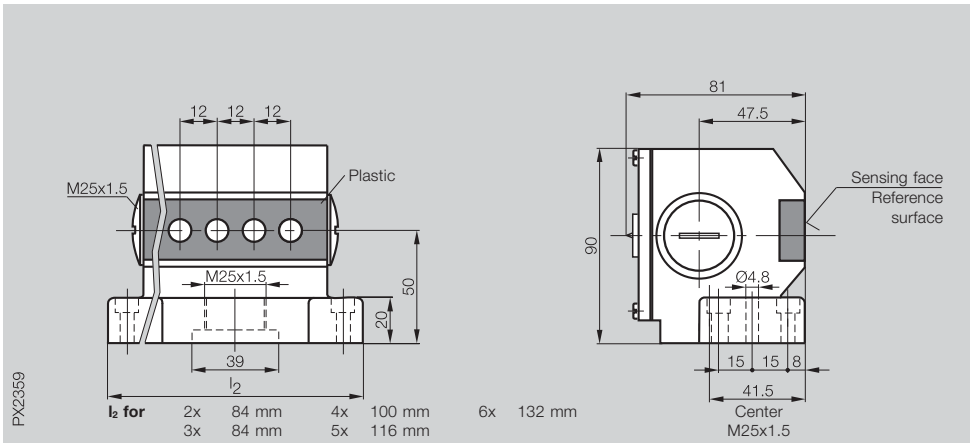
Other sizes and connectors on request.

Installation



Caution!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.

Type	Multiple position switch
Switch position spacing	12 mm



Ordering code	BNS 816-X603-B_ _-00-12-605-11
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements with head ∅ 10 mm

Inductive switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
BES 517-100-S42, ...-S43, ...-S44	PNP, complementary, 10...60 V DC, short circuit protected	4 mm	0...3.2 mm

Ordering example:
BNS 816-X603-B04-00-12-605-11

BNS 816-X603-B_ _-00-12-605-11

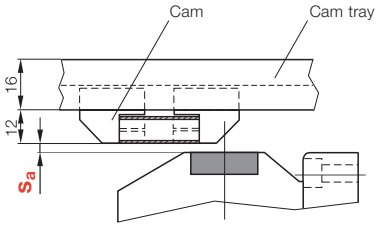
No. of switch positions

02 2×
03 3×
04 4×
05 5×
06 6×

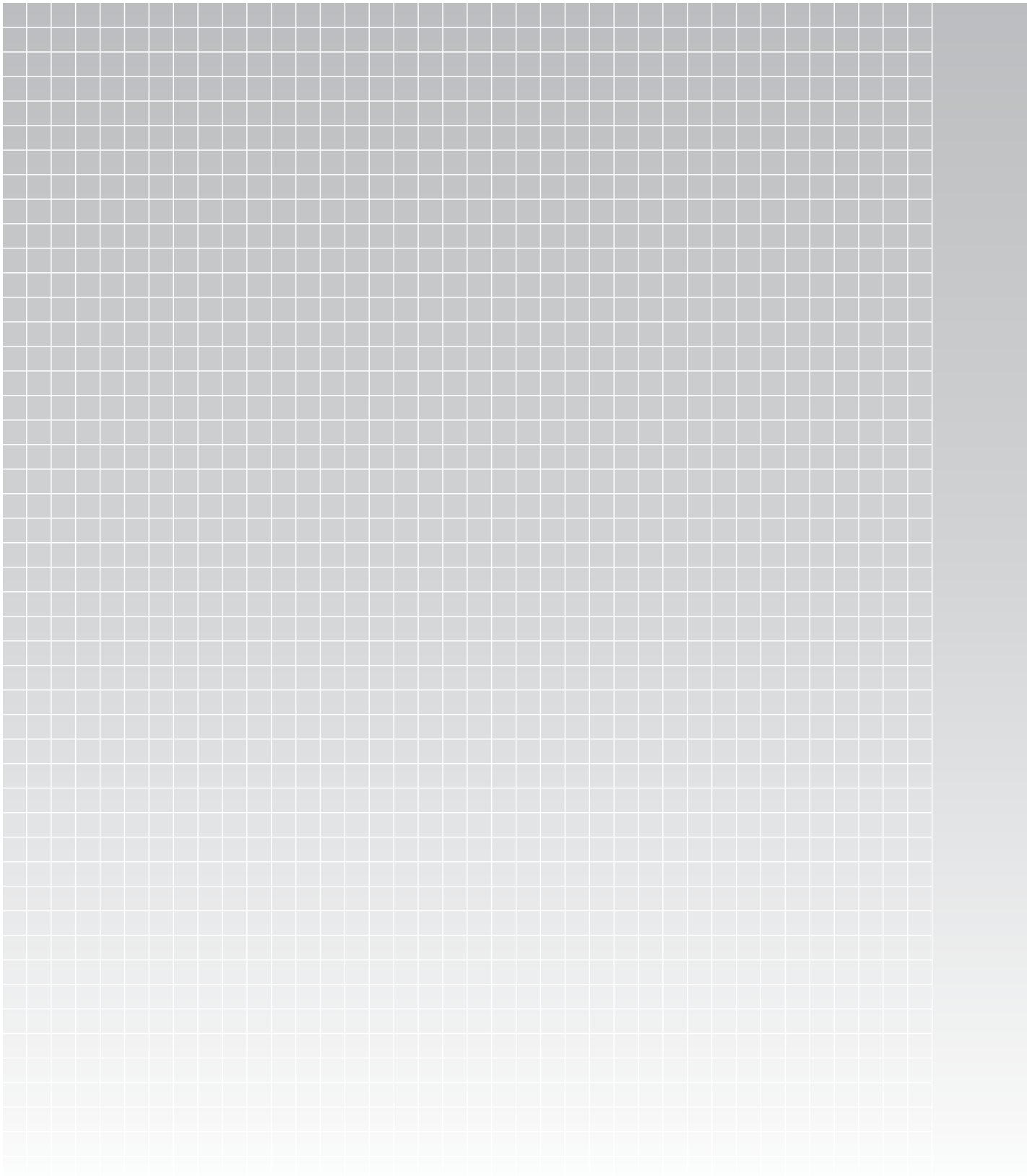
Inquire for connectors.

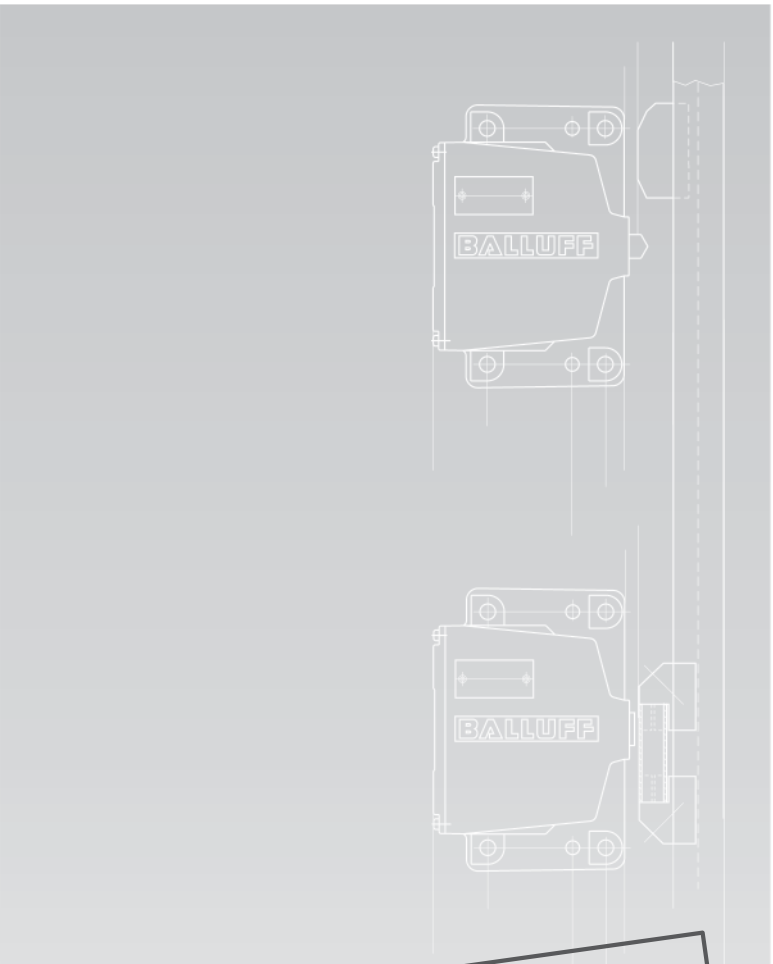
Not for new applications. Still available for replacements.

Installation



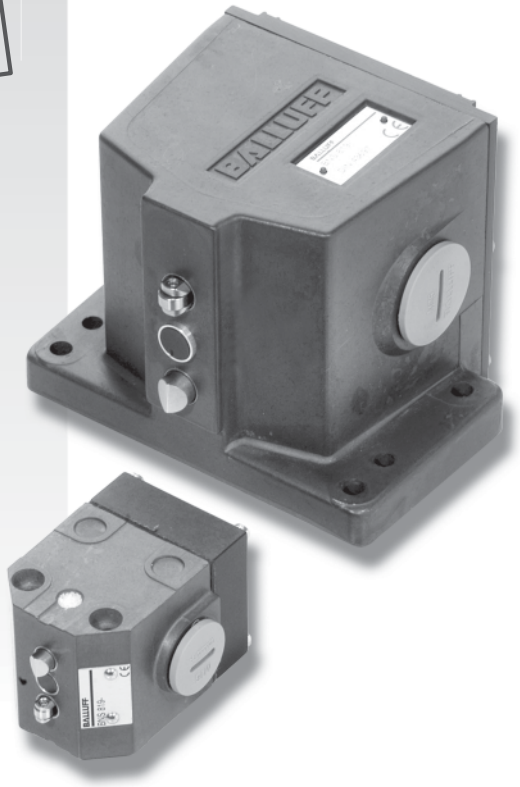
Caution!
To ensure switching function s_a must be in a range of $0 < s_a \leq 0.81\ s_n$.





more added value

– Long service life
– Optimized for your requirements and applications



Special form factors

102 Multiple position switches with mechanical and inductive switch positions
104 Custom products

Mechanical and inductive switch positions in one multiple switch housing

For applications in which different requirements need to be met, mixed assemblies can be used.
For example, simple position sensing can be done using inductive switch elements, and safety-relevant functions handled using safety switch positions.

The following possibilities are available:

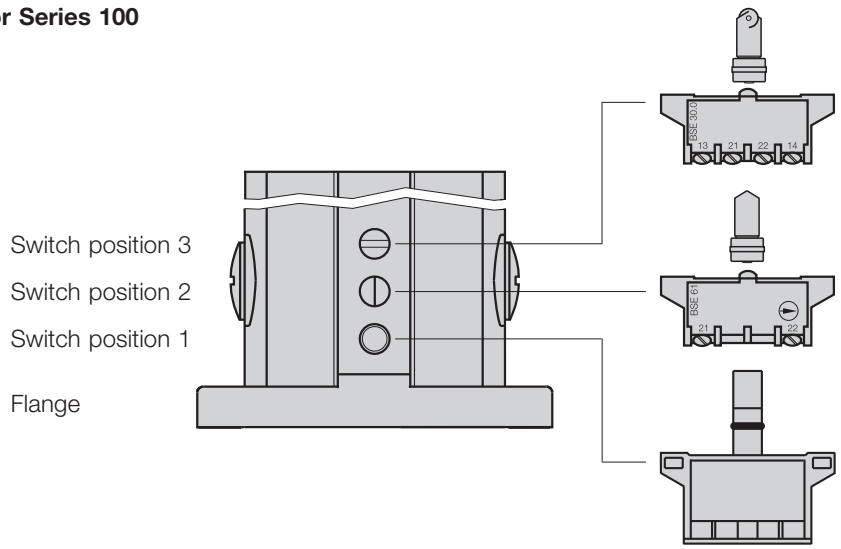
- Mechanical switch element actuated with telescoping plunger
- Safety switch element per DIN EN 60204-1/ VDE 0113 actuated with rigid plunger
- Inductive switch element

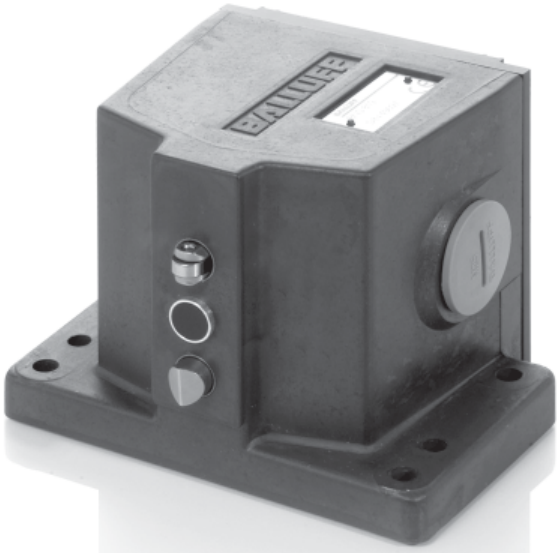
Mixing options

When ordering please indicate the **individual switch positions** in plain text. Begin with the first switch position as seen from the mounting surface.

Mixed assembly switches get a special ordering code.

Example for Series 100





Plunger styles

Chisel (**D**)
Ball (**K**)
Roller (**R**)
Roller bearing (**L**)

Mechanical switch elements

BSE 30.0
BSE 61 to
DIN EN 60204-1/VDE 0113,
BSE 85 to
DIN EN 60204-1/VDE 0113

Inductive switch elements

PA	BES 517-110
NA	BES 517-108
WS	BES 517-410
WO	BES 517-421
KHG	BES 517-560-H
KHH	BES 517-561-H
NG	BES 516-314-N
THA	BES 517-142-Y
EJA	BES 517-463
AAA	BES 517-464
DH	BES 516-110-D

Optional
Function indicators FD/FE/FC for mechanical switch positions
Connector S80/S90 to make installation easier

Note for standard series

The standard versions are described in:

Section **1**
Mechanical Single and Multiple Position Switches

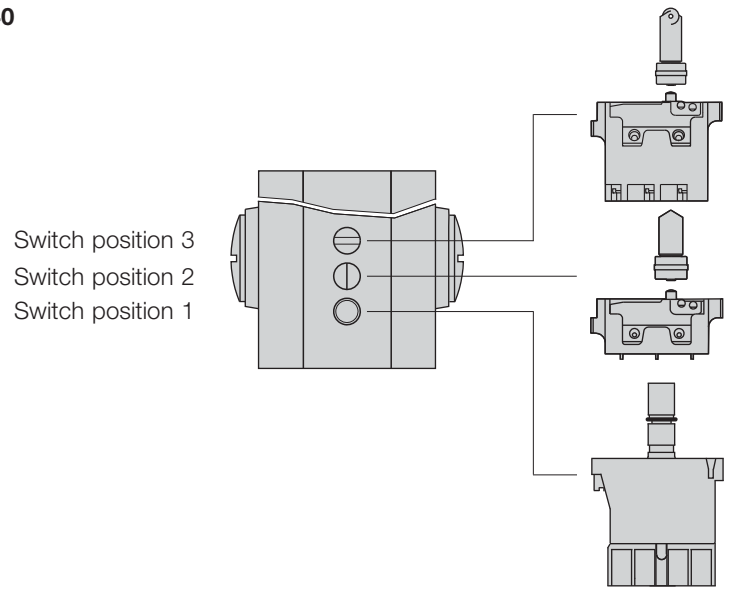
Section **2**
Inductive Single and Multiple Position Switches

Detailed information on switch elements and plungers can be found in:

Section **5.1**
Mechanical and Inductive Switch Elements

Section
Principles

Example for Series 40



Plunger styles

Chisel (**D**)
Ball (**K**)
Roller (**R**)

Mechanical switch elements

BSE 63 with forced-opening
BSE 64 with forced-opening
BSE 69.1
BSE 70.1
BSE 73.1
BSE 74.1

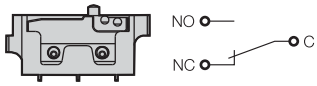
Inductive switch elements

TNB BES 517-311-Y
TOB BES 517-312-Y

Optional
Function indicator FC for mechanical switch positions
Connector S80 to make installation easier

Ultra-high temperature-proof multiple position switch BNS for applications up to +180 °C

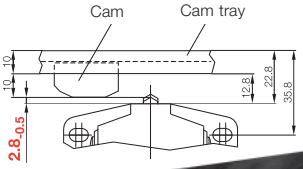
Type	Multiple position switches series 40 and 46
Plunger spacing	8 mm
Plunger style	Chisel (**D**), ball (**K**), roller (**R**)
Plunger material	Stainless steel, contact surfaces induction-hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for bulkhead
Ambient temperature range	–5...+150 °C (–5...+180 °C 10 h/day) +23 - 302 °F (+23 - 356 °F 10 h/day)
Degree of protection per IEC 60529	IP 67



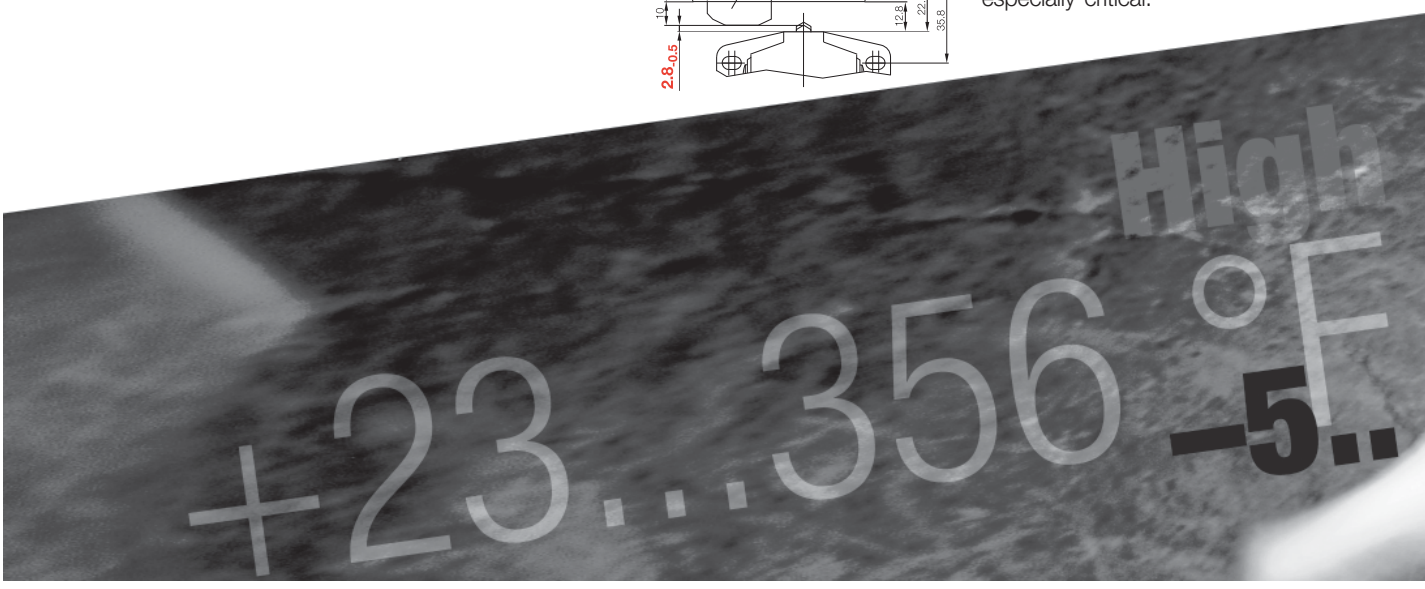
Switch element	**BSE 69.1**
Part number	BNS 819-...-46-12
Contact material	Gold
Switching principle	Snap switch
Contact system	single pole
Connection type	Solder connection
Approval	UL, CE, CSA, CCC, ENEC

Mechanical data	
Plunger point to reference surface	4 mm
Switching point to reference surface	3.5 mm
Maximum plunger travel	3.5 mm
Switching actuating force on plunger	Min. 8 N

Installation



Note!
To ensure switching function, the dimension 2,8$_{-0,5}$ is especially critical.



more added value

Stays cool, even when things get hot
The ultra-high temperature-proof multiple position switches can be used for temperatures up to 180 °C, require little space and feature a robust die casting housing. They are the perfect solution for harsh environments in die construction and in the plastic and steel industries.

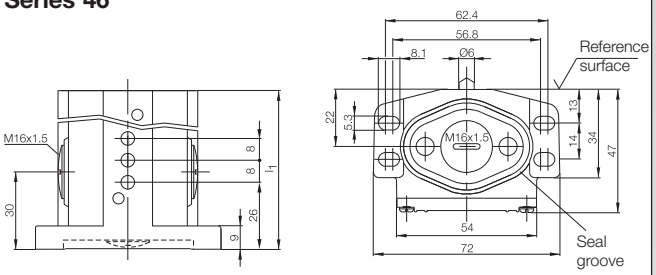
Ordering example:
BNS 819-B03-D08-46-15

BNS 819-B _ _-_-_ 08-_ _-15

No. of plungers		Plunger style		Series
02	2x	**D**	Chisel	**40**
03	3x	**K**	Ball	**46**
		R	Roller	

Additional types on request:
Ultra-BNS@balluff.de or from your Balluff Field Service Specialist.

Series 46

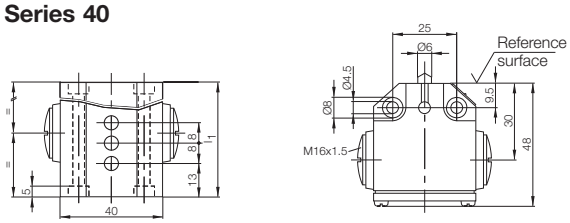


Available sizes

Number of plungers	2	3
Dimension l_1	49	59

Dimension in mm

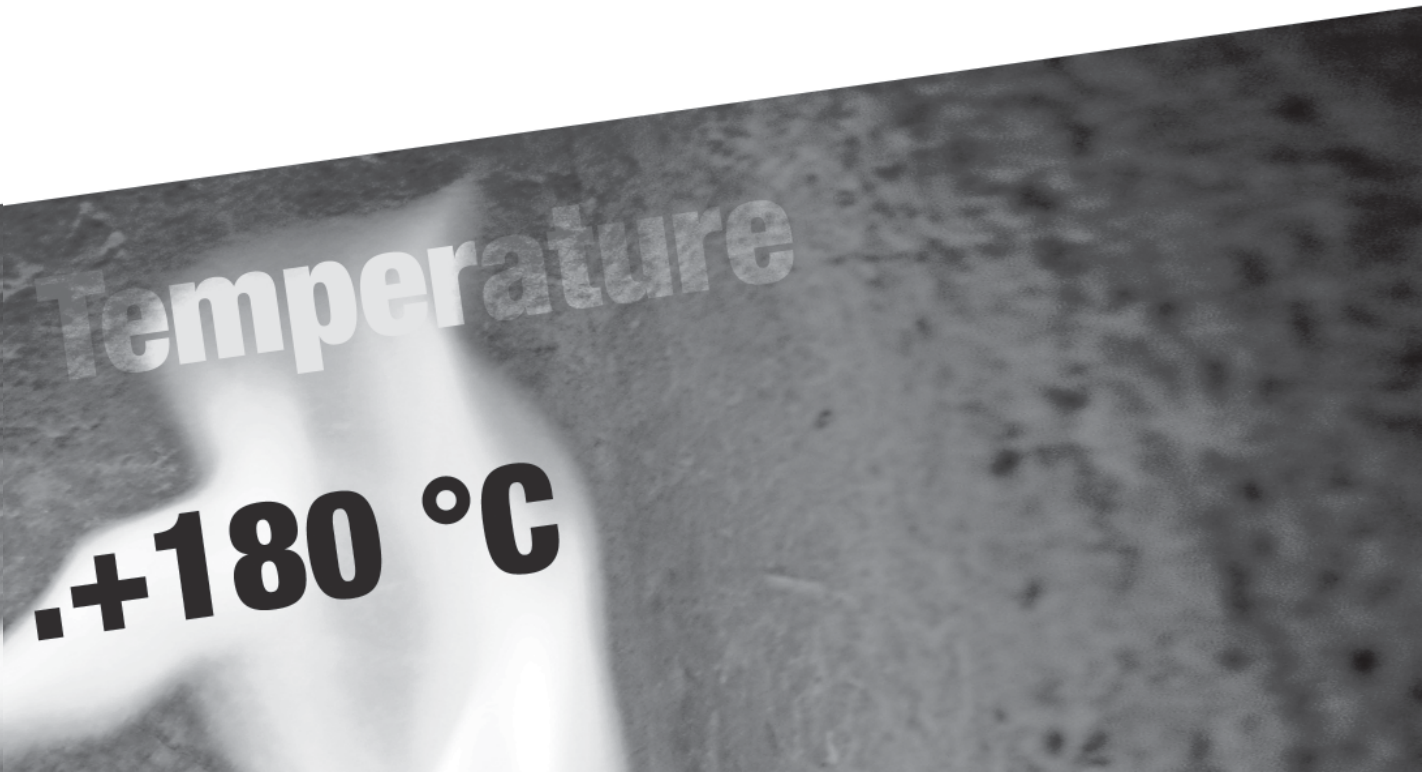
Series 40

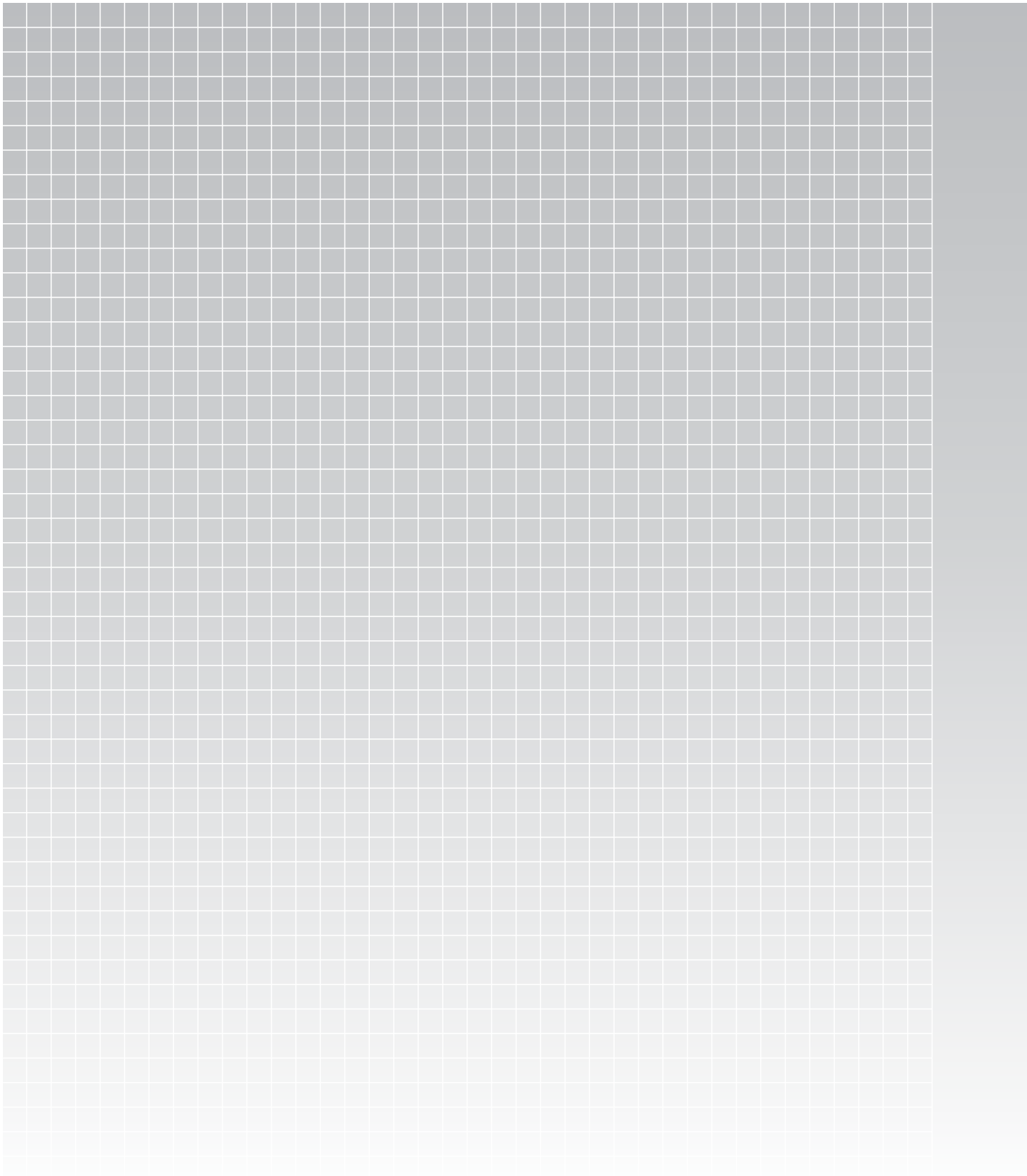


Available sizes

Number of plungers	2	3
Dimension l_1	49	59

Dimension in mm





more added value

- Simplest and most economical installation
- For flexible use
- Also ideal for retrofits

Wireless-System

108 Wireless
Position Switches
Series F 60
per DIN 43693,
Series 99

110 Wireless Receiver Box
BWT R1-4R1D-10_-T

Unidirectional wireless signal transmission. We recommend an application-specific test and plausibility check from the actuator and sensor signal in the controller.

more added value

Cumbersome cabling and construction were yesterday. Now you can enjoy easy configuration and freedom from maintenance. → **Reduce your costs. And devote your time elsewhere!**

Simple retrofitting requires less expenditure of human resources. → **Decrease your investment outlay.**

Use these sensors even where it used to be impossible: inaccessible locations and tight spaces. → **Expand your possibilities. While increasing the productivity of your equipment.**

Wireless technology

Advantages of the wireless position switch

- No more cable routing
- No cumbersome wiring
- Simple to install
- Fast setup
- Flexible use
- Ideal for retrofitting
- Retrofit machines and equipment

Wireless position switch for standard applications

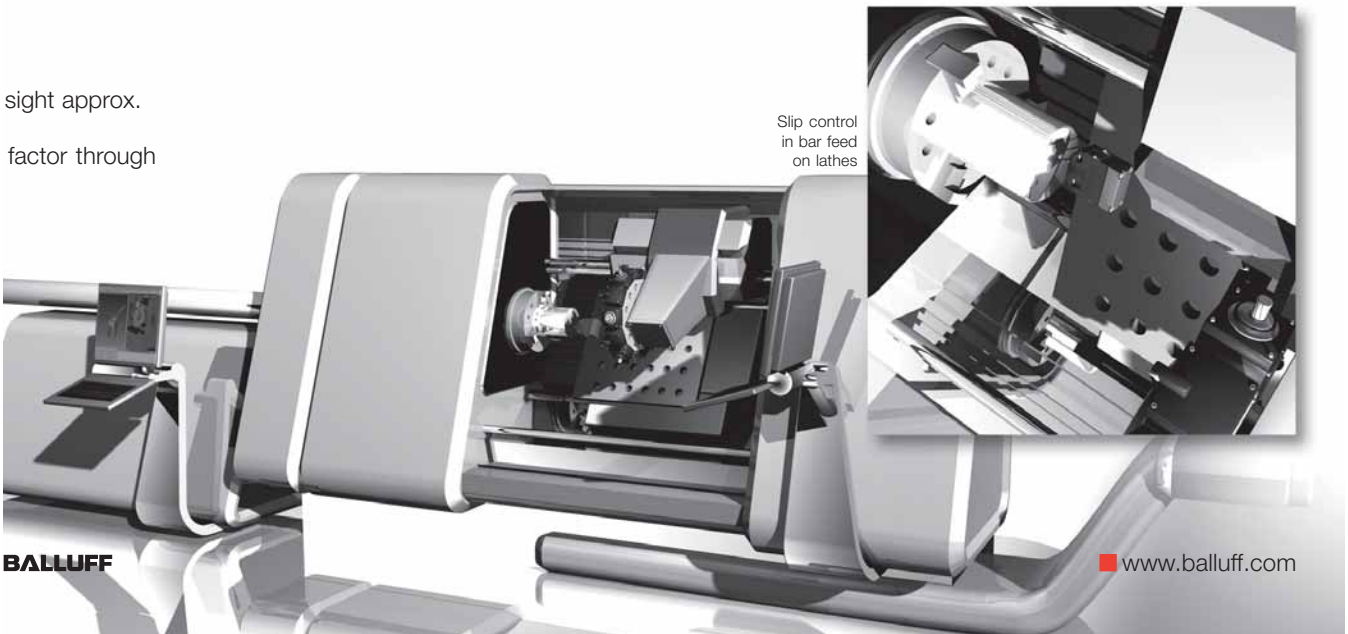
- Dual-chamber system with IP 67 protection: wear-free membrane hermetically seals plunger mechanism and switch chamber
- Maintenance-free, self-lubricating plunger guide with slide bearing

Wireless position switch with wiper plate

- Increased function security under extreme conditions of use
- Wiper plate prevents plunger from sticking in the guide
- For use in wet areas with strongly adhering media

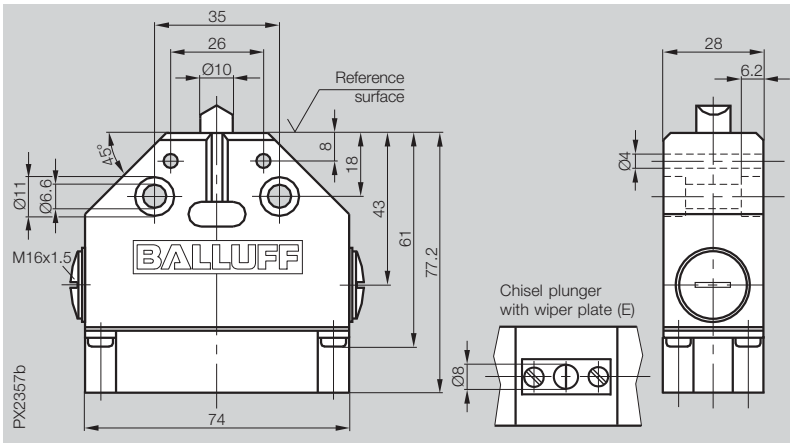
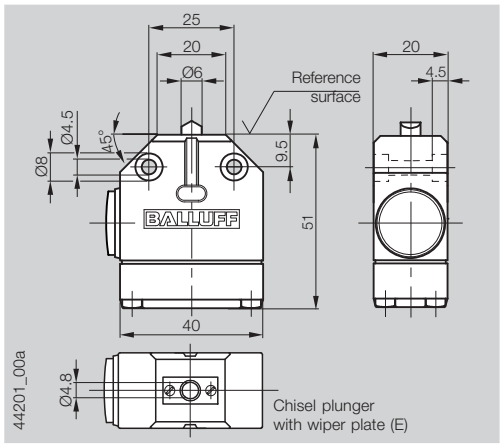
Ranges

- For line of sight approx. 30 m
- Reduction factor through walls



Slip control in bar feed on lathes

Type	
Mounting and function dimensions	
Plunger style	
Plunger material	
Housing material	
Ambient temperature range	
Degree of protection per IEC 60529	
Part number	
Switch element	
Transmitting frequency	
Switching and transmission principle	
Mechanical data	
Plunger point to reference surface	
Switchpoint to reference surface	
Maximum plunger travel	
Switching actuating force on plunger	
Switching frequency	
Approach speed (min. 2 m/min bei F 60)	Plunger D
	Plunger E
	Plunger K
	Plunger R
	Plunger L
Repeatability	
Service life	

Wireless position switches per DIN 43693	Wireless position switches
	
Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)	Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)
Stainless steel, contact surfaces induction hardened	Stainless steel, contact surfaces induction hardened
Cast aluminum, corrosion-resistant, anodized finish	Cast aluminum, corrosion-resistant, anodized finish
0...+70 °C	0...+70 °C
IP 67	IP 67
BNS 819-F_-60-W1_	**BNS 819-99-_-W1_**
868 MHz snap switch, Electrogenerative power production upon actuation of the switch, 14-byte protocol, duty cycle 1 %, 3 protocols per send procedure	868 MHz snap switch, Power supplied by miniature battery, 14-byte protocol, duty cycle 1 %, 3 protocols per send procedure
8 mm	4 mm
5.5 mm	3.5 mm
3.7 mm	3.5 mm
min. 20 N	min. 8 N
max. 60/min	max. 60/min
10 m/min	8 m/min
10 m/min	8 m/min
5 m/min	5 m/min
20 m/min	20 m/min
60 m/min	
±0.2 mm	±0.2 mm
250,000 switching operations	1 million switching operations/5 years

Ordering example:
BNS 819-FD-60-W13

BNS 819-F_-60-W1_

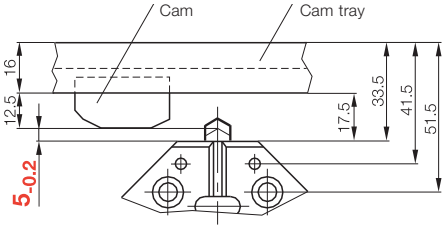
Plunger style		Approach direction	
D	Chisel	**3**	longitudinal, parallel to mounting surface
K	Ball		
R	Roller		
L	Roller bearing	**5**	lateral, 90° to mounting surface
E	Chisel with wiper plate		

BNS 819-99-D-W1Q

BNS 819-99-_-W1_

Plunger style		Approach direction	
D	Chisel	**3**	longitudinal, parallel to mounting surface
K	Ball		
R	Roller		
E	Chisel with wiper plate	**5**	lateral, 90° to mounting surface

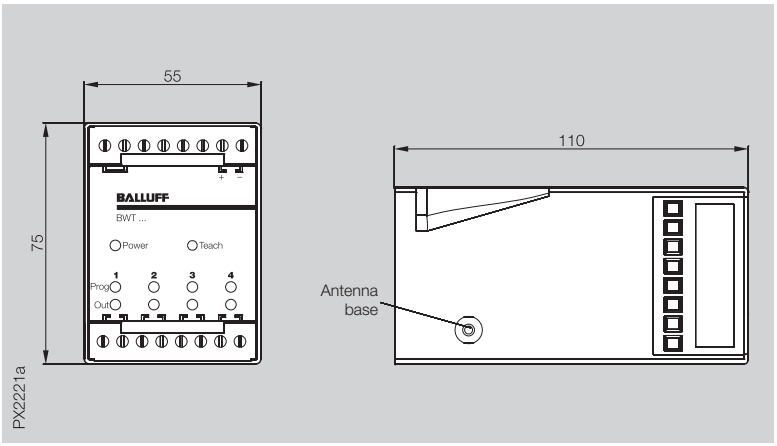
Mounting series F 60



Note!
To ensure switching function, the dimension $5_{-0.2}$ is especially critical.

Mounting series 99, see page 45

Type	Wireless receiver box	Wireless receiver box with Power-Down function



Ordering code Part number	**BWT0003** BWT R1-4R1D-101-T	**BWT0004** BWT R1-4R1D-102-T
Electrical data		
Rated operational voltage U_e	24 V DC	
Supply voltage U_B	20.4...28.8 V DC	
Ripple	≤ 5 % of U_e	
No-load supply current I_0 max.	20 mA	
Current consumption	1.5 W	
Max. load	2 A/30 V DC	
Min. relay switching frequency (1 A, 30 V DC, resistive load)	2× 10^5	
Mechanical data		
Housing material	PC	
Connection type	Clamping terminal	
Degree of protection per IEC 60529	IP 20	
Contamination class	2	
Ambient data		
Max. range	30 m	
Range reduction during the programming procedure	0.5 m	
Receive frequency	868 MHz	
Ambient temperature range T_a	+5...+65 °C	
Utilization category	DC 13	

Handheld tester
Ordering code **BWT0006**
Part number BWT S1-A01EPM100
(Battery is not included in scope of delivery)
A 9V block battery is required.

Power-down function saves last signal status when receiver power is interrupted.

Benefits

- Simple to install: teach-in of the switch and active range restriction in configuration mode
- Teach function blocking can be activated
- Configuration and switching states displayed per LED
- 4 programmable outputs: normally open or normally closed
- Antenna socket for SMB plug
- Simple installation on DIN rail
- Reset function

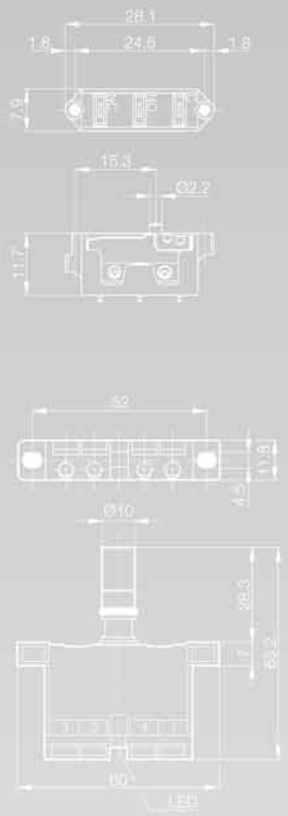
Please order separately!

Magnetic antenna, 2.5 m cable	Ordering code **BWT0001**
Screw-on antenna	Ordering code **BWT0002**
Antenna cable, 5.0 m cable for screw-on antenna	Ordering code **BWT0007**

Mechanical and Inductive Replacement Switching Elements (Replacement Kits)

Contents

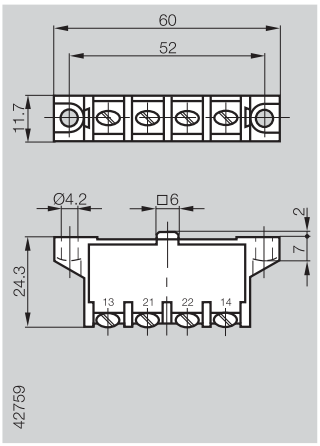
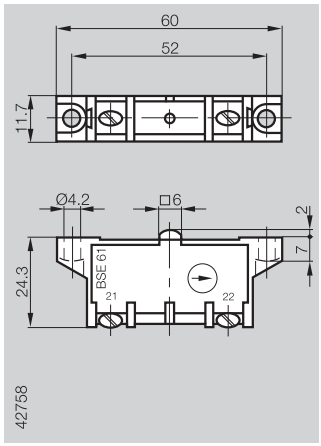
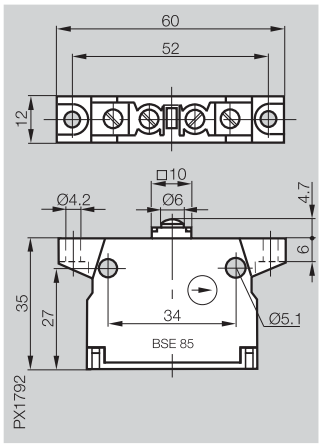
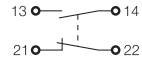
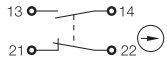
112 Mechanical replacement switching elements BSE
114 Inductive replacement switching elements DC 3-/4-wire
116 Inductive replacement switching elements AC, DC 2-wire



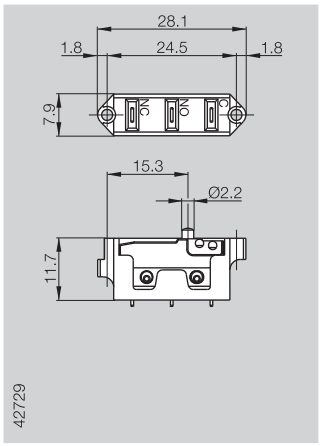
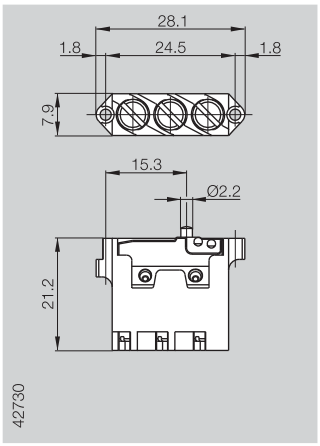
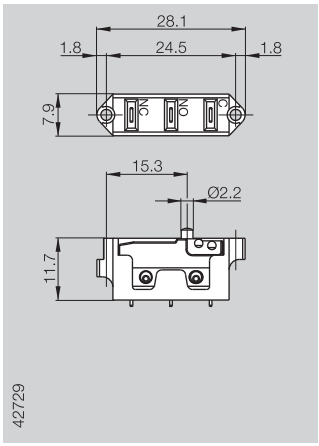
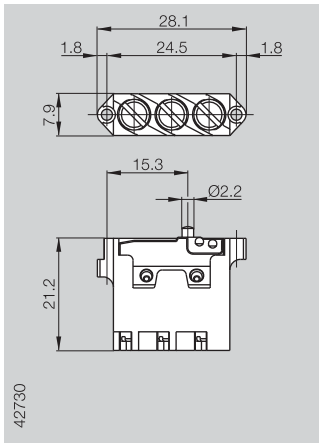
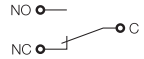
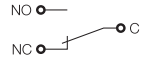
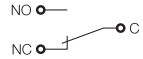
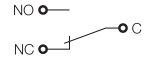
more added value

– Mechanical and inductive principle selectable
– Sensors and accessories ideally matched

5.1

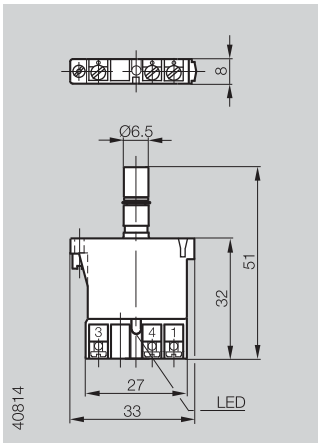
Type	Snap switch element BSE 30.0	Creep switch element BSE 61 to DIN EN 60204-1	Snap switch element BSE 85 to DIN EN 60204-1
for multiple position switches series	100, 62, 61, 72	100, 62, 61, 72	100, 62, 61, 72
for single position switches series	F 60	F 60	F 60
			
Ordering code Part number	**BSE0005** BSE 30.0-RK	**BSE0009** BSE 61-RK	**BSE000N** BSE 85-RK
Construction			
Contact material	**Silver, gold plated**	**Silver**	**Silver**
Switching principle	Snap switch	Creep switch, positive-opening	Snap switch, positive opening (normally-closed)
Contact system	Dual changeover, one normally open and one normally closed, galvanically isolated, double interruption	Normally-closed, double interruption	Dual-changeover: 1. NO (snap function), 2. Positive-opening (double-interruption), all galvanically isolated
Contact arrangement	NO 13 + 14 NC 21 + 22 	NC 21 + 22 	NO 13 + 14 NC 21 + 22 
Wire cross-section (with end ferrule)	max. 2×1.5 mm²	max. 2×1.5 mm²	max. 2×1.5 mm²
Connection type	Screw connection M3	Screw connection M3	Screw terminal M3.5
Mechanical data			
Switching actuation force on telescoping plunger	min. 20 N		
Switching actuation force on rigid plunger		min. 15 N	min. 30 N
Bounce time	≤ 1.5 ms		≤ 3 ms
Switchover time	≤ 10 ms		≤ 5 ms
Switching frequency	300 operations/min	300 operations/min	160 operations/min
Housing material	Duro- and Thermoplast	Duro- and Thermoplast	Thermoplast
Tightening torque max.	0.5 Nm	0.5 Nm	0.9 Nm
Ambient temperature range T_a	–5...+85 °C	–5...+85 °C	–5...+85 °C
Electrical data			
Isolation	Group C (VDE 0110)	Group C (VDE 0110)	Group C (VDE 0110)
Nominal voltage	240 V AC	250 V AC	250 V AC
Constant current	6 A	6 A	6 A
Minimum load at 24 V DC	≥ 20 mA	≥ 20 mA	≥ 20 mA
Contact resistance	< 40 mΩ	< 40 mΩ	< 40 mΩ
Switching capacity AC 250 V, 40...60 Hz	6 A, cos φ = 1 2 A, cos φ = 0.8 1 A, cos φ = 0.4	Depends on traverse speed and switching frequency	2 A, cos φ = 0.8
DC 220 V	0.5 A, L/R = 200 ms		
DC 24 V	4 A, L/R = 200 ms		
Service life			
Mechanical data	> 30 mil. switching operations (VDE 0660)	> 30 mil. switching operations (VDE 0660)	> 1 mil. switching operations (VDE 0660)
Electrical data	Depending on load, switching frequency and traverse speed	Depending on load, switching frequency and traverse speed	Depending on load, switching frequency and traverse speed
Approval	UL, CSA, CCC	CSA, CCC	cULus, CSA, CCC

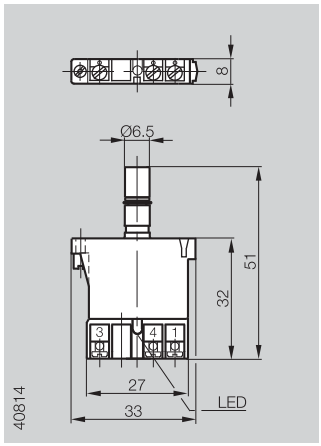
Replacement switching elements (replacement kits - RK) are delivered with mounting supplies.

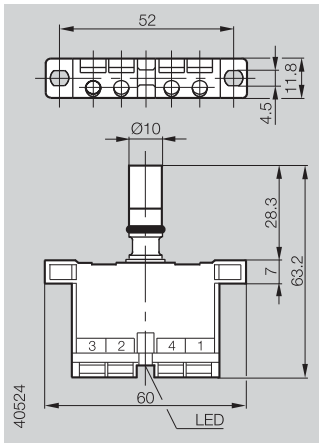
	Snap switch element BSE 69.1, BSE 73.1	Snap switch element BSE 70.1, BSE 74.1	Snap switch element with positive-opening BSE 63	Snap switch element with positive-opening BSE 64
	46, 40	46, 40	46, 40	46, 40
	99, 100	99, 100	99, 100	99, 100
				
	BSE000F BSE 69.1-RK **BSE000K** BSE 73.1-RK	**BSE000J** BSE 70.1-RK **BSE000L** BSE 74.1-RK	**BSE000P** BSE 63-RK	**BSE000C** BSE 64-RK
	Silver **Gold**	**Silver** **Gold**	**Silver**	**Silver**
	Snap switch	Snap switch	Snap switch	Snap switch
	Single-pole changeover	Single-pole changeover	Single-pole changeover	Single-pole changeover
	NO C + NO NC C + NC 	NO C + NO NC C + NC 	NO C + NO NC C + NC 	NO C + NO NC C + NC 
	max. 0.75 mm²	max. 0.75 mm²	max. 0.75 mm²	max. 0.75 mm²
	Solder connection	Screw terminal	Solder connection	Screw terminal
	min. 8 N	min. 8 N		
			min. 7.5 N	min. 7.5 N
	≤ 2 ms	≤ 2 ms	≤ 2 ms	≤ 2 ms
	≤ 10 ms	≤ 10 ms	≤ 10 ms	≤ 10 ms
	200 operations/min	200 operations/min	200 operations/min	200 operations/min
	Thermoplast	Thermoplast	Thermoplast	Thermoplast
		0.12 Nm		0.12 Nm
	–5...+85 °C	–5...+85 °C	–5...+85 °C	–5...+85 °C
	Group C (VDE 0110)	Group C (VDE 0110)	Group C (VDE 0110)	Group C (VDE 0110)
	250 V AC 30 V DC	250 V AC 30 V DC	250 V AC	250 V AC
	5 A	5 A	5 A	5 A
	≥ 20 mA ≥ 10 mA	≥ 20 mA ≥ 10 mA	≥ 20 mA	≥ 20 mA
	< 240 mΩ	< 240 mΩ	< 100 mΩ	< 100 mΩ
	2 A, cos φ = 0.8	2 A, cos φ = 0.8	5 A, cos φ = 0.75	5 A, cos φ = 0.75
	5 A, L/R = 10 ms	5 A, L/R = 10 ms	5 A, L/R = 10 ms	5 A, L/R = 10 ms
	> 10 mil. switching operations (VDE 0660)	> 10 mil. switching operations (VDE 0660)	> 10 mil. switching operations (VDE 0660)	> 10 mil. switching operations (VDE 0660)
	Depending on load, switching frequency and traverse speed	Depending on load, switching frequency and traverse speed	Depending on load, switching frequency and traverse speed	Depending on load, switching frequency and traverse speed
	UL, CSA, CCC	UL, CSA, CCC	cULus, CSA, CCC	cULus, CSA, CCC

5.1

Code for inductive switch elements	**TOB**	**TNB**	**PA**
Rated operating distance s_n	**1.1 mm**	**1.1 mm**	**2 mm**
Assured operating distance s_a	0...0.9 mm	0...0.9 mm	0...1.6 mm
for multiple position switches series	603, 650	603, 650	602, 610...613, 605



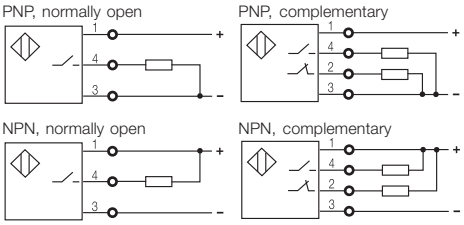




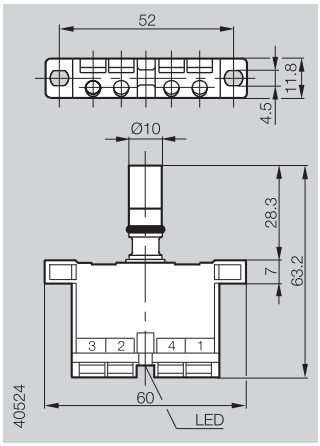
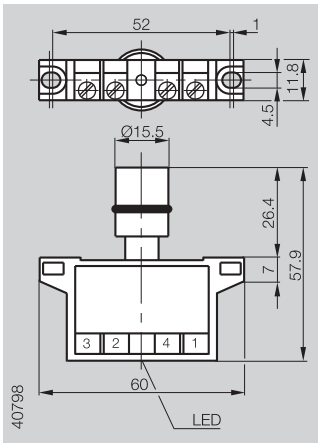
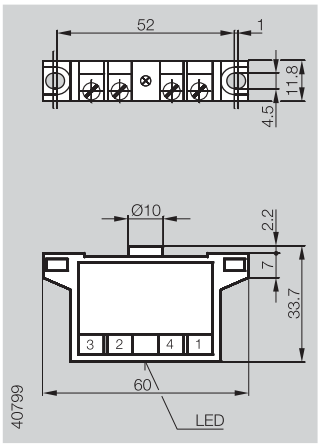
PNP	NO	**Ordering code**	**BES02MU**		
		Part number	BES 517-312-Y-RK		
	Complementary	**Ordering code**			**BES02MM**
		Part number			BES 517-110-RK
NPN	NO	**Ordering code**		**BES02MT**	
		Part number		BES 517-311-Y-RK	
	Complementary	**Ordering code**			
		Part number			

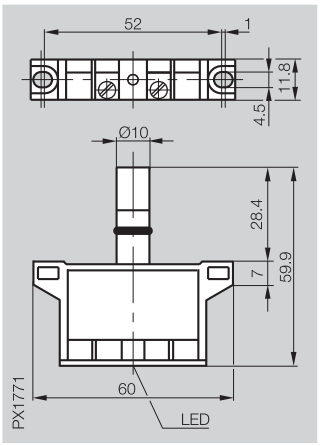
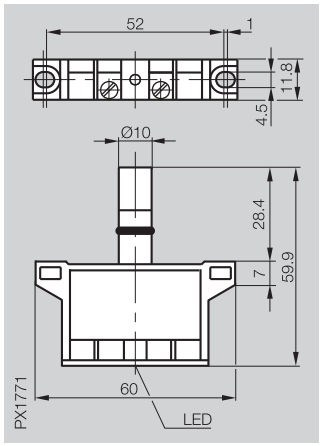
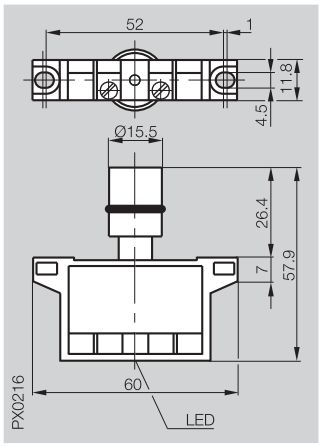
Rated operational voltage U_e	24 V DC	24 V DC	24 V DC
Supply voltage U_B	10...30 V DC	10...30 V DC	10...60 V DC
Voltage drop U_d at I_e static	≤ 3.5 V	≤ 3.5 V	≤ 1.5 V
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC
Rated operational current I_e	130 mA	130 mA	200 mA
No-load current I_0 damped/undamped	≤ 25 mA/≤ 12 mA	≤ 25 mA/≤ 12 mA	≤ 15 mA/≤ 12 mA
Off-state current I_r	≤ 80 µA	≤ 80 µA	≤ 50 µA
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Permissible load capacitance	≤ 1 µF	≤ 1 µF	≤ 0,5 µF
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	500 Hz	500 Hz	1500 Hz
Utilization category	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67	IP 67
Housing material	PA 6.6	PA 6.6	PA 12
Material of sensing face	PVDF	PVDF	PA 12
Connection type	Screw terminals	Screw terminals	Screw terminals
max. conductor cross-section	up to 1 mm²	up to 1 mm²	up to 1.5 mm²

Wiring diagrams



Replacement switching elements (replacement kits - RK)
are delivered with mounting supplies.

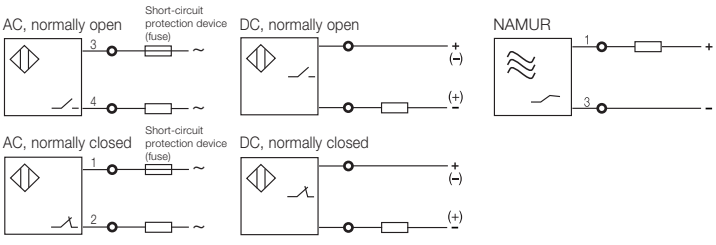
NA	THA	DH	
2 mm	**5 mm**	**2.2 mm**	
0...1.6 mm	0...4 mm	0...1.8 mm	
602, 610...613, 605	602, 611, 613, 605	100, 62, 72, 61	
			
	BES02MN BES 517-142-Y-RK	**BES03J8** BES 516-110-D-RK	
BES02ML BES 517-108-RK			
24 V DC	24 V DC	24 V DC	
10...60 V DC	10...30 V DC	10...30 V DC	
≤ 1.5 V	≤ 3.5 V	≤ 1.2 V	
75 V DC	75 V DC	75 V DC	
200 mA	130 mA	400 mA	
≤ 15 mA/≤ 12 mA	≤ 30 mA/≤ 30 mA	≤ 30 mA/≤ 30 mA	
≤ 50 µA	≤ 80 µA	≤ 100 µA	
yes	yes	yes	
yes	yes	no	
≤ 0.5 µF	≤ 1 µF	≤ 1 µF	
≤ 5 %	≤ 5 %	≤ 5 %	
–25...+70 °C	–25...+70 °C	–25...+70 °C	
1500 Hz	500 Hz	1000 Hz	
DC 13	DC 13	DC 13	
yes	yes	yes	
IP 67	IP 67	IP 67	
PA 12	PA 12	PA 12	
PA 12	PBT	PA 12	
Screw terminals	Screw terminals	Screw terminals	
up to 1.5 mm²	up to 2.5 mm²	up to 2.5 mm²	

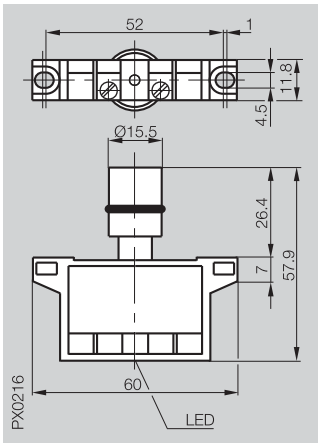
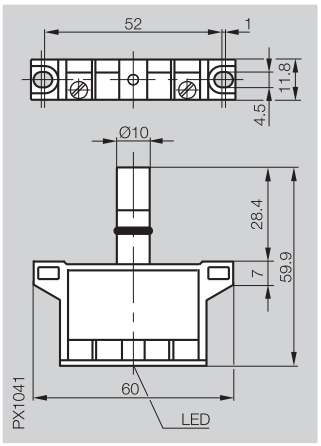
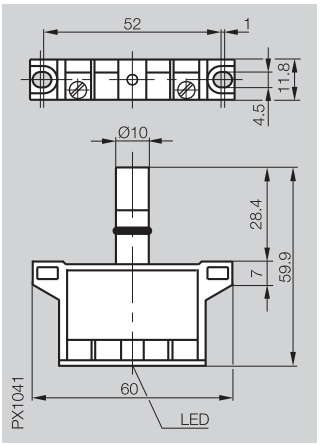
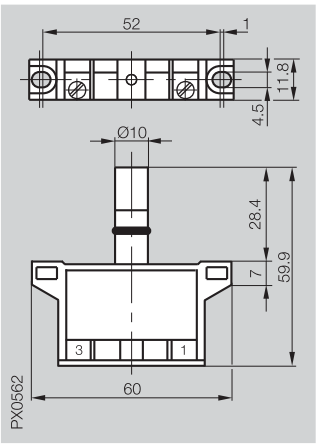
Code for inductive switch elements		**WS**	**WO**	**EJA**	
Rated operating distance s_n		**2 mm**	**2 mm**	**5 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...4 mm	
for multiple position switches series		602, 610...613, 605	602, 610...613, 605	602, 611, 613, 605	
					
AC	NO	**Ordering code** Part number	**BES02MW** BES 517-410-RK		**BES02MZ** BES 517-463-RK
	NC	**Ordering code** Part number		**BES02MY** BES 517-421-RK	
DC	NO	**Ordering code** Part number			
	NC	**Ordering code** Part number			
	NAMUR	**Ordering code** Part number			
Rated operational voltage U_e			110 V AC	110 V AC	220 V AC
Supply voltage U_B			35...250 V AC	35...250 V AC	90...250 V AC
Voltage drop U_d at I_e static			≤ 8.5 V	≤ 8.5 V	≤ 8.5 V
Rated insulation voltage U_i			250 V AC	250 V AC	250 V AC
Rated operational current I_e			100 mA	100 mA	100 mA
No-load current I_0 damped/undamped					
Off-state current I_r			≤ 1700 µA	≤ 1700 µA	≤ 3000 µA
Polarity reversal protected			yes	yes	yes
Short circuit protected			no	no	no
Permissible load capacitance					
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			10 Hz	10 Hz	15 Hz
Utilization category			AC 140	AC 140	AC 140
Function indicator			yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67
Housing material			PA	PA	PA
Material of sensing face			PA 12	PA 12	PA 12
Connection type			Screw terminals	Screw terminals	Screw terminals
max. conductor cross-section			up to 2.5 mm²	up to 2.5 mm²	up to 2.5 mm²
Approval			cULus	cULus	cULus
Output signal: Fully undamped Fully damped					
Permissible series resistance R_V					

Recommendation for AC switch elements

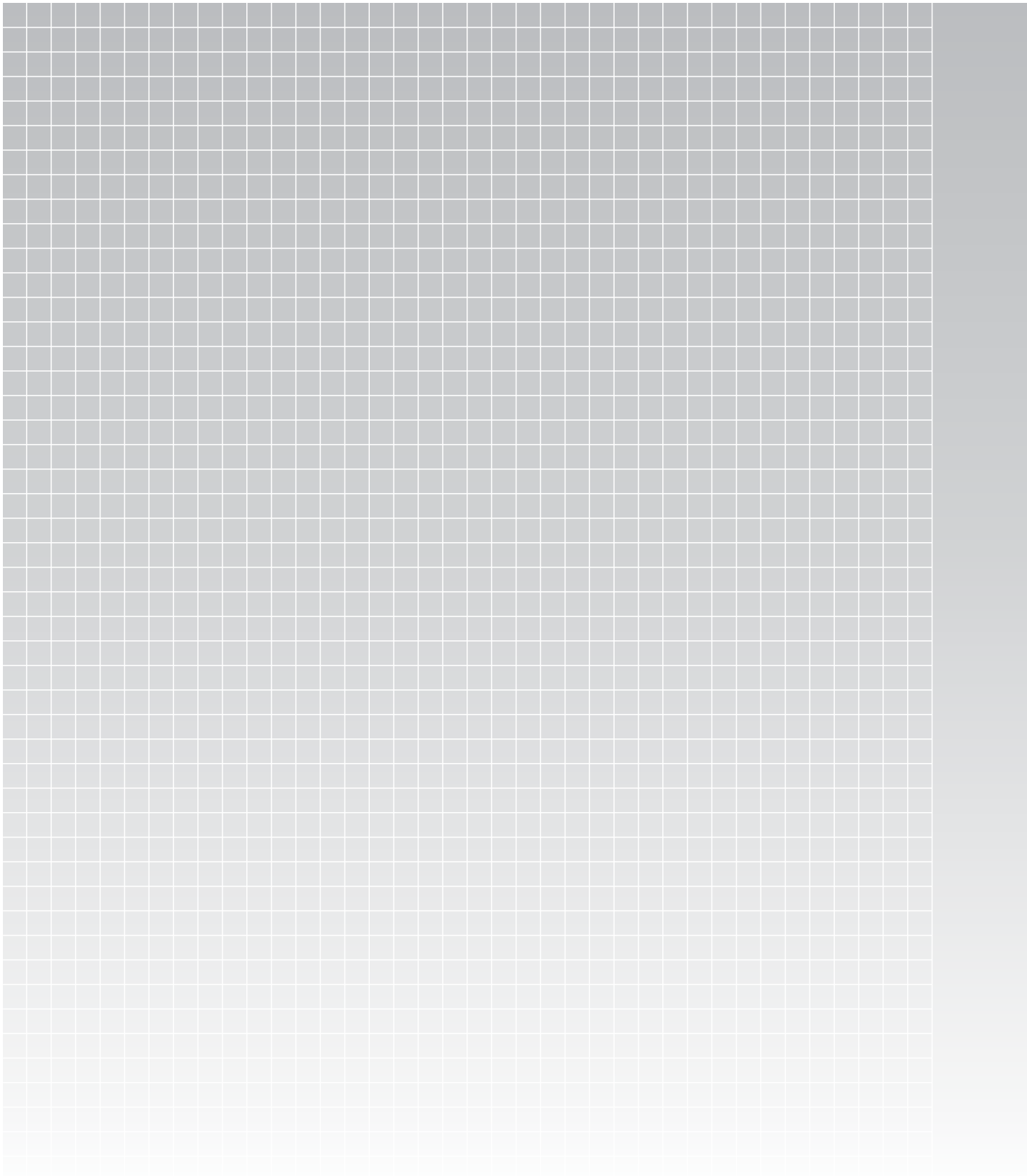
Short-circuit protection device: miniature fuse acc. to IEC 60127-2 sheet 1, ≤ 2 A (fast-action). See connection diagrams. After a short circuit, check the device for proper function.

Wiring diagrams



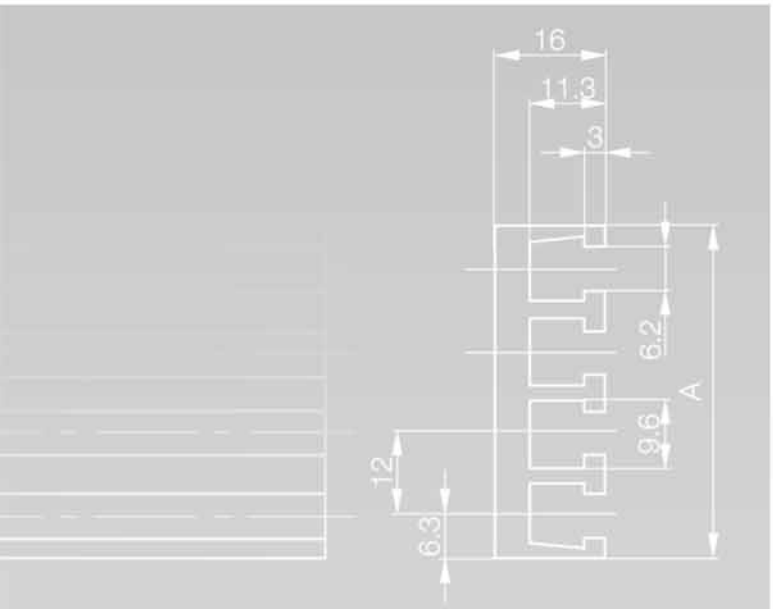
	AAA	KHG	KHH	NG
	5 mm	**2 mm**	**2 mm**	**2 mm**
	0...4 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm
	602, 611, 613, 605	602, 610...613, 605	602, 610...613, 605	602, 610...613, 605
				
	BES02N0 BES 517-464-RK			
		BES02N1 BES 517-560-H-RK		
			BES02N2 BES 517-561-H-RK	
				BES02MK BES 516-314-N-RK
	220 V AC	24 V DC	24 V DC	8,2 V DC
	90...250 V AC	10...55 V DC	10...55 V DC	7.7...9 V DC
	≤ 8.5 V	≤ 7 V DC	≤ 7 V DC	
	250 V AC	75 V DC	75 V DC	75 V DC
	100 mA	100 mA	100 mA	
	≤ 3000 µA	≤ 1350 µA	≤ 1350 µA	
	yes	yes	yes	yes
	no	yes	yes	no
		≤ 0,5 µF	≤ 0,5 µF	
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	15 Hz	1000 Hz	1000 Hz	1000 Hz
	AC 140	DC 13	DC 13	
	yes	yes	yes	no
	IP 67	IP 67	IP 67	IP 67
	PA	PA 12	PA 12	PBT
	PA 12	PA 12	PA 12	PBT
	Screw terminals	Screw terminals	Screw terminals	Screw terminals
	up to 2.5 mm²	up to 2.5 mm²	up to 2.5 mm²	up to 2.5 mm²
	cULus			
				Current change (no trigger response)
				≥ 4 mA
				≤ 1 mA
				550...1100 Ohm

Replacement switching elements (replacement kits - RK)
are delivered with mounting supplies.



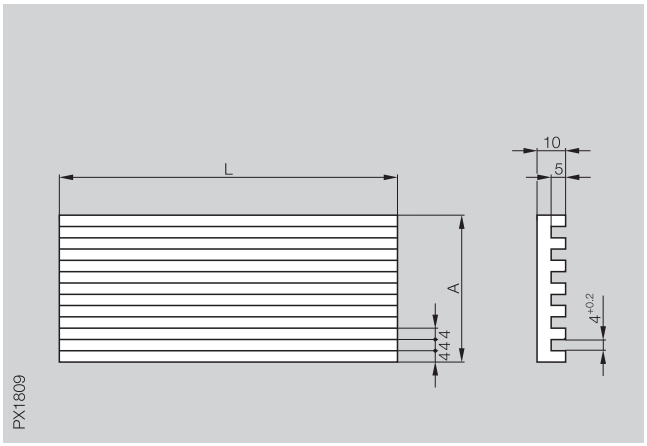
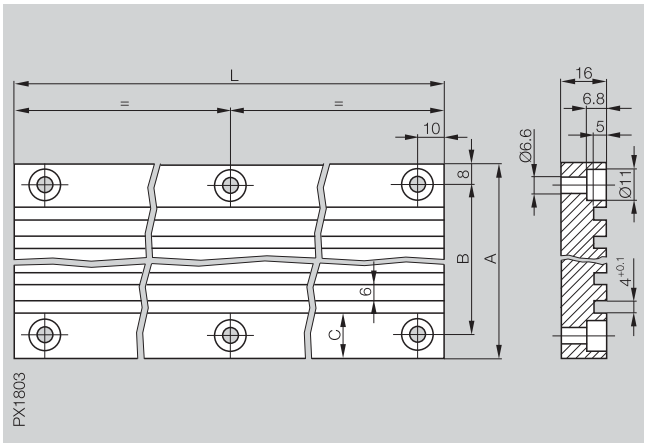
Contents

120 Cam trays
122 Cams for mechanical single and multiple position switches
124 Cams for inductive single and multiple position switches



more added value

– Optimized for your particular application
– Rugged and reliable
– Versatility through many possible combinations

Type	Aluminum cam trays with **8 mm** slot spacing for switches with switch position spacing **8 mm** for cams BNN 520-81-S-_ _ _ or BEN 516-19- _ _ _	Steel cam trays with **10 mm** slot spacing for switches with switch position spacing **10 mm** for cams BNN 520-81-S-_ _ _ or BEN 516-19- _ _ _
		
Order code	BNL 5304-080-_ _-_ _ _ _ without holes	BNL 5308-100-_ _-_ _ _ _ with holes BNL 5306-100-_ _-_ _ _ _ without holes

Number of slots	Dimension A
02	20
03	28
04	36
06	52
08	68
10	84

Number of slots	Dimension A	Dimension B	Dimension C
02	46	30	16
03	56	40	16
04	68	52	17
05	76	60	16
06	87	71	16.5
08	108	92	17
10	126	110	16
12	148	132	17
14	167	151	16,5
16	188	172	17

Dimensions in mm

L = Standard cam tray lengths:
1000, 1200, 1400, 1600, 1800, 2000 or 2500 mm.

L = Standard cam tray lengths:
200, 400, 600, 800, , 1000 or 1200 mm.

Cam trays

Cam trays are used for holding cams.
We offer these in standard lengths with or without standard holes.

Installation note

Cam trays should be mounted on flat surfaces or machined members.

Ordering example:
BNL 5304-120-04-1000

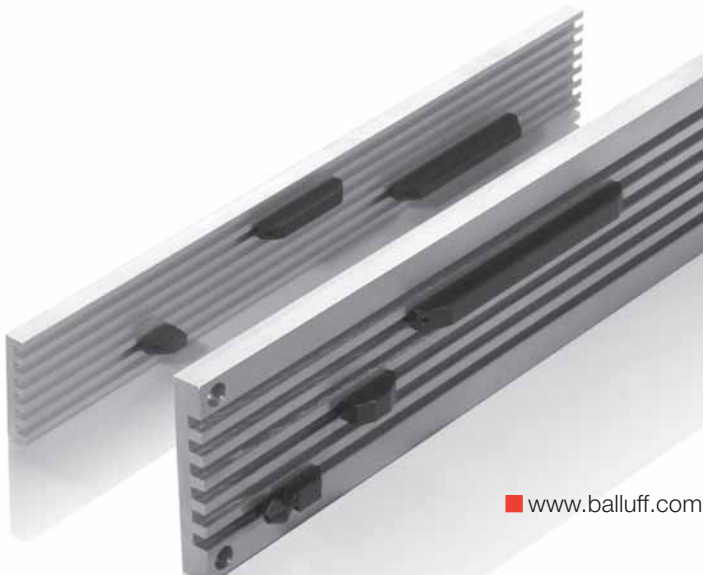
BNL 53_ _-_ _ _-_ _-_ _ _ _

Version
- **04** Aluminum, no holes
- **07** Aluminum, with holes
- **06** Steel, no holes
- **08** Steel, with holes
- **10** Aluminum, no holes, T-slot

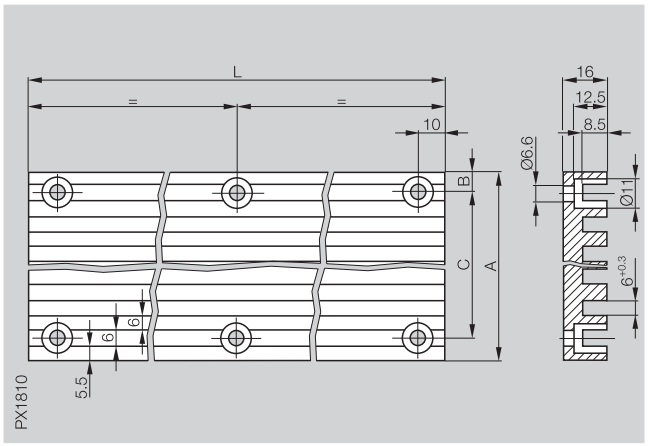
Slot spacing
- **80** 8 mm
- **100** 10 mm
- **120** 12 mm
- **160** 16 mm

Number of slots
- **02** 2 slots
- **...**
- (see table)

Total length L
(see standard lengths)



Aluminum cam trays with **12 mm** slot spacing
for switches with switch position spacing **12 mm**
for cams BNN 520-UA/UB-_ _ _ _ or BEN 516-14-_ _ _ _
Form A per DIN 69638

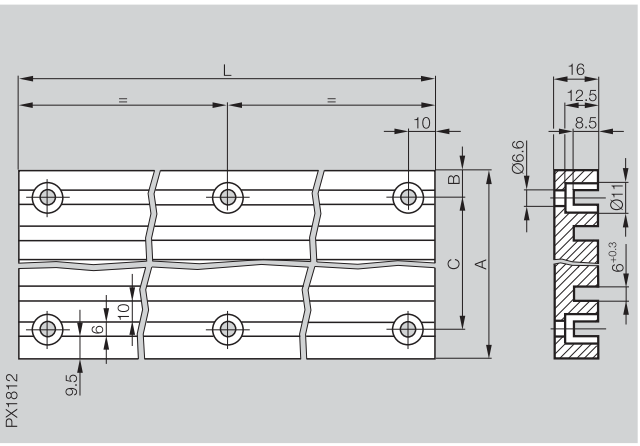


BNL 5307-120-_ _-_ _ _ _ with holes
BNL 5304-120-_ _-_ _ _ _ no holes

Number of slots	Dimension A	Dimension B	Dimension C
02	29	14.5	
04	53	26.5	
06	77	8.5	60
08	101	8.5	84
10	125	8.5	108

L = Standard cam tray lengths:
1000, 1200, 1400, 1600, 1800, 2000 or 2500 mm.

Aluminum cam trays with **16 mm** slot spacing
for switches with switch position spacing **16 mm**
for cams BNN 520-UA/UB-_ _ _ _ or BEN 516-14-_ _ _ _
Form A per DIN 69638



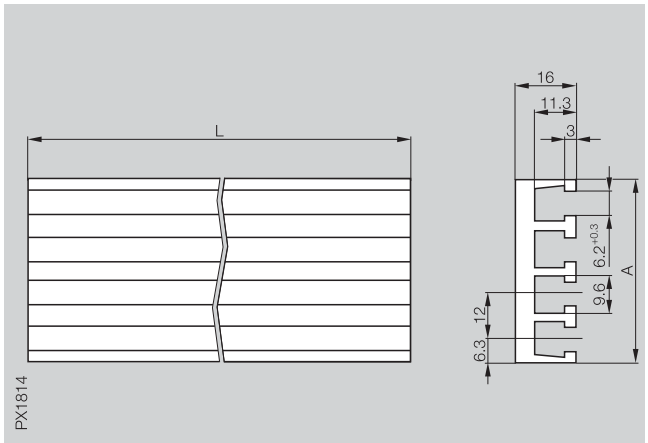
BNL 5307-160-_ _-_ _ _ _ with holes
BNL 5304-160-_ _-_ _ _ _ no holes

Number of slots	Dimension A	Dimension B	Dimension C
02	41	20.5	
04	73	36.5	
06	105	12.5	80
08	137	12.5	112

L = Standard cam tray lengths:
1000, 1200, 1400, 1600, 1800, 2000 or 2500 mm.

Type

Aluminum cam trays with **12 mm** slot spacing
for switches with switch position spacing **12 mm**
for cams BNN 520-TA/TB-_ _ _ and BEN 516-13-_ _ _
Form B per DIN 69638



Order code

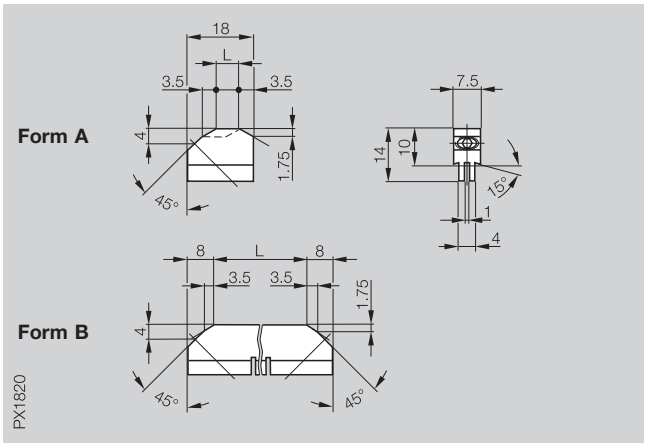
BNL 5310-120-_ _-_ _ _ _ no holes

Number of slots	Dimension A
04	48.6
06	72.6

Dimensions in mm

L = Standard cam tray lengths:
200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000 or 2500 mm.

Type	**BNN 520-81-S-_ _ _**
	for switches with switch position spacing **8 mm** or **10 mm**
	For use with BNL 5304-080-... or
	BNL 5306/5308-100-...



Ordering code	**Form A**	L
	BNN 520-81-S-0	0
	BNN 520-81-S-6,5	6,5

Ordering code	**Form B**	L
	BNN 520-81-S-20	20
	BNN 520-81-S-40	40
	BNN 520-81-S-60	60
	BNN 520-81-S-80	80
	BNN 520-81-S-145	145

Dimensions in mm

L = Length of switching surface. Additional lengths on request.

Material: Steel with hardened and burnished surface.

Mounting possibilities for cams

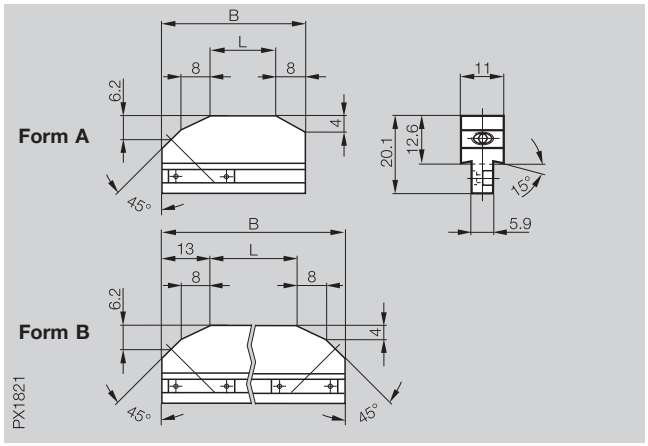
- BNN 520-UA/UB
  When a set screw is tightened, the cam is clamped firmly in the slot.
- BNN 520-81-S
  When a set screw is tightened, the lower part of the cam is spread apart and the cam held firmly in place.
- BNN 520-TA/TB
  When a clamping nut is tightened, the cam is clamped firmly in the T-slot.

Note!

Cams for safety switch positions must be installed to fit.

A tight connection such as is necessary for safety switch positions can be made by the customer with our cams using screws, pins or by welding.

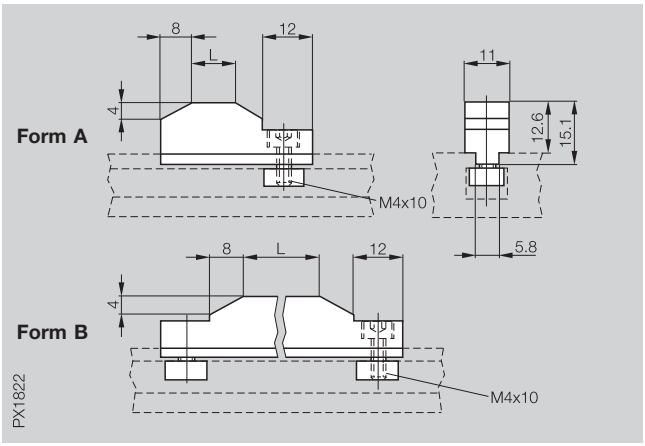
BNN 520-UA-_ _, BNN 520-UB-_ _ _ nach DIN 69639
for switches with switch position spacing **12 mm** and **16 mm**
For use with BNL 5304/5307-120/160-...



Form A	B	L
BNN 520-UA-0	21	0
BNN 520-UA-4	25	4
BNN 520-UA-10	31	10
BNN 520-UA-16	37	16

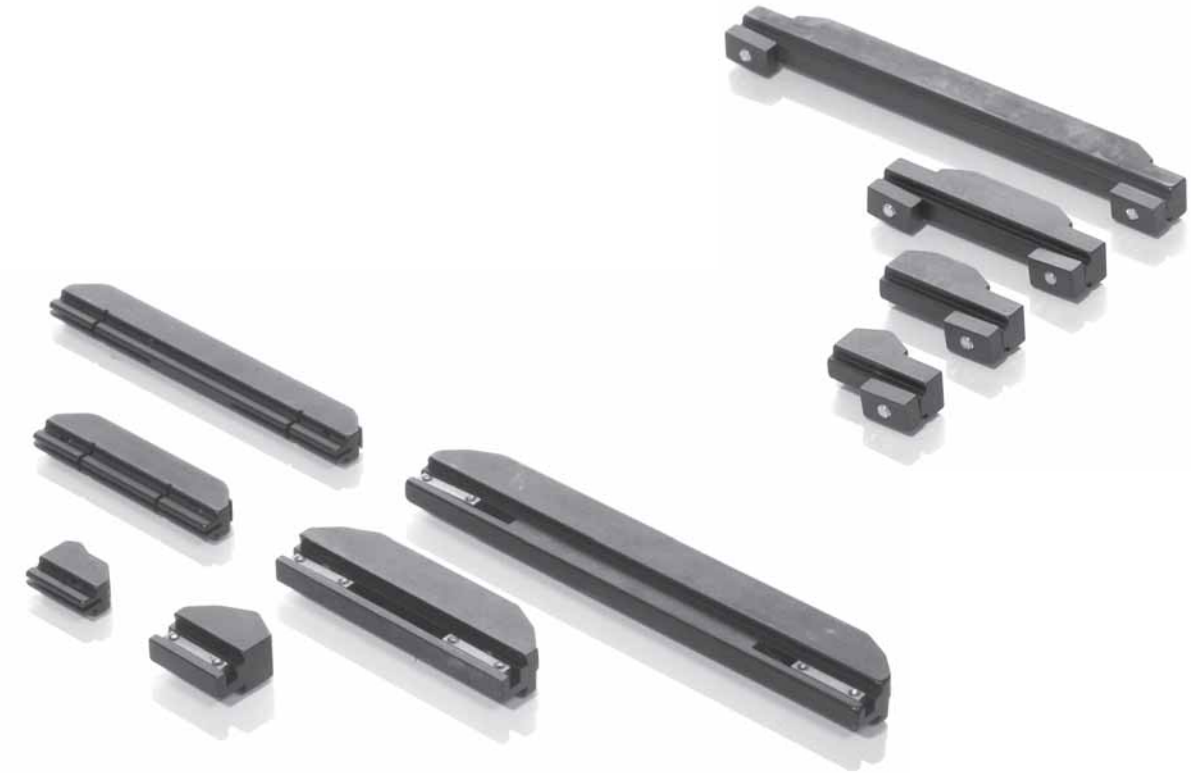
Form B	B	L
BNN 520-UB-25	51	25
BNN 520-UB-40	66	40
BNN 520-UB-63	89	63
BNN 520-UB-100	126	100
BNN 520-UB-120	146	120
BNN 520-UB-150	176	150
BNN 520-UB-200	226	200
BNN 520-UB-250	276	250
BNN 520-UB-300	326	300
BNN 520-UB-400	426	400

BNN 520-TA-_ _, BNN 520-TB-_ _ _ nach DIN 69639
for switches with switch position spacing **12 mm** and **16 mm**
For use with BNL 5310-120-...



Form A	L
BNN 520-TA-0	0
BNN 520-TA-4	4
BNN 520-TA-10	10
BNN 520-TA-16	16

Form B	L
BNN 520-TB-25	25
BNN 520-TB-40	40
BNN 520-TB-63	63
BNN 520-TB-100	100



Type

Mounting possibilities for cams

- BEN 516-13
  When a set screw is tightened, the cam is clamped firmly in a T-slot of the cam tray.
- BEN 516-14/19
  When a set screw is tightened, the cam is clamped firmly in a U-shaped slot of the cam tray.

Note!

Cams for safety switch positions must be installed to fit.

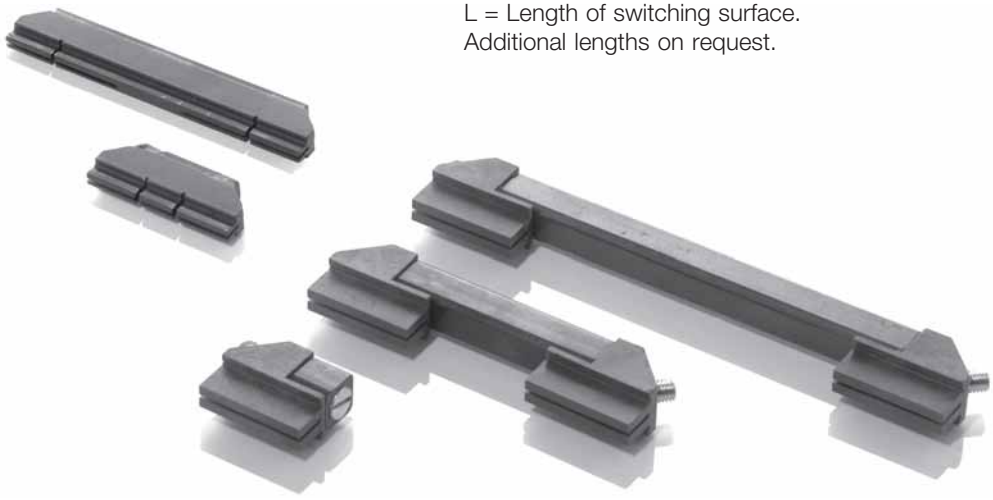
A tight connection such as is necessary for safety switch positions can be made by the customer with our cams using screws, pins or by welding.

Ordering code

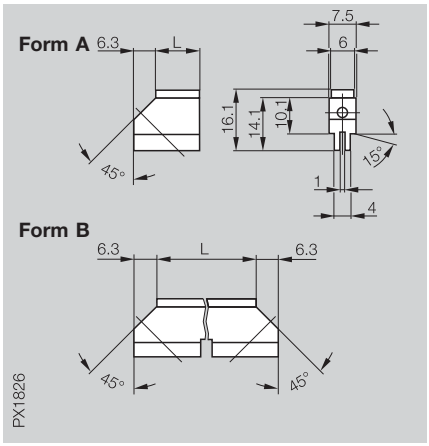
Ordering code

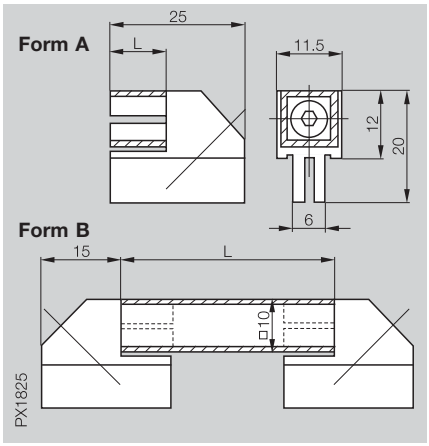
Dimensions in mm

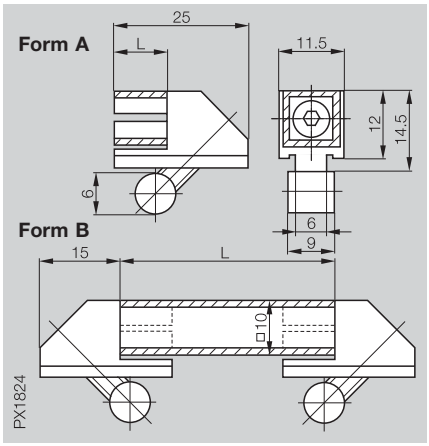
L = Length of switching surface.
Additional lengths on request.



	BEN 516-19	BEN 516-14	BEN 516-13
	For switches with switch position spacing **8 mm** and **10 mm**	For switches with switch position spacing **12 mm** and **16 mm**	For switches with switch position spacing **12 mm** and **16 mm**
	For use with BNL 5304-080-...	For use with BNL 5304/5307-120/160-...	For use with BNL 5310-120-...







Form A	L
BEN 516-19-10	10
BEN 516-19-15	15

Form B	L
BEN 516-19-20	20
BEN 516-19-30	30
BEN 516-19-40	40
BEN 516-19-50	50
BEN 516-19-60	60
BEN 516-19-80	80
BEN 516-19-100	100
BEN 516-19-120	120

Material: Steel with burnished surface.

Form A	L
BEN 516-14-10	10
BEN 516-14-20	20

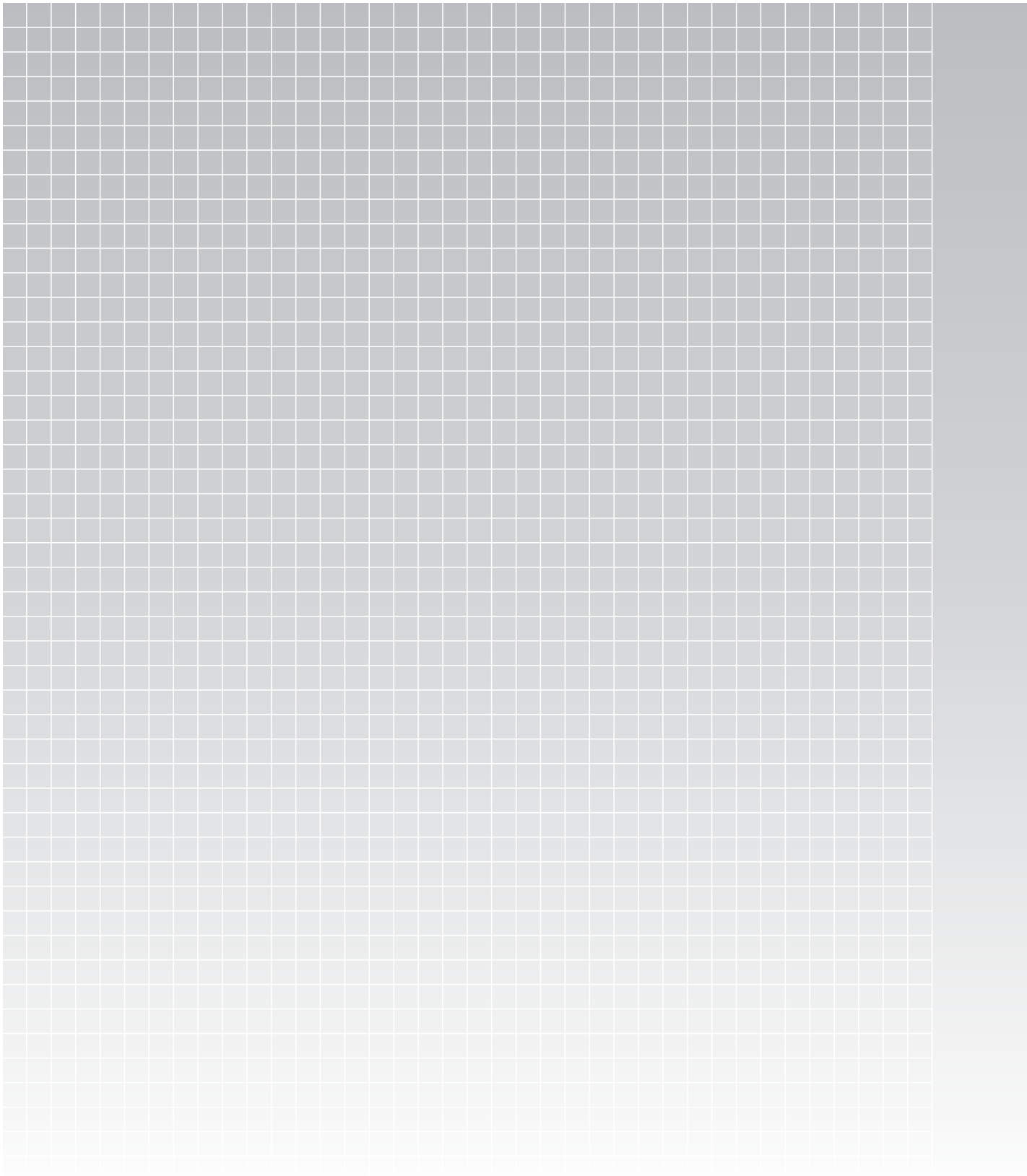
Form B	L
BEN 516-14-30	30
BEN 516-14-50	50
BEN 516-14-100	100
BEN 516-14-120	120
BEN 516-14-140	140
BEN 516-14-160	160
BEN 516-14-180	180
BEN 516-14-200	200

Material: Steel damping element with burnished surface and base made of PA 6.6.

Form A	L
BEN 516-13-10	10
BEN 516-13-20	20

Form B	L
BEN 516-13-30	30
BEN 516-13-50	50
BEN 516-13-100	100
BEN 516-13-120	120
BEN 516-13-140	140
BEN 516-13-160	160
BEN 516-13-180	180
BEN 516-13-200	200

Material: Steel damping element with burnished surface and base made of PA 6.6.



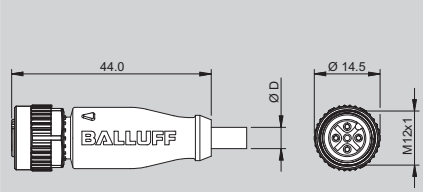
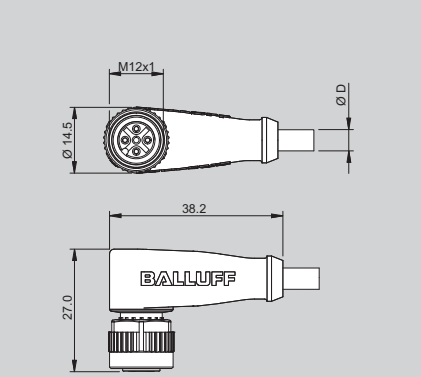
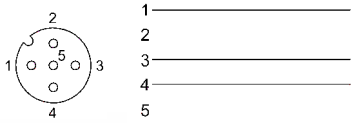
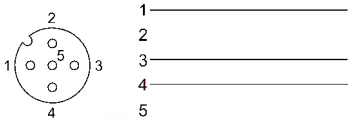
Contents

128 AC/DC connectors,
DC connectors
130 Function indicators
FD, FE, FC

more added value

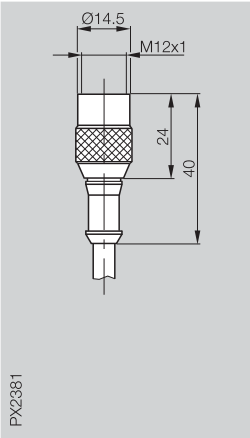
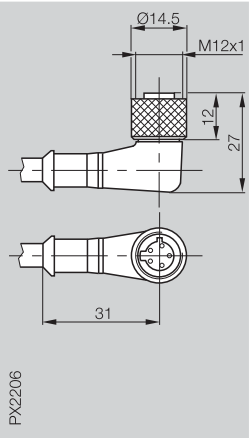
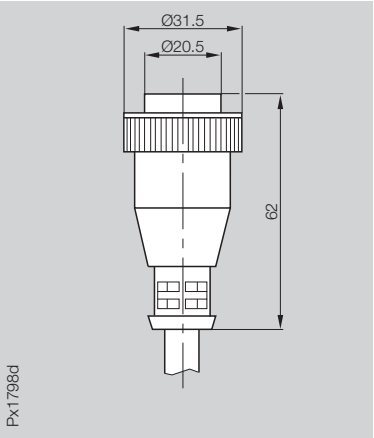
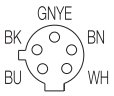
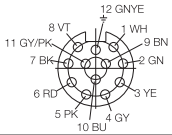
– Complete solutions from one source
– Sensors and accessories ideally matched

5.3

Connector		**BCC**	**BCC**
Version		M12 female straight	M12 female right-angle
Use		Position switch S4	Position switch S4
			
3-pin PUR	2 m **Ordering code**	**BCC030K**	**BCC0317**
	2 m Part number	BCC M415-0000-1A-001-PX0334-020	BCC M425-0000-1A-001-PX0334-020
	5 m **Ordering code**	**BCC030L**	**BCC0318**
	5 m Part number	BCC M415-0000-1A-001-PX0334-050	BCC M425-0000-1A-001-PX0334-050
	10 m **Ordering code**	**BCC030M**	**BCC0319**
	10 m Part number	BCC M415-0000-1A-001-PX0334-100	BCC M425-0000-1A-001-PX0334-100
Supply voltage max. AC U_B		250 V AC	60 V AC
Supply voltage max. DC U_B		250 V DC	60 V DC
Cable		Molded	Molded
No. of wires × conductor cross-section		3×0.34 mm²	3×0.34 mm²
Degree of protection per IEC 60529		IP 68	IP 68
Ambient temperature range T_a		–25...+80 °C	–25...+80 °C
Use		Normally open (NO)	Normally open (NO)
Connector diagram and wiring			

Other cable lengths and cable qualities on request.

You can find additional connectors in our "Industrial Networking and Connectivity" catalog or online at **www.balluff.com**

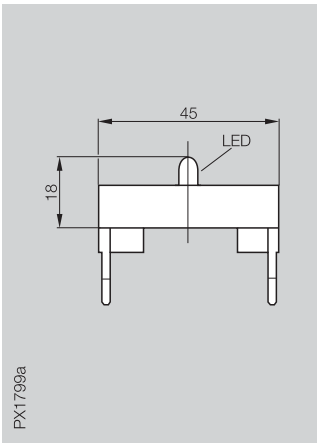
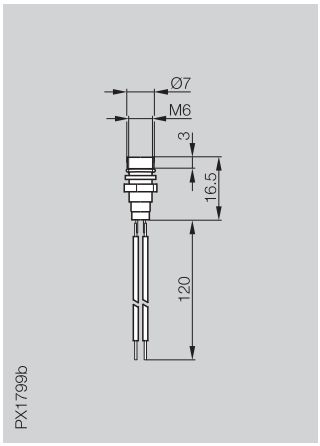
Connector			BKS-S 80	BKS-S 80	BKS-S 90
Version			Straight female	Right angle female	Straight female
Use			BNS ...-S80	BNS ...-S80	BNS ...-S90
					
5-pin	5 m	**Ordering code** Part number	**BCC0094** BKS-S 80-G-PU-05	**BCC0095** BKS-S 80-W-PU-05	
12-pin	6 m	**Ordering code** Part number			**BCC00L2** BKS-S 90-G-PU-06
	15 m	**Ordering code** Part number			**BCC00L3** BKS-S 90-G-PU-15
Supply voltage U_B			300 V AC/10...60 V DC	300 V AC/10...60 V DC	300 V AC/DC (max. 2 A)
Cable			molded-on PUR	molded-on PUR	molded-on PUR
No. of wires × conductor cross-section			5×0.5 mm²	5×0.5 mm²	12×0.5 mm²
Degree of protection per IEC 60529			IP 67	IP 68	IP 67
Ambient temperature range T_a			–25...+90 °C	–25...+90 °C	–25...+90 °C
Connector diagram					

Note!

Standard configuration Is normally open.
Other pin assignments on request.

If there are multiple switch positions, multiple connectors or larger connectors with a larger number of pins are used.

5.3

Type	FD/FE	FC
		
Application with		
Multiple position switches **FD** 6...60 V AC/DC	510870	
Multiple position switches **FE** 90...250 V AC/DC	510880	
Multiple position switches **FC** 6...24 V DC		149730
Function indicator	LED yellow	LED yellow
Material	PBT	PBT
Version	plug-in	universal

Plug-in function indication

For switches assembled with BSE 30.0 and BSE 61 switch elements we offer plug-in function indicators type FD/FE. For switches fitted with BSE 85 we offer the FC function indicator.

A yellow LED indicates the function of the switch position. The LED is visible through a plastic lens on the housing cover.

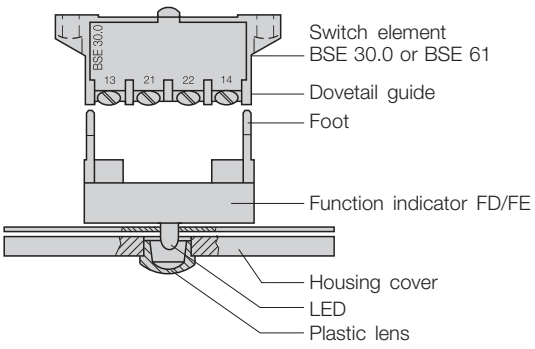
Three voltage ranges are available for multiple position switches with quick-change unit:
6...60 V AC/DC (FD)
90...250 V AC/DC (FE)
24...28 V DC (FC)

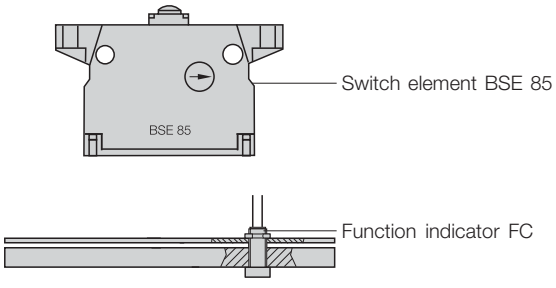
Installation for FD/FE

The foot of the function indicator is plugged into the dovetail guide of the snap switch.

Installation for FC

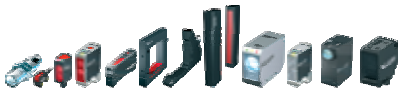
The FC function indicator is screwed directly into the cover.





Object Detection

Sensor Product Line
Inductive sensors BES DC 3-/4-wire
Inductive sensors BES DC 2-wire
Inductive sensors BES AC/DC
Inductive sensors BES with special properties
Sensors for pneumatic cylinders BMF
Magnetic field sensors BMF
Capacitive sensors BCS
Ultrasonic sensors BUS
Pressure sensors BSP



Photoelectric Product Line
Diffuse energetic BOS with fore- and background suppression
Retro-reflective sensors BOS
Through-beam sensors BOS (emitter/receiver)
Fiber optic devices BFB
Through-beam fork sensors BGL
Dynamic optical windows BOWA
Light grids BLG
Contrast sensors BKT
Luminescence sensors BLT
Color sensors BFS
Photoelectric distance sensors BOD

Mechanical Product Line
Mechanical multiple and single position switches
Mechanical multiple and single position switches to DIN EN 60204-1/VDE 0113
Mechanical multiple and single position switches with forced opening
Mechanical multiple and single position switches with quick-change plunger unit
Inductive multiple and single position switches
Inductive multiple and single position switches with extended switching distance
Mechanical wireless position switches
Mixed assembly multiple position switches

Linear Position Sensing

Linear Position Sensing Product Line
Micropulse® transducer BTL Profile series
Micropulse® transducer BTL AT series
Micropulse® transducer BTL Rod series
Micropulse® transducer BTL Compact Rod series
Micropulse® processors, BUS interfaces
Magnetic linear encoder system BML
Incremental and absolute encoders BDG/BRG
Inductive linear position sensor BIW
Inductive distance sensors BAW
Magneto-inductive position sensors BIL
Photoelectric distance sensors BOD
Ultrasonic sensors BUS

Industrial Identification

Industrial Identification
Industrial RFID systems BIS C
Industrial RFID Systems BIS L
Industrial RFID systems BIS M
Industrial RFID systems BIS S
Vision sensor BVS

Industrial Networking and Connectivity

Industrial Networking and Connectivity
Connectors and cables BCC
Passive splitter boxes BPI
Active splitter boxes BNI
IO-Link
Remote inductive transmission systems
Inductive couplers BIC
BUS systems
Wireless
Electrical devices

Mechanical Accessories

Mechanical Accessories
Holders and fastening systems
Mounting system BMS

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Object Detection

Inductive sensors BES, cylinder sensors BMF, magnetic field sensors BMF, capacitive sensors BCS for object detection, ultrasonic sensors BUS for object detection, photoelectric sensors BOS, fiber optic devices BFB and BFO, through-beam fork sensors BGL, angle sensors BWL, optical window sensors BOW, light grids BLG, contrast sensors BKT, luminescence sensors BLT, color sensors BFS, mechanical and inductive multiple and single position switches BNS

Linear Position Sensing

Micropulse transducers BTL, magnetic linear encoder system BML, incremental encoders BDG, absolute encoders BRG, inductive linear position sensor BIW, inductive positioning system BIP, inductive distance sensors BAW, magnetoinductive position sensors BIL, capacitive distance sensors BCW, photoelectric distance sensors BOD, ultrasonic sensors BUS for analog distance measurement

Fluid Sensors

Pressure sensors BSP, capacitive sensors BCS for level detection, Micropulse filling level sensor BTL

Industrial Identification

Industrial RFID systems BIS, vision sensors BVS

Industrial Networking and Connectivity

Connectors and connection cables BCC, valve connectors BCC, passive splitter boxes BPI, active splitter boxes BNI, inductive couplers BIC, IO-Link, bus systems (Profibus, Profinet, CC-Link, Devicenet, Ethernet), wireless systems BWT, power supplies BAE, electrical devices BAE

Mechanical Accessories

Brackets and mountings BAM, mounting system BMS

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