BALLUFF

sensors worldwide

Object Detection

Mechanical and inductive single and multiple position switches

SENSOR SOLUTIONS AND SYSTEMS

BALLUFF

sensors worldwide

As a recognized partner in all sectors of the automation industry, Balluff offers comprehensive expertise in sensor technology and networking. We supply advanced technology and state-of-the-art electronics to our customers, who benefit from excellent service, application-specific solutions and individual consultation. You too can benefit from the excellent quality of our products and services.

Object Detection

Condition Monitoring and Fluid Sensors

Linear Position Sensing and Measurement

Accessories

Industrial Identification

Industrial Networking and Connectivity

Systems and Services

Mechanical Switches
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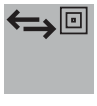


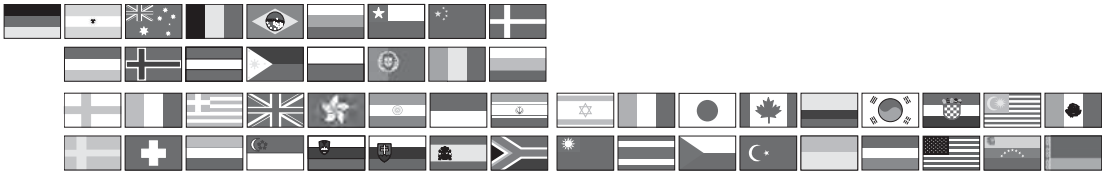
Balluff North America

Florence, Kentucky USA
Balluff's Florence, Kentucky United States headquarters is located just south of Cincinnati, Ohio. Our customers are in industries such as automotive, machine tool, robotics, injection molding, packaging, material handling, and more.

In addition to sales, marketing, and logistic functions, this facility manufactures Micropulse® magnetostrictive linear position sensors and warehouses over 60,000 products.

The Balluff Global Network

Balluff spans the globe with representation in over 50 countries.



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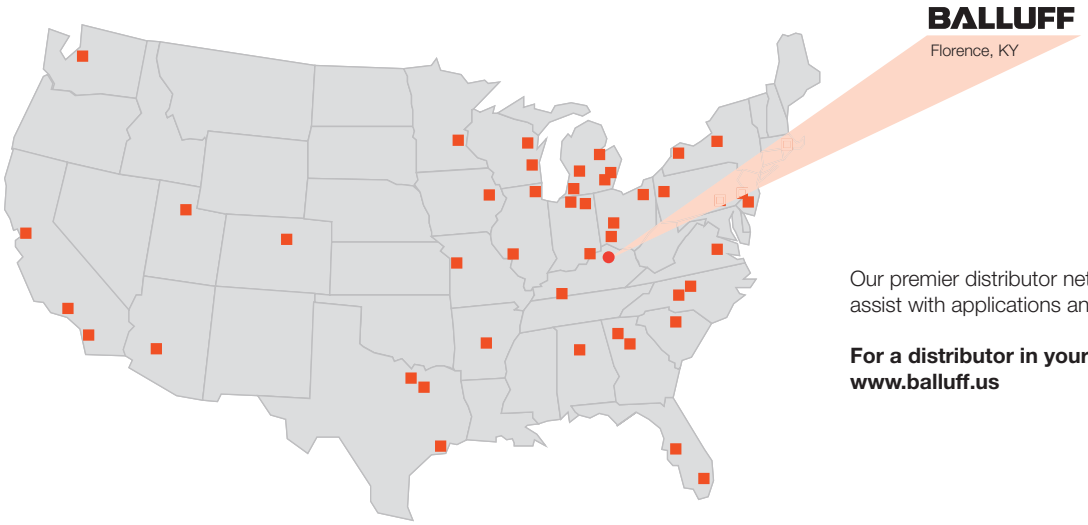

Our premier distributor network can quickly assist with applications and order fulfillment.

For a distributor in your area, visit www.balluff.us

Service

- **24 hour on-call service.**
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- **Fast, friendly experienced service – guaranteed!**
- **Same day shipping – in by 2:00 p.m. EST, out the same day!**

www.balluff.com
Visit us online.

Technical.Support@balluff.com
E-mail us.

1-800-543-8390
Give us a call.

Warranty

Balluff products are guaranteed to be free from defects in material and workmanship as follows:

Standard lifetime warranty for inductive sensors and magnetically operated sensors sold to the original user.
Standard 2-year warranty from the date of shipment for photoelectric, capacitive sensors, read-write ID systems, magnetostrictive transducers*, connectors and cables, electromechanical limit and rotary switches, and all products with electromechanical relays sold to the original user.
Balluff will repair or replace at our discretion, without charge, any unit which fails because of defective workmanship or material, during this guarantee period and which is returned to Balluff transportation prepaid. This guarantee will not apply if, in the judgement of Balluff, damage or failure has resulted from accident, alteration, misuse, abuse, or operation on an incorrect power supply. This guarantee expressly does not include any other costs such as the cost of removal of the defective part, installation, labor or consequential damages of any kind. Balluff assumes no responsibility for selection and installation of its products. The foregoing is in lieu of all other guarantees expressed, implied or statutory and Balluff neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products.

⚠ WARNING

- Read, understand, and follow warnings and manual. Failure to do so could result in serious injury or death.
- NEVER USE AS A SENSING DEVICE FOR PERSONNEL PROTECTION
- Does NOT include self-checking redundancy circuitry required for use in personnel safety applications
- Does NOT meet OSHA and ANSI standards for point-of-operation devices

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Mechanical Switches
Applications

Single and multiple position cam 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 ensure lasting quality and reliability.

Mechanical switch systems consist of two basic components:

1. A rugged single or multiple position switch assembly with a wide variety of switch elements (see sections 1-10).
2. Linear or rotary cams and associated cam trays or drums (see sections 11-14).

Actuation and switching systems

You can choose from three actuation and output switching systems.

- **Mechanical/mechanical**
  A mechanical cam trips a mechanical plunger, which actuates an electro-mechanical switch element through a sealed membrane. Best for hightest level of switchpoint stability and repeatability.
- **Mechanical/electronic**
  A mechanical cam trips a mechanical plunger. The metallic plunger is sensed internally by an inductive sensor and the output signal is switched electronically. Perfect for extremely low DC current switching in heavy metallic chip areas that would false trip an inductive sensor.
- **Inductive/electronic**
  Metallic cam is sensed by an inductive sensor element, which changes state electronically to activate the output signal. Non-contact operation for wear-free service in areas without metallic chips.

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.

Switching cams are available in multiple variations:

- Straight for linear applications
- Radial for rotary applications in multiple radii and swept angles
- Surface-hardened solid steel for long life with mechanical switches
- Mild steel tubular cams for non-contact inductive switching
- U-channel for drop-in installation or T-slot for drop-in captive installation

Cam tray variations include:

- Straight for linear applications with various slot types and profiles
- Machined aluminum drums for rotary applications in multiple diameters and profiles
- Extruded aluminum semi-circles with T-slots and various radii

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 bushing constructed of three layers: Steel back, bronze and PTFE coating
- Low coefficient of friction
- Can be continuously used without lubrication
- Plunger will not stick after production is stopped even when aggressive coolants are used
- Optional LED indicators
- Optional inductive switch elements
- Pre-wired connectors for rapid installation on new equipment and replacement in event of failure during production

For safety applications:

Such as E-stop or end-of travel restriction

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.

Balluff multiple position switches are ideal for robot dynamic safety zone control. Positive break switches coupled with high switching element density, rugged construction, and long life expectancy, combine to prove a perfect match for safe and reliable human-robot interface.

Features

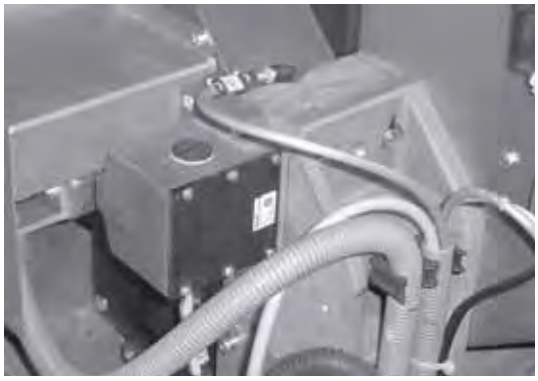
- Housing styles and sizes for a variety of applications
- Various plunger spacings
- Up to 12 switch positions
- Rigid chisel plungers for reliable switching
- Creep or snap switch elements with positive opening in accordance with DIN EN 60204-1/VDE 0113 for the greatest possible safety
- Maintenance-free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

Catalog and custom products

Standard switches and application-specific 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.

Custom products include mixed assemblies combining snap, safety, and inductive elements, pre-wired and factory tested micro or mini style connectors. Custom configurations receive unique part numbers with documentation (refer to section 10).



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.

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

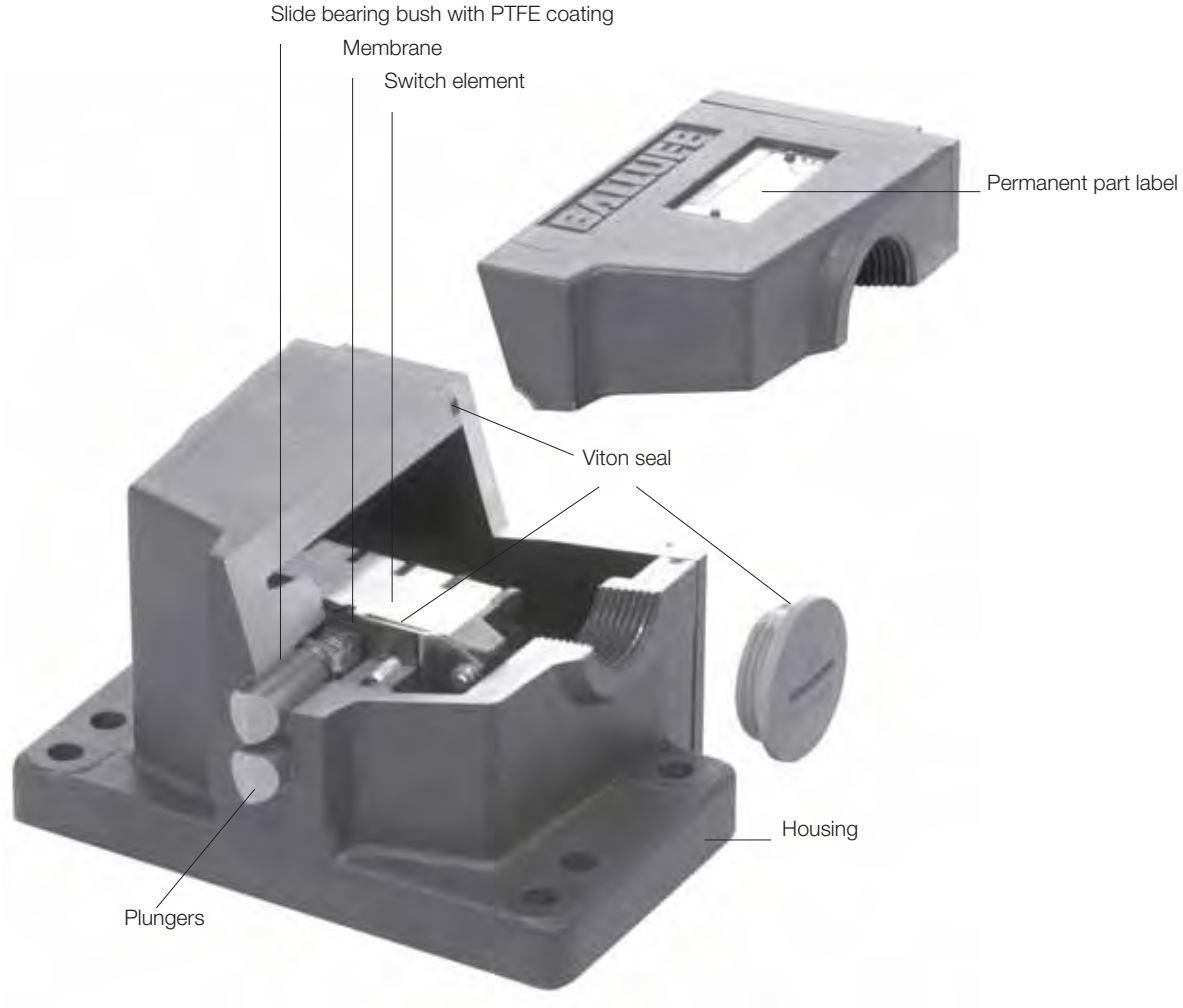
The creep switch element opens and closes depending on the speed with which it is actuated. The snap switch element opens regardless of its actuation speed.

Function indicator for the switch positions with LEDs is optional on mechanical versions. LEDs are standard on inductive switch assemblies.

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)
- Standard with S4 (M12) connector
- Available for all standard form factors
- Not available on safety style switches

IO-Link



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
- For optimum safety we recommend chisel plungers

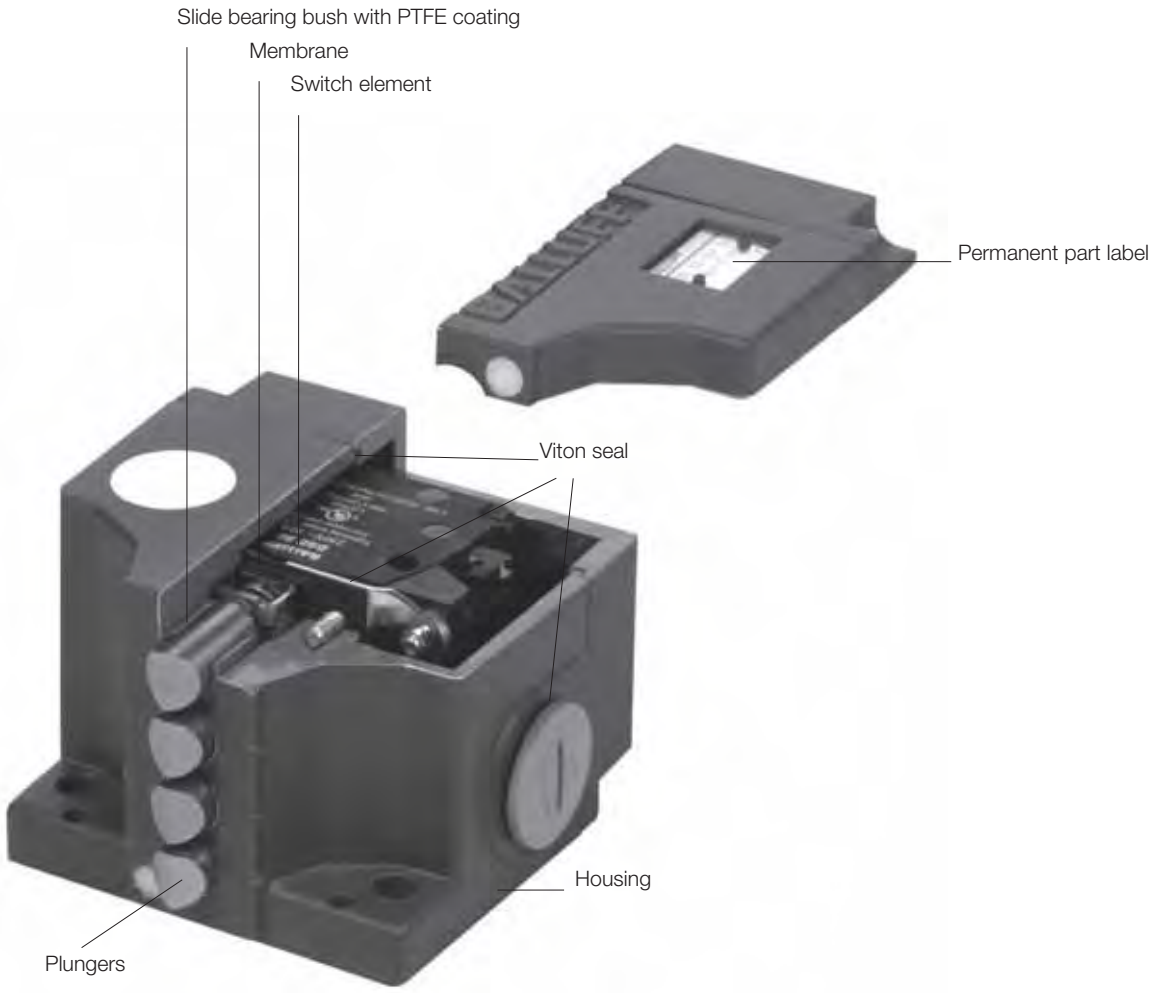
Available series

Safety switch positions can be installed in Series 100, 99/100, 62, 61, 72, F 60, 46 and 40 single and multiple position switches.

Switch position combinations

Switches with safety switch positions can be assembled using both mechanical elements and inductive elements. Such mixed assemblies can be provided on request. Refer also to Section 10.

Note!
Cams for safety switch positions must be permanently secured.



Mechanical Switches
Form Factors with Quick-Change Plunger Block

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 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
- Aggressive 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:

- 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.

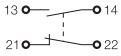
Switch characteristics

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

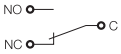
Switch elements for standard applications

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

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



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

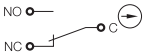


Snap switch elements BSE 73.1 or BSE 74.1 have specially formed gold contacts making them suitable for low currents from 10...100 mA.

Switch element with positive opening

Were developed for miniature series 99/100, 46 and 40 switches. 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

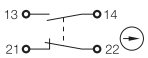


Switch elements with safety functions

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

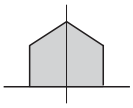
Creep switch element BSE 61
NC, double-interrupting, positive-opening.

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



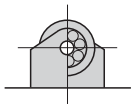
Mechanical Switches
Plunger Styles

Chisel plunger
for short actuation travel at low speeds with highly repeatable switch points.



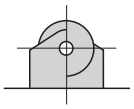
- max. approach velocity 40 m/min
- Typical cam length 100 mm
- Defined approach direction
- Repeatability up to ±0.002 mm
- Recommended in conjunction with rigid plunger for safety applications
- Hardened, polished contact surface
- Angle of slope 30°
- Hardness 58 HRC

Roller bearing plunger
for long actuation travel at maximum speeds



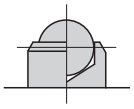
- max. approach velocity 120 m/min
- Typical cam length 1000 mm
- Defined approach direction
- Repeatability up to ±0.01 mm
- Not recommended in safety positions
- Low-noise
- Hardness 58 HRC

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

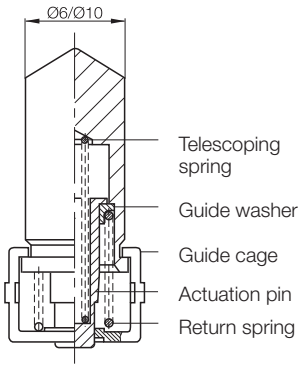
Dimensions of roller and roller bearing plungers	**Series 46, 40, 99/100**	**Series 100, 62, 61, 72, F 60**
Plunger diameter in mm	6	10
Roller diameter in mm	5	7.8
Roller width in mm	2.8	3.8
Roller bearing diameter in mm		8
Roller bearing width		3.6

The specified approach speeds for all plunger styles apply only in combination with **Balluff mechanical cams** (see page 13.1)

Telescoping plungers

For standard switch positions. 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.

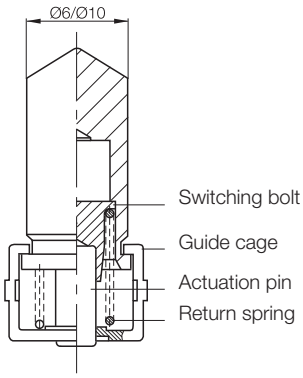
- Maintenance-free, self-lubricating slide bearing bushing with coating (PTFE)
- Can be dry-run in continuous operation with no lubrication
- Lowest coefficient of friction
- Resistant to chemical effects



Rigid plunger

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

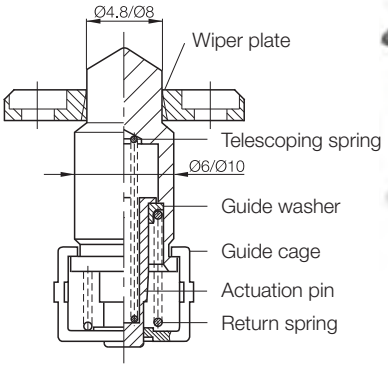
- Reliable opening of the switching circuit even when overload causes contact welding
- Telescoping plunger



Telescoping plunger Chisel with wiper plate

Encapsulated version for extreme applications. 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.

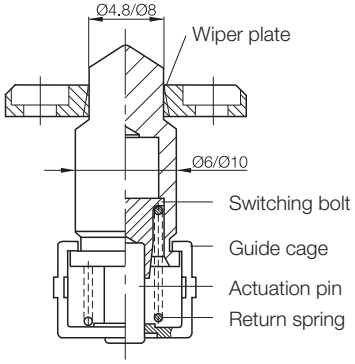
- One-piece, easily replaceable plastic plate with wiper edge
- Protection against effects of coolants and lubricants which form resins
- Breaks up adhering, hardened coolants and lubricant deposits
- Slide bearing bushing is kept clean
- Ideal for use in processing cast materials



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



Mechanical Switches
Inductive Single and Multiple Position Switches

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

Machine-compatible **housing** per DIN 43697 made of a special cast aluminum.

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

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

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 available (except NAMUR).

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

Connectors
The threads on factory installed connectors are sealed.

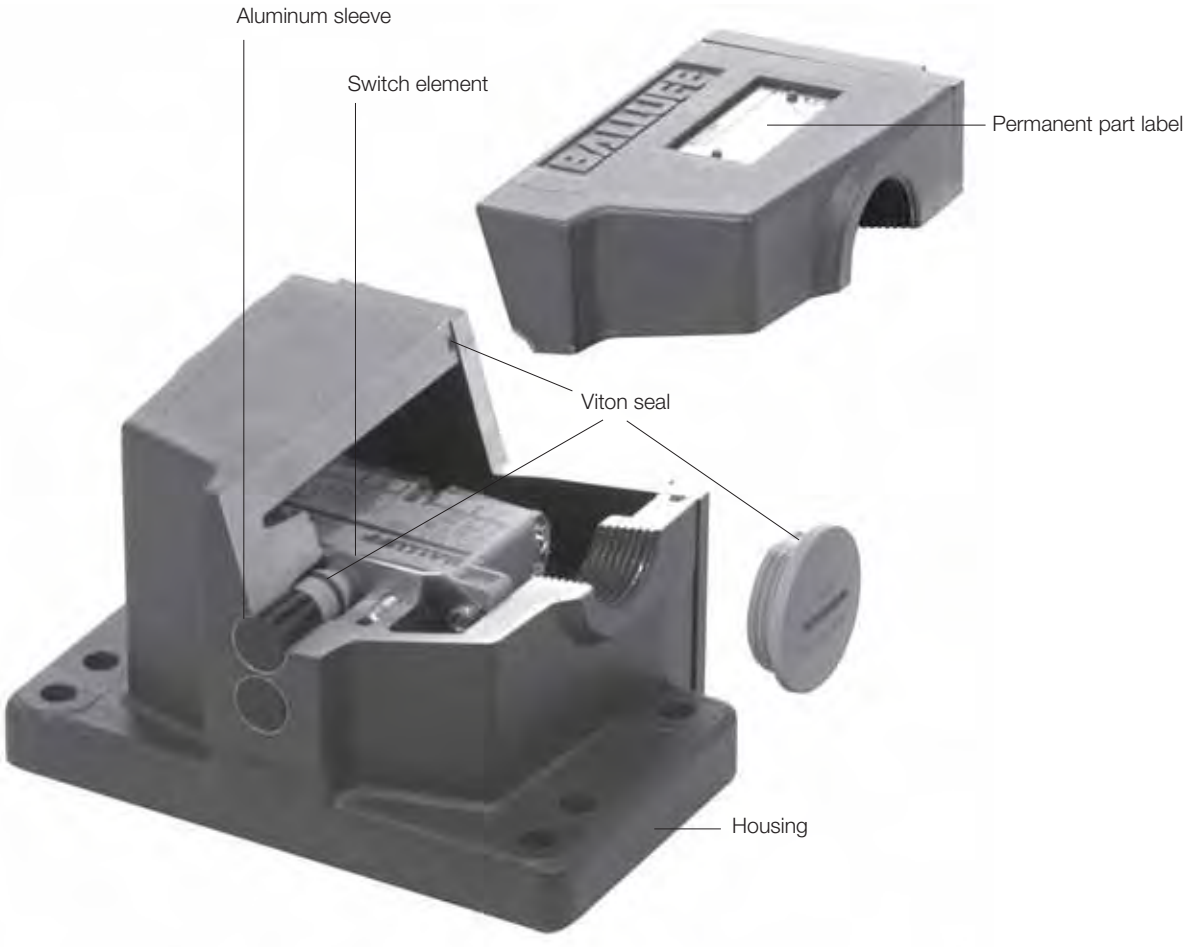
Switching distances

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... 4 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

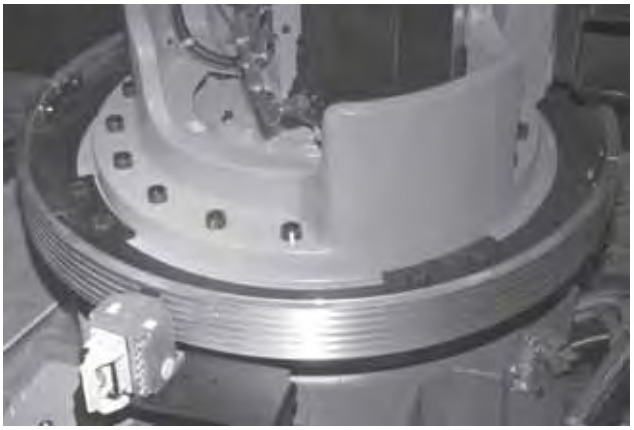
Category		Typical load applications
AC 12	AC-switch	Resistive and semiconductor loads, optocouplers
AC 140	AC-switch	Small electromagnetic load $I_a \leq 0.2$ A; e. g. contactor relay
DC 12	DC-switch	Resistive and semiconductor loads, optocouplers
DC 13	DC-switch	Electromagnets



Balluff's Robot Zone Limit System

No compromise on safety or productivity

Wherever a human operator must share workspace with a robot, there's no question that safety is the highest priority. When a person enters a robotic work cell, the robot must be safely idled. But this idle time results in a loss of the robot's productivity. Enter Balluff's robot zone limit systems. These pre-engineered hardware kits let you recapture that lost productivity, while maintaining complete operator safety. Finally, you don't have to sacrifice productivity to keep your floor team safe.

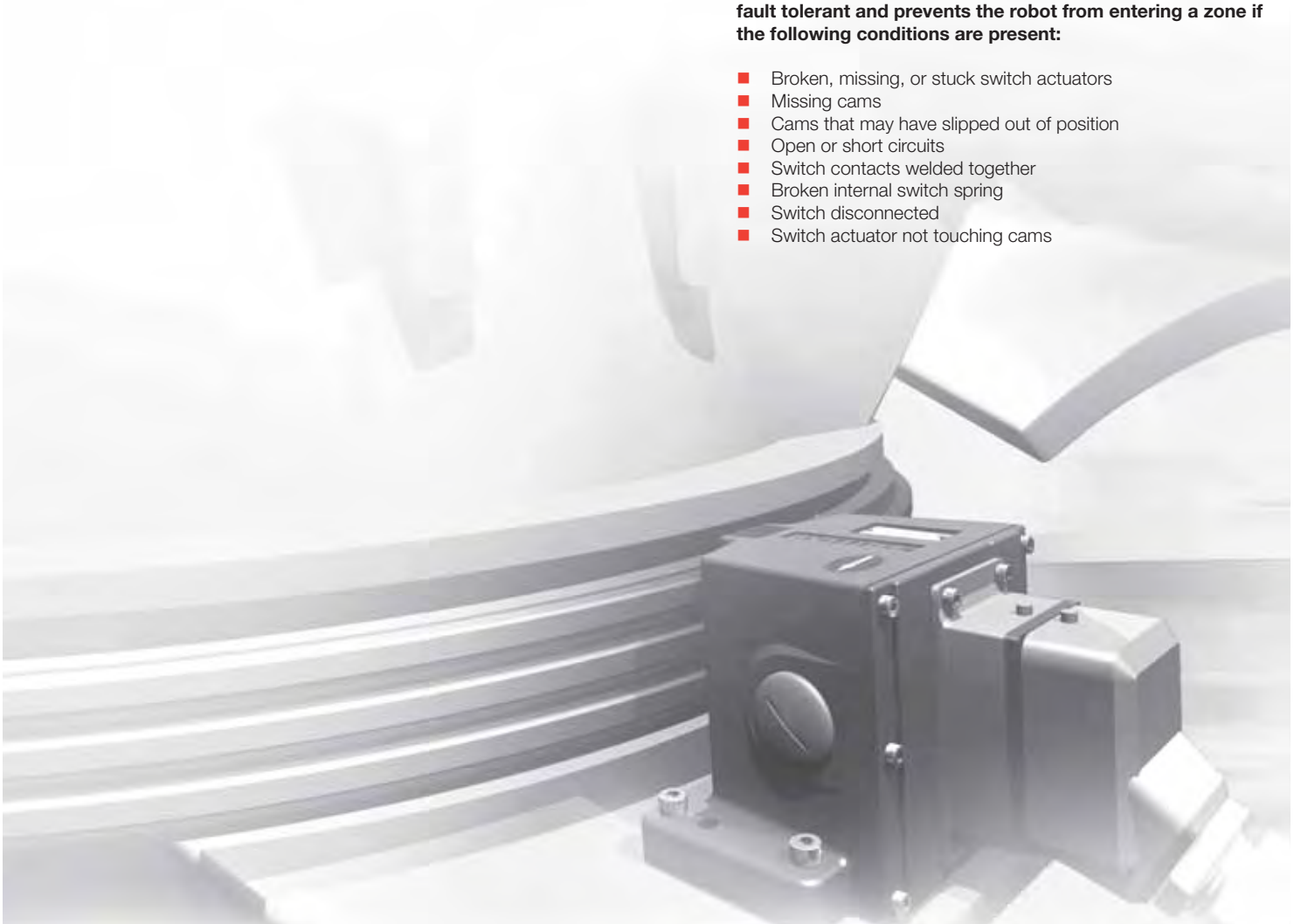


The Finest and Most Reliable ANSI/RIA Dynamic Limiting System Available Anywhere

Balluff zone limit systems are hardware kits that provide diverse, complementary, and redundant position monitoring for up to three robot axes. Designed to interface with a user-supplied safety monitoring relay or safety PLC, Balluff zone limit systems include all mounting hardware, complementary redundant cams, and the proven Balluff multiple position limit switch, available in either mechanical or non-contact inductive configurations. These robust systems install easily and provide the flexibility to adjust zone angles and zone location, while providing a control-reliable means to mute personnel sensing devices when the robot is safely out of the way.

Control Reliability is defined by ANSI/RIA R15.06-1999 –Section 4.54 as …any single component failure shall not prevent the stopping action of the robot. When properly installed and monitored, the Balluff system is single point fault tolerant and prevents the robot from entering a zone if the following conditions are present:

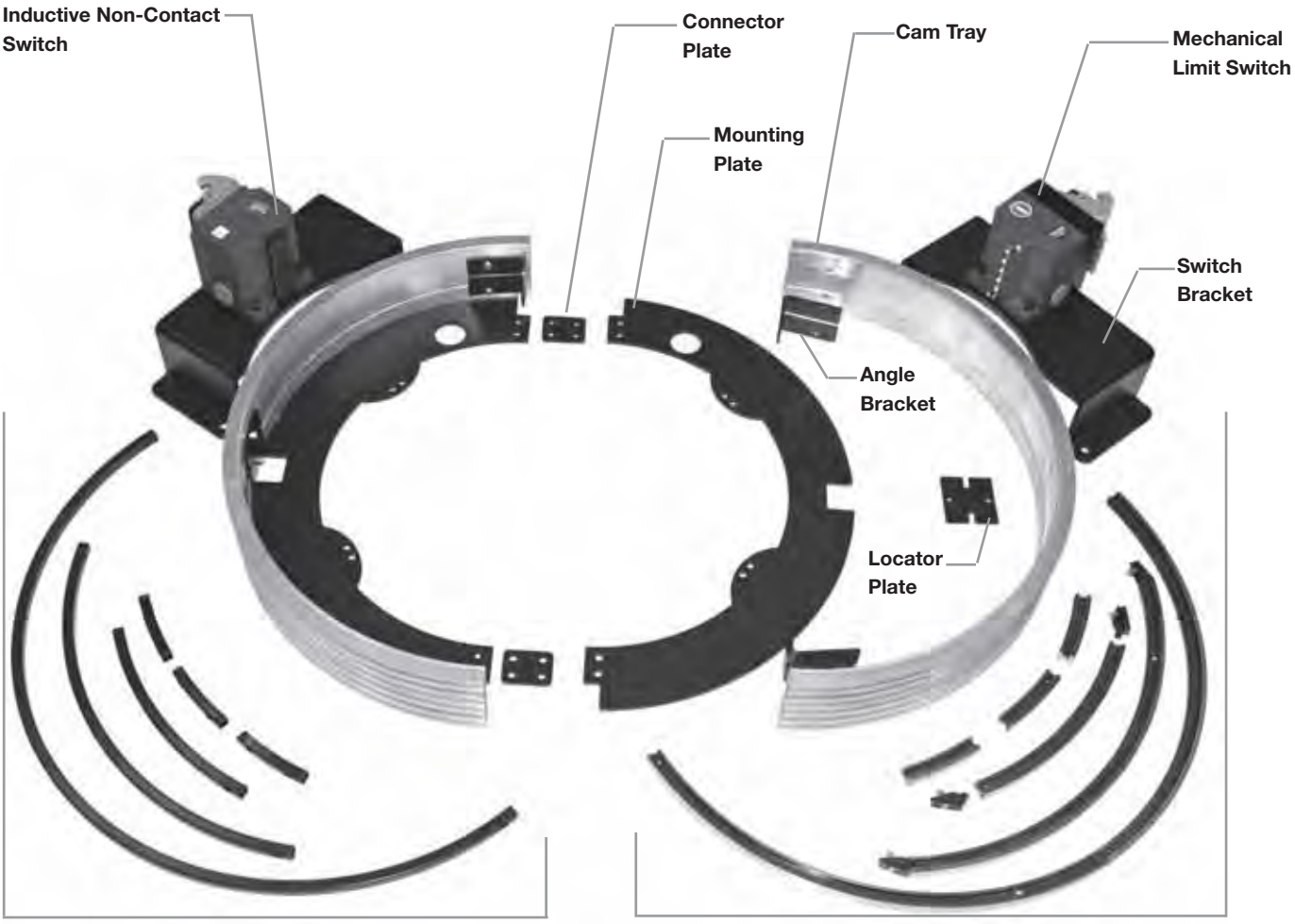
- Broken, missing, or stuck switch actuators
- Missing cams
- Cams that may have slipped out of position
- Open or short circuits
- Switch contacts welded together
- Broken internal switch spring
- Switch disconnected
- Switch actuator not touching cams



Balluff Zone Limit System Components

Designed for safety, durability, and long operational life

All mounting hardware is included in the kit. Mounting hardware can consist of: cam tray, mounting plates, switch bracket, connector plates, angle brackets, and hubs or spacers as required, including all nuts, bolts, screws and washers.



Non-Contact Cams for Inductive Sensors
Non-Contact rotary trip cams are made from tubular mild steel. They mount to the T-slot cam ring with a cleverly-designed speed T-nut for easy installation. Tamper resistant spanner screws are included to semi-permanently fix the cams to the ring for additional installation integrity.

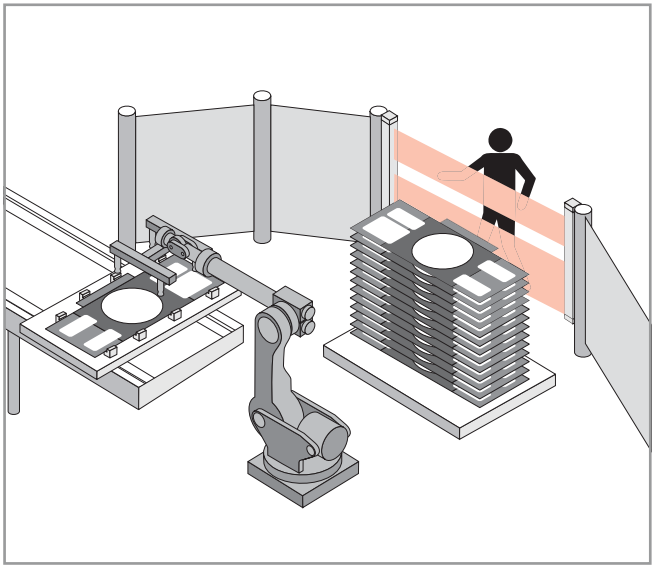
Mechanical Cams for Mechanical Limit Switches
Mechanical rotary trip cams are made from hardened steel with a burnished and hard-chromed surface for extra long life. The cams mount with either friction wedges for U-slots or T-nuts for T-slots. Self-tapping screws are also provided to semi-permanently fix the cams to the ring to guard against slippage or inadvertent re-positioning.

Cam Sets
Segmented cam sets (one set required per zone) are supplied with everything needed to create complimentary angles totaling 360°. The cam set typically includes one 180° segment, one 90° degree segment, one 45° degree segment, and three 15° segments. By attaching different combinations of cam angles together, two complementary cam sets can be created – for example 90° and 270°, in minimum increments of 15°. The cams that are supplied for axis 2 and 3 are typically two 180° segments that are positioned around the cam ring to set the boom back or flip over switch point.

Balluff Zone Limit Systems
How they work

Two Channels Per Zone
Balluff zone limit systems consist of a multi-channel ring that holds switch-actuating cams. Each zone is monitored by two adjacent yet complementary cams. The differential status of two separate switches must be confirmed to prove that the robot is safely out of the operator-occupied zone, before muting of the presence-sensing device is allowed. For example, an Axis 1 system with six channels and six switches allows up to three independent zones to be monitored with diverse, complementary redundancy. Segmented cams allow configuration of the angular size of the zones in 15° increments from 15° to 345°. Each zone can be independently and infinitely located 360° around the circumference of the cam ring.

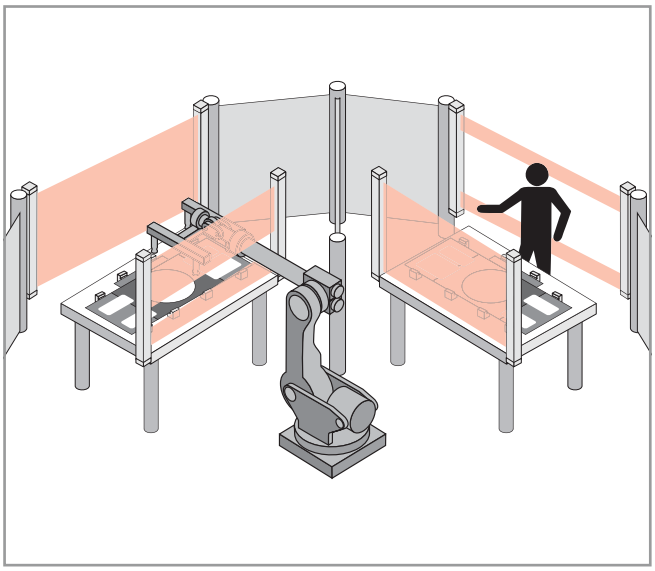
Before



Typical Robotic Work Cell
(Without Robot Zone Limit System)
In the first example, when the operator breaks the light curtain, the robot immediately stops working – no matter where it is positioned in the cell. Robot productivity is lost as long as the operator is present.

See next page for improved configuration ➔

Before



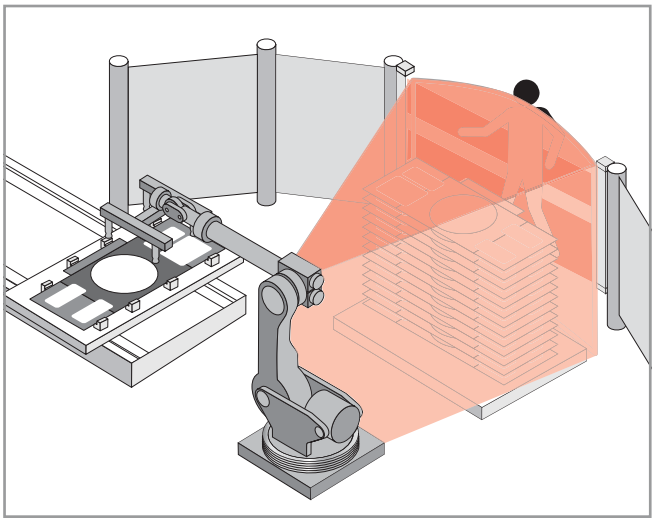
Typical Robotic Work Cell
(Without Robot Zone Limit System)
The second example shows a typical light curtain robot limiting application. Two extra sets of robot-detecting light curtains are employed. As long as the robot does not break the light curtain at the station where an operator is present, the robot can continue working elsewhere in the cell.

Although this method delivers some improvement in robot productivity, the space occupied by the additional light curtains restricts the robot motion and may cause interference with transport of large parts or sizable end-of-arm tooling. The additional robot moves required to remain clear of hitting the light curtains add to increased cycle time, which steals back some of the productivity gains resulting from adding the light curtains in the first place.

See next page for improved configuration ➔

Balluff Zone Limit Systems
Designed to increase productivity

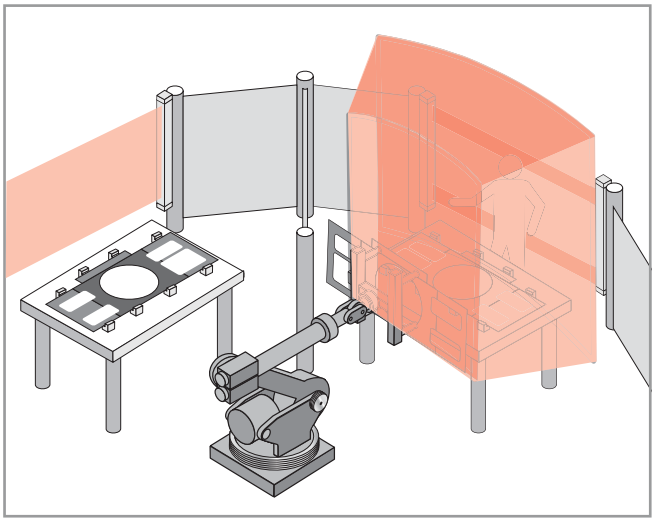
After



Balluff Axis 1 Zone Limit System
In the third example, the Axis 1 position of the robot is directly detected by the Balluff zone limit system. As long as the robot is safely away from the operator-occupied area of the cell, the safety light curtain is muted and the robot remains operational.

The operator can enter the work cell to load or unload parts into a fixture, replenish raw materials, or perform other tasks – without stopping the robot. However, if the robot finishes its task and tries to enter the operators zone before the operator leaves the area, the zone limit system detects the intrusion. The safety light curtains are instantly reactivated and the robot is stopped.

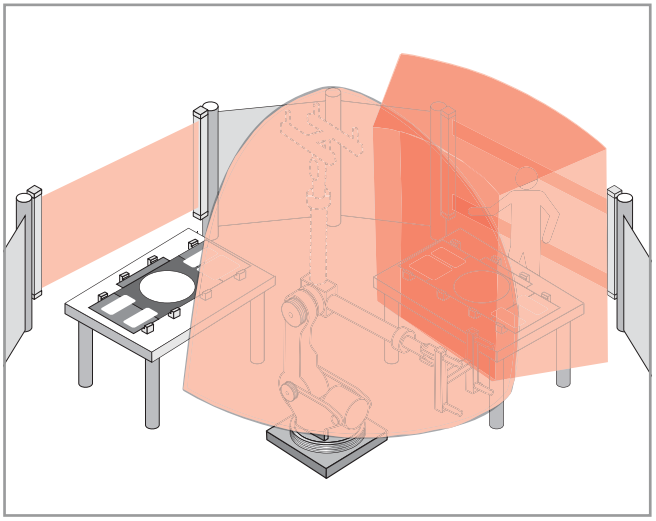
After



Balluff Axis 2 Zone Limit System
Some applications may require the robot arm to traverse past an operator to go to another area of the cell. By implementing a zone limit system on Axis 2 (commonly called boom back), the robot can pass in front of the operator with the arm safely retracted without shutting down the robot, even though the operator is present. If the robot should unexpectedly come off of the boom back switch while the operator is present in the station, the safety light curtains are re-enabled, stopping the robot.

Another application for an Axis 2 zone limit system is to prevent a gantry (or track) robot from reaching back under itself, or to ensure that the robot arm is safely retracted before the robot is allowed to traverse the length of the gantry.

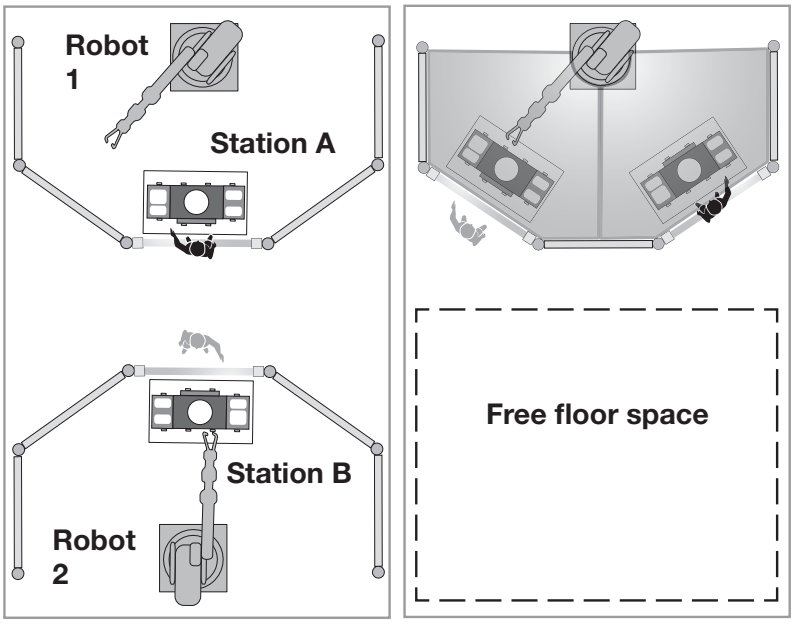
After



Balluff Axis 3 Zone Limit System
Axis 3 zone limit systems are sometimes referred to as flip over switches. Some robots have the capability to reach backwards. In these cases, an Axis 1 zone limit system is not sufficient to determine the actual position of the robot arm.

In this example, if an operator is working on the right and the robot suddenly tries to flip the upper arm over into that zone, the safety light curtains are re-enabled and the robot is stopped.

Two Stations/Two Cells



Rather than single workstations in two robot cells working without zone limits, a single robot/dual workstation setup using a Balluff zone limit system can reduce the number of robots and floorspace needed by half.

Work cell size reduction is another big benefit. Since the size of the area guarding must be larger than the maximum operational envelope of the robot and its payload, a Balluff robot zone limit system can be used to dynamically restrict the operating envelope of the robot, allowing a much smaller area to be guarded. The reduced guarded area also saves a substantial amount of money by reducing the amount of perimeter guard fencing per work cell.

The enhanced productivity of several robot cells may free up enough capacity to eliminate the need for additional robotic work cells, saving significant capital investment costs.

Linear Zone Limit Systems

RTU Systems
Robot Transfer Units, floor-mounted tracks that convey robots between multiple work stations, can benefit from linear zone limit system implementation.

A multi-channel linear zone limit system can eliminate multiple sets of robot-detecting light curtains while increasing zoning flexibility. This cuts initial cost, simplifies work cell design, speeds workflow changes, and reduces clutter on the factory floor.

Linear Toploaders (Track or Gantry Robots)
Gantry-mounted robots travel back and forth delivering parts and products. Balluff linear zone limit systems can provide up to four independent zones along the full length of robot travel.

When used in conjunction with an Axis 2 system, linear zone limit systems ensure that the robot can be safely interlocked with automatic machine doors, gates, operator-occupied areas, and other robots mounted on the same track or working within the same physical envelope.

Easy to Install, Easy to Maintain, and Totally Effective

- **Flexible**
  Zones can be easily changed by maintenance or trade personnel.
- **Reliable**
  Proven ganged mechanical switches or wear-free inductive sensors.
- **Productive**
  Robot doesn t need to wait for operator to load or unload components.
- **Space-Saving**
  Reduces area guarding requirements.
- **Cost-Saving**
  Reduces capital costs for unnecessary robots and perimeter guarding.
- **User-Friendly**
  Provides direct visual indication of zone sizes and locations.
- **Convenient**
  Fully pre-engineered, kitted hardware solutions eliminate guesswork.
- **Specified**
  Meets automotive manufacturers requirements.
- **Safe**
  Hardware conforms to ANSI recommended practices.

Axis 1
The main rotational axis (Axis 1) system can monitor up to three fully independent diverse complimentary redundant zones. Each zone can be infinitely located 360° around the axis of rotation. The angular zone can be configured in 15° increments from 15° to 345°, or the cams can be user-modified to create smaller increments.

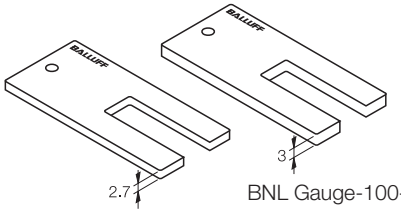
Axis 2
The boom forward/back (Axis 2) switch monitors a single zone using two channels with two 180° cams. Some available systems can monitor up to three zones with six channels. This axis is used to ensure boom is retracted, allowing the robot more freedom to move safely past operator-occupied areas.

Axis 3
Similar to an Axis 2 system, the flip over (Axis 3) switch monitors a single zone using two channels with two 180° cams. An Axis 3 system provides protection against the robot flipping over 180°, without the need to restrict the robots motion with permanent hard stops that might interfere with required program movements.

SAFETY NOTICE:
The components supplied with Balluff Zone Limit Systems are suitable for use in personnel safety applications only when installed and used in compliance with all applicable provisions of American National Standards Institute / Robotics Industries Association American National Standard for Industrial Robots and Robot System – Safety Requirements ANSI/RIA R15.06-1999 or subsequent editions thereof, and all other relevant industrial and governmental standards and requirements.

Setting the correct distance between the limit switch and the cam is critical to the proper operation of the switch. If the distance is too large, the switch contacts may not open. If the distance is too small, the maximum allowable overtravel on the switch plungers will be exceeded and the switches will be damaged or have their life expectancy reduced. Excessive overtravel can also damage the internal sealing membrane between the plunger and the switch operator, resulting in entry of dirt and fluids into the sealed contact chamber.

To set dimension "A", set up gauges can be used.



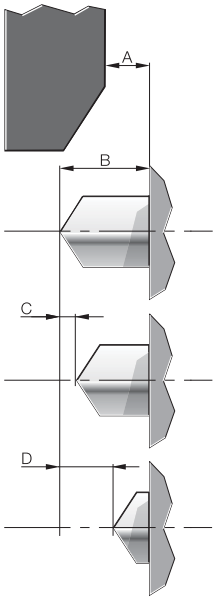
BNL Z/Gauge-X508

BNL Gauge-100-3mm

The pre-travel adjustment of Balluff cam switches has been carefully set by the Balluff factory. Do not tamper with the pre-travel adjustment screw for the following reasons:

1. If the pre-travel is increased beyond factory specifications, the switch will fail to reliably function.
2. If the pre-travel is reduced below factory specifications, excessive overtravel will lead to premature switch failure due to return spring fatigue.

   Excessive overtravel will also cause premature failure of the sealing membrane, allowing fluid leaks into the housing.



Multiple Position Switches

Series		100	62	61	72	46	40
A	cam setting	5-0.5	5-0.5	5-0.5	3-0.5	2.8-0.5	2.8-0.5
B	plunger point to reference surface (basic setting)	(d) 8	(d) 8	(d) 8	(d) 6	(d) 4	(d) 4
B minus C	switchpoint to reference surface	(a) 6 (b) 6.5 (c) 7	(a) 6 (b) 6.5 (c) 7	(a) 6 (b) 6.5 (c) 7	(a) 4 (b) 4.5 (c) 5	(d) 3.5	(d) 3.5
C	switchpoint of switch element	(a) 2 (b) 1.5 (c) 1	(a) 2 (b) 1.5 (c) 1	(a) 2 (b) 1.5 (c) 1	(a) 2 (b) 1.5 (c) 1	(d) 0.5	(d) 0.5
D	max. travel plunger	(a) 5.5 (b), (c) 4	(a) 5.5 (b), (c) 4	(a) 5.5 (b), (c) 4	(a) 5.5 (b), (c) 4	(d) 3.5	(d) 3.5

Single Position Switches

Series		F60	99	100
A	cam setting	5-0.5	2.8-0.5	2.8-0.5
B	plunger point to reference surface (basic setting)	(d) 8	(d) 4	(d) 4
B minus C	switchpoint to reference surface	(a) 4 (b) 4.5 (c) 5	(d) 3.5	(d) 3.5
C	switchpoint of switch element	(a) 2 (b) 1.5 (c) 1	(d) 0.5	(d) 0.5
D	max. travel plunger	(a) 7.5 (b), (c) 4	(d) 3.5	(d) 3.5

Dimensions in mm

When replacing snap switches in the field, every effort should be made to ensure proper pre-travel adjustment according to the following:

Switch Type	Pre-Travel Specification		Dimension
BSE-30	2.0 mm ± 0.1mm		A
BSE-61	1.0 mm ± 0.1mm	Forced opening at 2.3 mm depression	C
BSE-85	1.5 mm ± 0.1mm	Forced opening at 3.3 mm depression	B
Miniature	0.5 mm ± 0.25mm		

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
($0.9\ s_n \le s_r \le 1.1\ s_n$)

Useful operating distance s_u

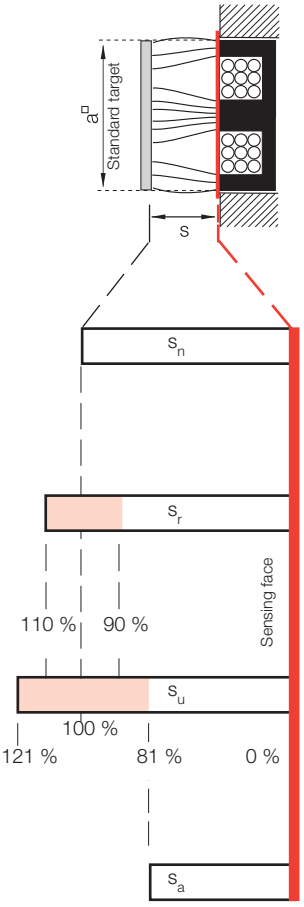
... is the permissible switching distance of an individual switch element within the specified voltage and temperature conditions.
($0.81 s_n \le s_u \le 1.21\ s_n$).

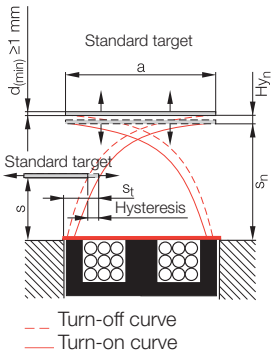
Assured operating distance s_a

... is the switching distance at which assured operation of the switch element is guaranteed at specified voltage and temperature conditions.
($0 \le s_a \le 0.81\ s_n$).

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).
$H \le 0.2\ s_r$





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.

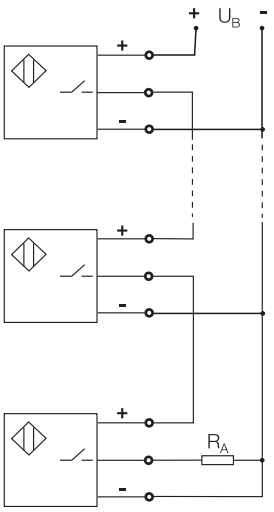
Short circuit/overload protected
(for operating with AC or DC supply)

... 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.

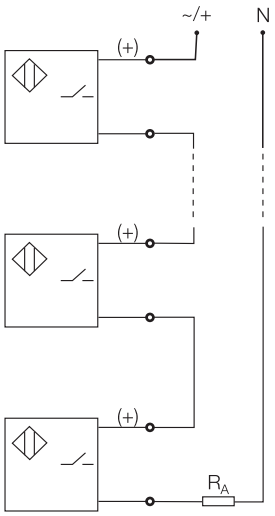
Series connection

... 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



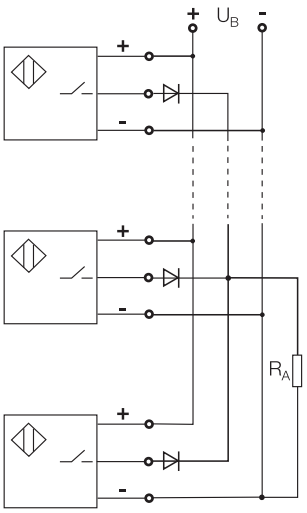
2-wire DC switch elements (AC/DC)



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 LEDs 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 Part 1
	Metric fitting	EN 50262
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 Frequency range: 10...500 Hz Amplitude: 3 mm_{P-P}/20 g Oscillation duration: 40 sweeps in 3 axes	EN 60068-2-6/IEC 60068-2-6
	Shock Pulse shape: half-sine Peak acceleration: 100 g Pulse duration: 6 ms Number of shocks: 25 positive, 25 negative in 3 axes	EN 60068-2-27/IEC 60068-2-27
	Continuous shock Pulse shape: half-sine Peak acceleration: 100 g Pulse duration: 6 ms Number of shocks: 4000 positive, 4000 negative in 3 axes	EN 60068-2-29/IEC 60068-2-29

Mechanical Switches
BNS Precision Switches

Approach direction

Plunger can be rotated (except safety version)

Series	BNS 100	BNS 72	BNS 62	
Housing Type				
Full Size Housing - Multiple Position	■	■		
Full Size Housing / Reduced Mounting Flange - Multiple Position			■	
Compact Housing Smaller Wiring Compartment - Multiple Position				
Miniature - Multiple Position				
Compact - Single Position Limit				
Miniature - Single Position Limit				
Actuation/Switching Means				
Mechanical / Mechanical	■	■	■	
Mechanical / I/O Link	■		■	
Non-Contact / Inductive	602-11	605-11		
Plunger Spacing				
8 mm				
10 mm				
12 mm	■	■	■	
16 mm	■	■	■	
Plunger Type				
Chisel - D	■	■	■	
Chisel with Wiper - E	■	■	■	
Low Speed Bushing Roller - R	■	■	■	
High Speed Sealed Ball Bearing Roller - L	■	■	■	
Multi-Directional Ball Tip - K	■	■	■	
Plunger/Switch Style				
Standard - 819	■	■	■	
Safety - 813	■	■	■	
Standard Quick Change Plunger Block - 829	■			
Safety Quick Change Plunger Block - 823	■			
Hardened Aluminum Guides - X512	■	■	■	
Switch Elements				
BSE-30 Snap Action - 250 Vac - NO & NC	■	■	■	
BSE61 Safety Forced Opening - 250 Vac - NC	■	■	■	
BSE 85 Safety Snap Action - 250 Vac -NO & NC	■	■	■	
BSE 69.1 (solder), BSE 70.1 (screw) Snap Action - 250 Vac - Form C				
BSE 73.1 (solder), BSE 74.1 (screw) Snap Action - 30 Vdc - Form C				
KHG Inductive - 10...55 Vdc - DC 2-wire - NO	■	■		
KHH Inductive - 10...55 Vdc - DC 2-wire - NC	■	■		
PA Inductive - 10...60 Vdc - PNP - NO & NC	■	■		
NA Inductive - 10...60 Vdc - NPN - NO & NC	■	■		
TOB Inductive - 10...30 Vdc - PNP -NC				
TNB Inductive - 10...30 Vdc - NPN - NO				
WO Inductive - 35...250 Vac - NC	■	■		
WS Inductive - 35...250 Vac - NO	■	■		
LED - Function Indication				
FC - 24 Vdc	w/BSE 85 switch	w/BSE 85 switch		
FD - 6...60 Vdc	■	■	■	
FE - 90...250 Vac	■	■	■	
Attributes				
Short Circuit Protection - Inductive Version Only	■	■		
Reverse Polarity Protection - Inductive Version Only - Except AC Version	■	■		
Temperature Range up to 70 °C	Inductive	Inductive		
Temperature Range up to 85 °C	Mechanical	Mechanical	Mechanical	
Metric Conduit Opening	■	■	■	
Optional Factory Pre-Wired Connector	■	■	■	
CE	■	■	■	





BNS 61	BNS F. 60	BNS 46	BNS 40	BNS 99/100
■				
		■	■	
	■			
				■
■	■	■	■	■
■		■	■	
610-11, 611-11, 612-11, 613-11		603-11	650-11	BES 516
		■	■	
		■	■	
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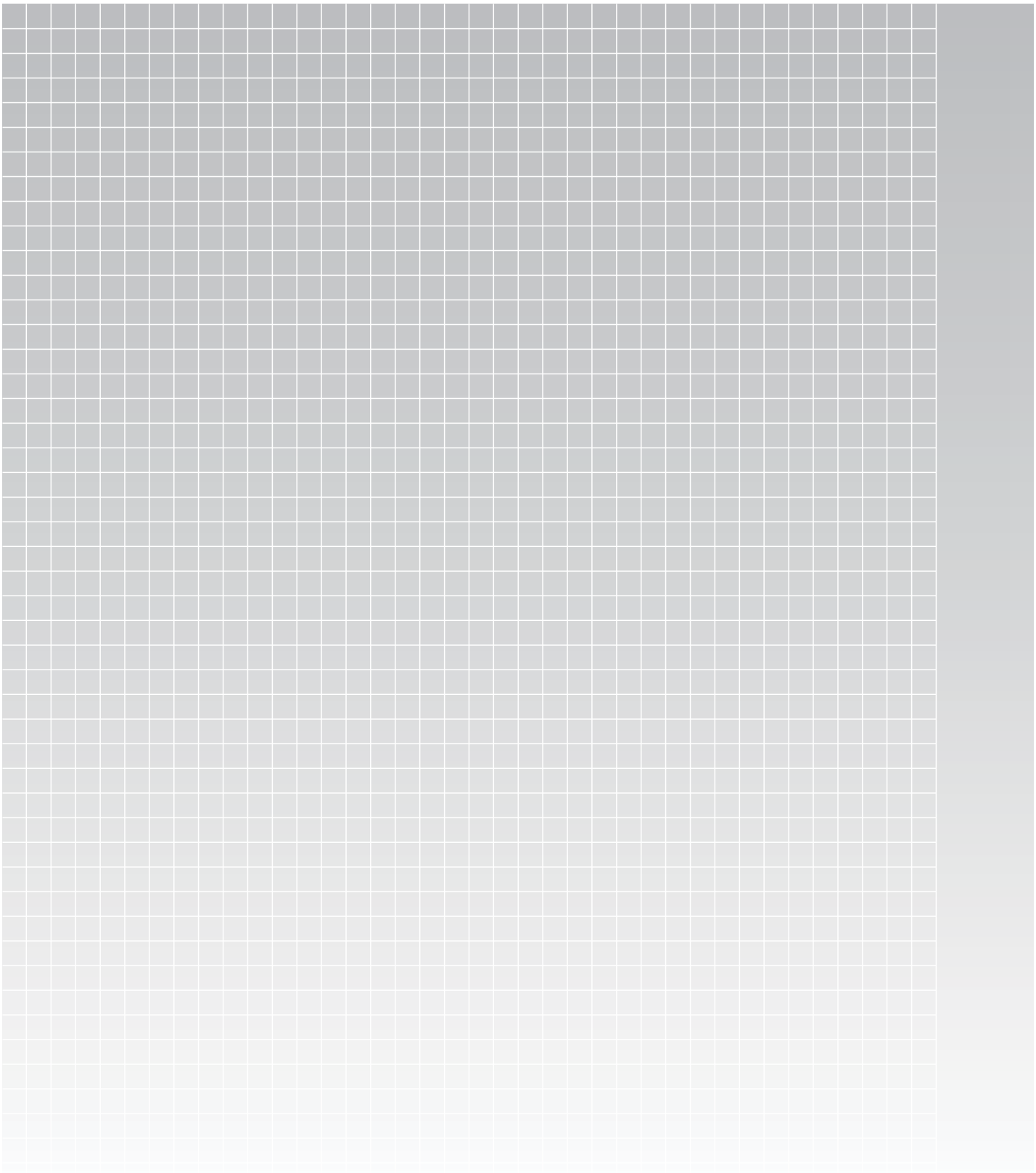
■	BES...346			
		■	■	■
		■	■	■
■				
■				
w/BSE 85 switch	w/BSE 85 switch	■	■	■
■	■			
■	■			
■		■	■	■
■		■	■	■
Inductive	Inductive	Inductive	Inductive	Inductive
Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
■	■	■	■	■
■	■	■	■	■
■	■	■	■	■

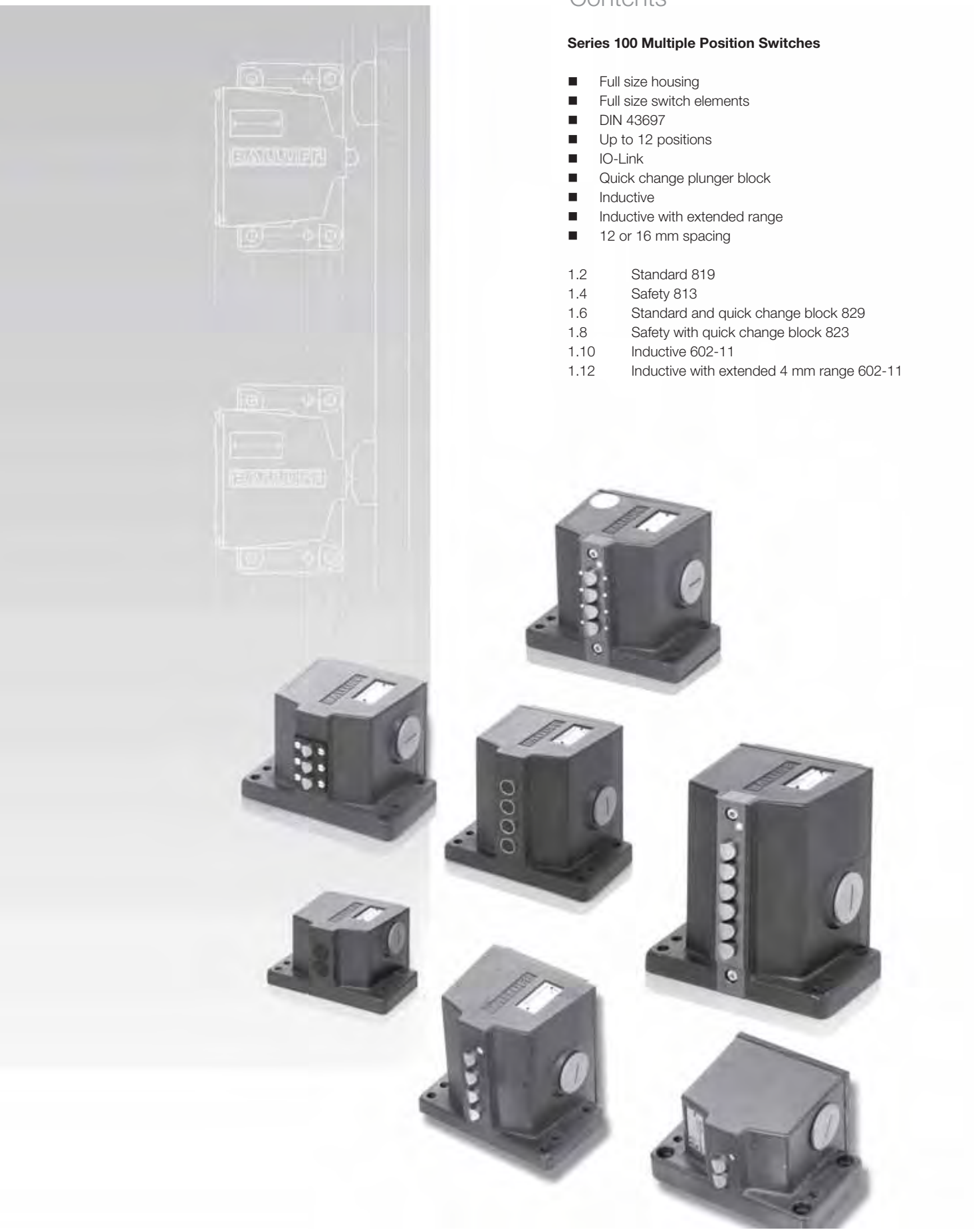


Mechanical Switches
Contents

Series 100 Multiple Position Switches

- Full size housing
- Full size switch elements
- DIN 43697
- Up to 12 positions
- IO-Link
- Quick change plunger block
- Inductive
- Inductive with extended range
- 12 or 16 mm spacing

1.2 Standard 819
1.4 Safety 813
1.6 Standard and quick change block 829
1.8 Safety with quick change block 823
1.10 Inductive 602-11
1.12 Inductive with extended 4 mm range 602-11



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

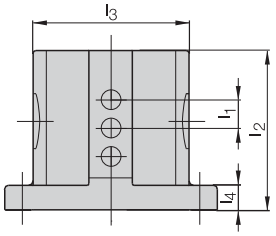
- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Connection options

- Thread for cable gland M25×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16).

Multiple position switches with function indication

- Optional function indication for two voltage ranges



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

Dimensions in mm

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

BNS 819-X####-D_ _-_ _ _-100-10-_ _-_ _ _ _

See page 15.14 for connector options

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushings

No. of plungers
02 2×
03 3×
04 4×
...

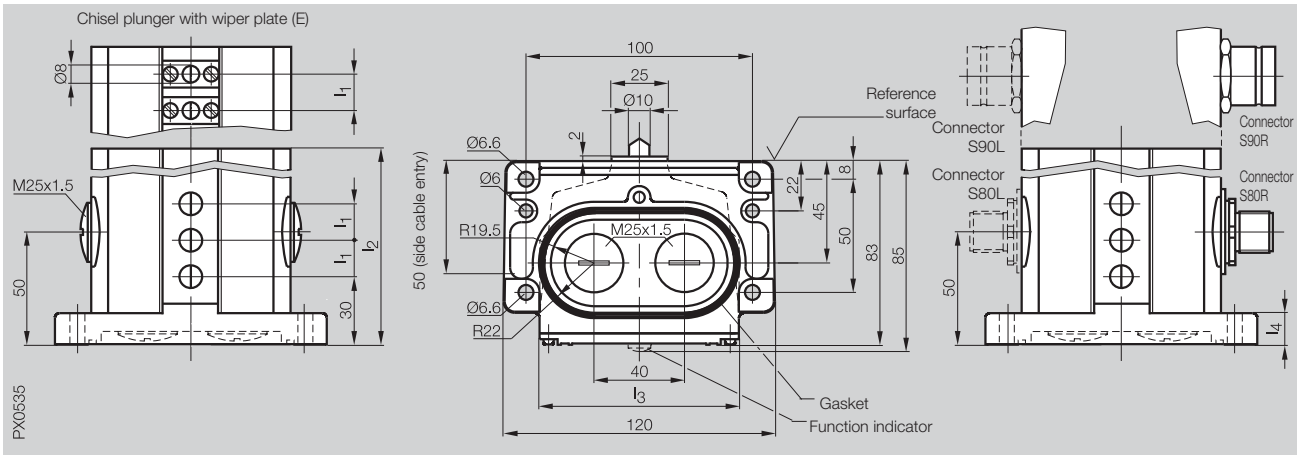
Plunger type
D Chisel
K Ball
R Roller
L Roller bearing
E Chisel with wiper plate

Plunger spacing
12 12 mm
16 16 mm

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

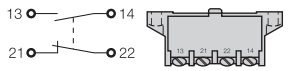
optional **Connector**
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway left
S80S 5-pin, right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left
S4R-I 4-pin, right only for IO-Link
S4L-I 4-pin, left only for IO-Link

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



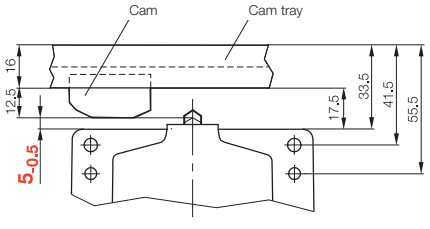
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable 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

With switch element	**BSE 30.0**
Part number	BNS 819-D_ _-_ _ _-100-**10**-_ _-_ _ _
Wiring diagram	

Switch element		
Contact material		Silver, gold plated
Switching principle		Snap switch
Contact system		Dual changeover, one normally-open and one normally-closed, galvanically isolated
Electrical data		see page 15.2
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 to front edge of mounting base.
Dimension is 3-.05 to the face of the switch housing (the area around the plungers).

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

- Optional function indication for three voltage ranges

Multiple position switches with wiper plate

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

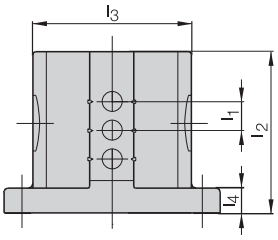
Connection options

- Thread for cable gland M25×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16).

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

Dimensions in mm



Ordering example:
BNS 813-D04-D12-100-10-03-FE-S80S

BNS 813-X####-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

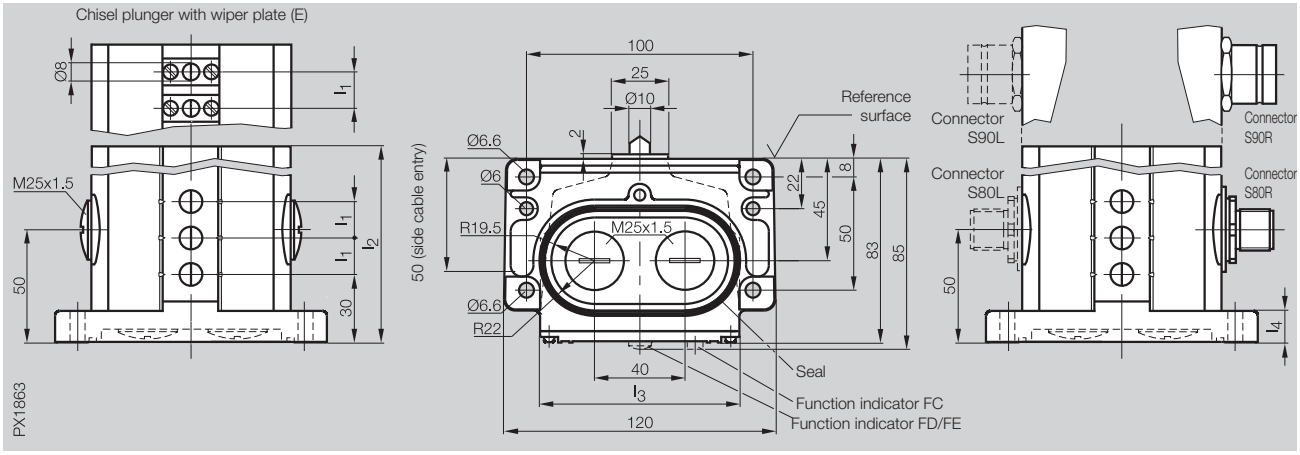
Safety switch elements
No. from flange

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** 24...28 V DC (only for BSE 85)

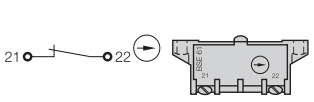
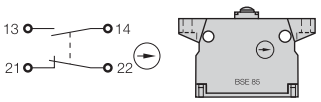
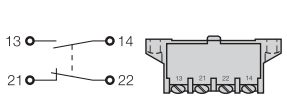
optional **Connector**
See page 15.14 for connector options
- **S80R** 5-pin, dual keyway right
- **S80L** 5-pin, dual keyway left
- **S80S** 5-pin, dual keyway right and left
- **S90R** 12-pin, right
- **S90L** 12-pin, left
- **S90S** 12-pin, right and left

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assmbly)
X512
Hardened aluminum bushings

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 24...28 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**
Part number		BNS 813-D_ _-_ _ _-100-**1**_ _-_ _ _ _ _	BNS 813-D_ _-_ _ _-100-**2**_ _-_ _ _ _ _	BNS 813-D_ _-_ _ _-100-**0**_ _-_ _ _ _ _
Wiring diagram				
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
Electrical data		see page 15.2	see page 15.2	see page 15.2
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
	Plunger E	30 m/min	30 m/min	30 m/min
	Plunger K	10 m/min	10 m/min	10 m/min
	Plunger R	60 m/min	60 m/min	60 m/min
	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
	Plunger R, L	± 0.01 mm	± 0.02 mm	± 0.01 mm

For installation and notes, see page 1.3

Multiple position switches per DIN 43697 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 M25×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

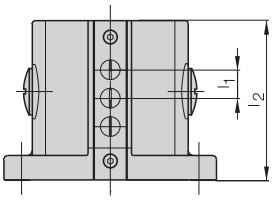
Multiple position switches with function indication

- Optional function indication for two 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	

Dimensions in mm



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

BNS 829-X####-D_ _-_ _ _-100-10-_ _-_ _ _ _

See page 15.14 for connector options

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

optional
Connector
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway left
S80S 5-pin, dual keywayright 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

No. of plungers
02 2×
...
06 6× (12mm only)

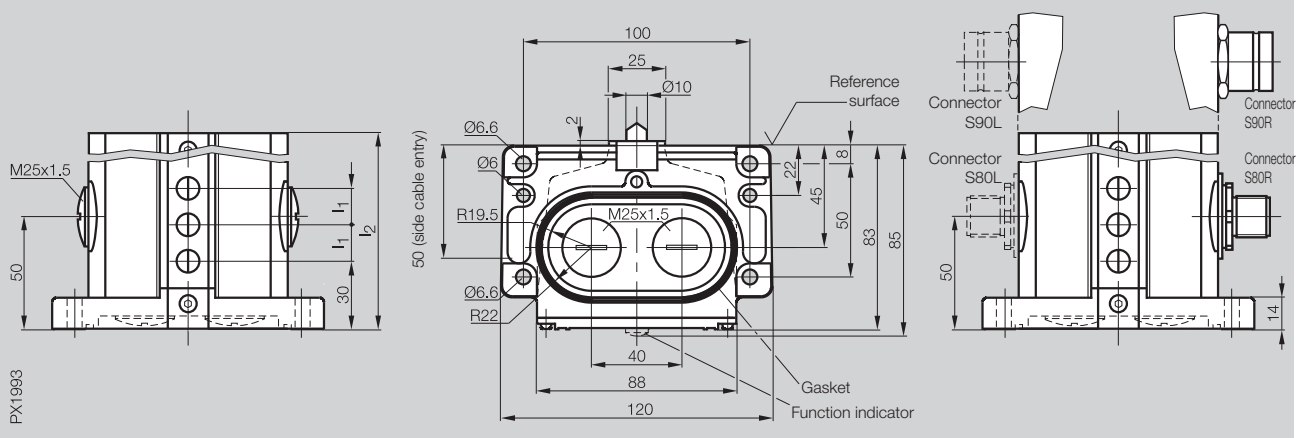
Plunger style
D Chisel
K Ball
R Roller
L Roller bearing

Plunger spacing
12 12 mm
16 16 mm

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

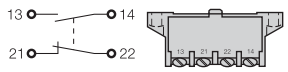
Note!
See accessory section for replacement plunger blocks and plungers.

Type	Multiple position switch with quick change plunger block
Plunger spacing	12 mm or 16 mm
Mounting and function dimensions	per DIN 43697



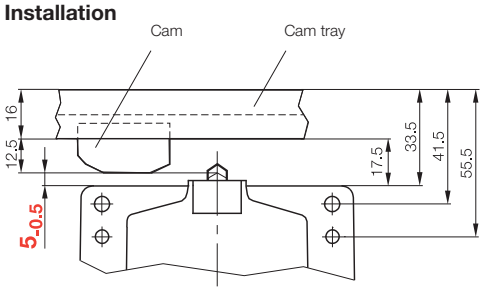
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) or Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable gland
Ambient temperature range	–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

With switch element	**BSE 30.0**
Part number	BNS 829-D_ _-_ _ _-100-**10**-_ _-_ _ _ _
Wiring diagram	

Switch element		
Contact material		Silver, gold plated
Switching principle		Snap switch
Contact system		Dual changeover, one normally-open and one normally-closed, galvanically isolated
Electrical data		see page 15.2
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.
Dimension is 3-.05 to the face of the switch housing (the area around the plungers)

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

- 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 (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

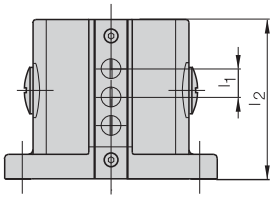
Multiple position switches with function indication

- Optional function indication for 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	

Dimensions in mm



Ordering example:
BNS 823-D02-D12-100-10-03-FE-S80R

BNS 823-X####-D_ _-_ _ _-100-_ _-_ _-_ _-_ _ -_ _ _

See page 15.14 for connector options

No. of plungers
02 2×
...
06 6×
(12 mm only)

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

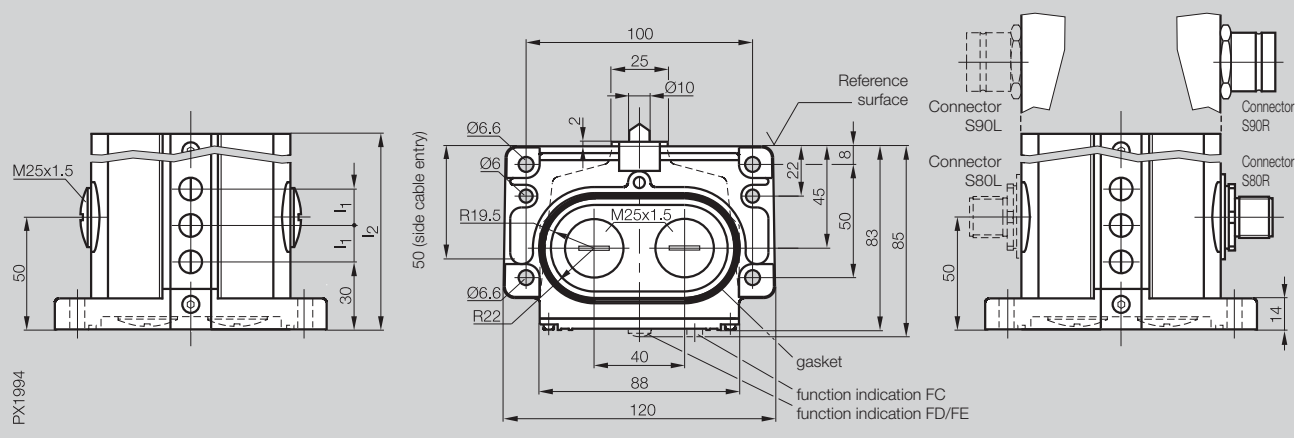
optional
Function indication
FD 6...60 V AC/DC (for BSE 30.0 and BSE 61)
FE 90...250 V AC/DC (for BSE 30.0 and BSE 61)
FC 24...28 V DC (only for BSE 85)

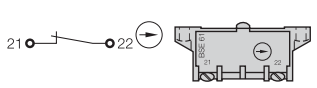
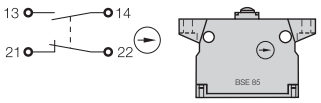
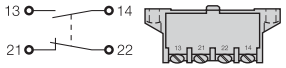
X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

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

Note!
See accessory section for replacement plunger blocks and plungers.

Type	Multiple position switch with forced-opening contacts and quick change plunger block
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 24...28 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**
Part number	BNS 823-D_ - _ _ _-100-**1**_ - _ _ _ _ _	BNS 823-D_ - _ _ _-100-**2**_ - _ _ _ _ _	BNS 823-D_ - _ _ _-100-**0**_ - _ _ _ _ _
Wiring diagram			
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
Electrical data	see page 15.2	see page 15.2	see page 15.2
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

For installation and notes, see page 1.7

Multiple position switches per DIN 43697 for standard applications

- Can be used under extreme conditions such as shock, temperature fluctuations, coolant flooding, high speed, and abrasive applications
- 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.

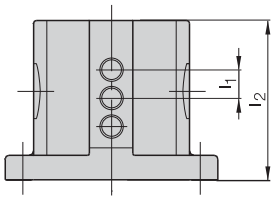
Connection options

- Thread for cable gland M25×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

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
Dimension l_3	4 mm for inductive switch elements with sensing head ∅ 10 mm								
	2 mm for inductive switch elements with sensing head ∅ 15.5 mm								

Dimensions in mm



Ordering example:
BNS 816-B06-THA-16-602-11-S90R

BNS 816-X####-B_ _-_ _ _-_ _-602-11-_ _ _ _

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

Code for switch elements
(see table at right)

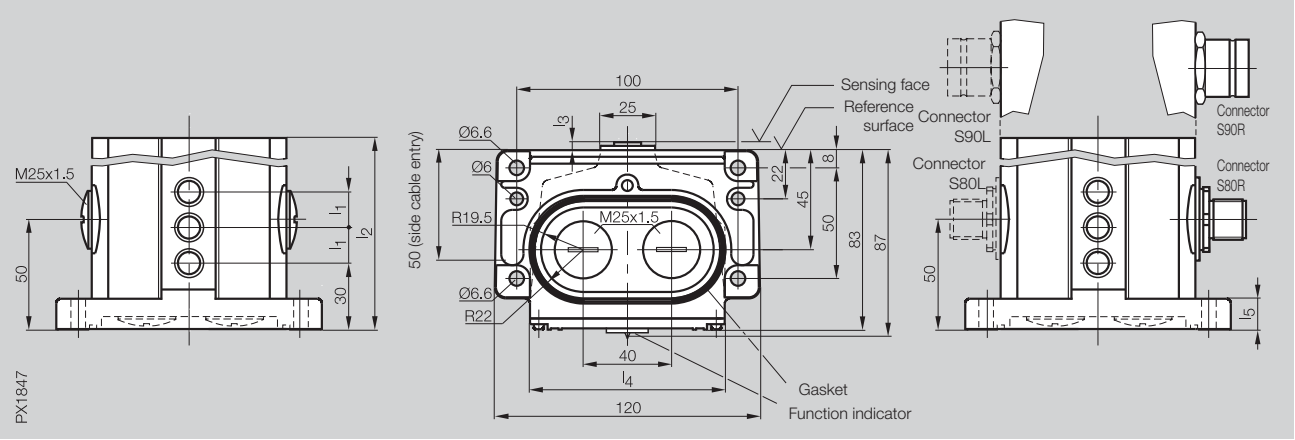
Plunger spacing
12 12 mm
16 16 mm

See page 15.14 for connector options

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

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

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



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

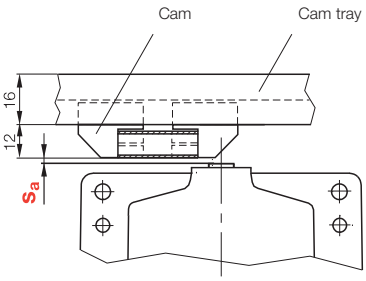
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
THA	BES 517-142-Y-RK	PNP, complementary, 10...30 V DC, short circuit protected	5 mm	0...4 mm
EJA	BES 517-463-RK	NO, up to 250 V AC	5 mm	0...4 mm
AAA	BES 517-464-RK	NC, up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

For additional electrical data see pages 15.4-15.7.

Installation



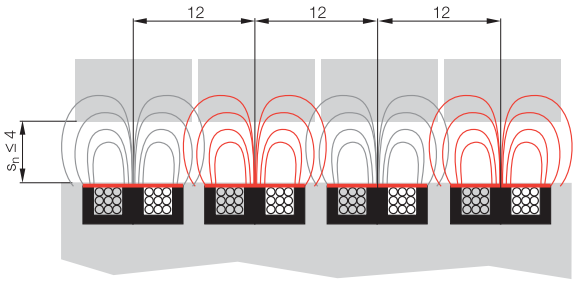
Note!
To ensure switching function s_a must
be in a range of
$0 < s_a \leq 1.6$ @ 12mm spacing
$0 < s_a \leq 4$ @ 16mm spacing

Mechanical Switches
Series 602-11 per DIN 43697

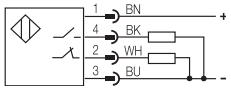
Extended Range
Inductive Multiple Position

Inductive sensors from Balluff are characterized by a compact housing and generous switching distances. The result is a non-contacting, wear-free sensor.

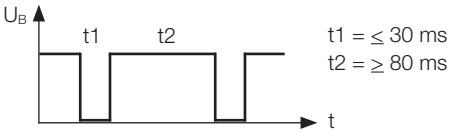
The tuned sensing coil oscillator frequences of the inductive sensors allow them to be installed very close to each other. Mutual interference is precluded at 12 mm spacing and 4 mm switching distance.



Complementary electronic switching elements allow the sensor to be used either as normally open or normally closed.



Sensor compatible with pulsed power supply.



Robot Zone Limits

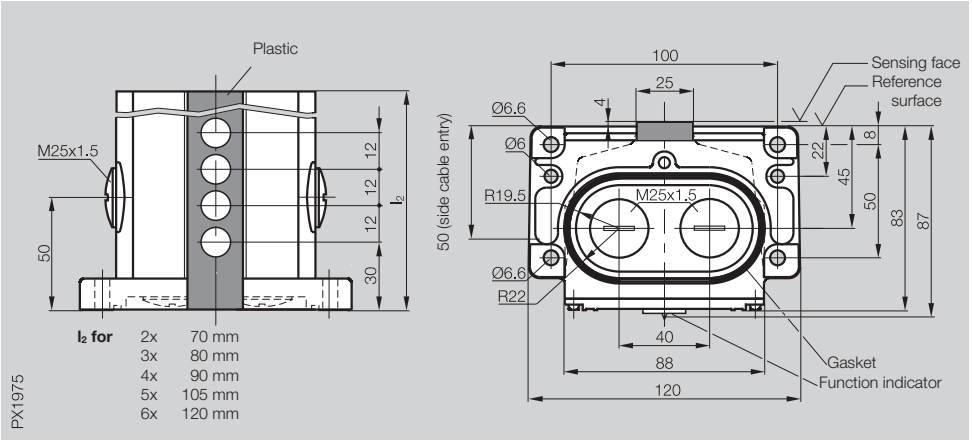
Two diverse, complementary, redundant channels are required for control reliable operation of each zone.

In case of error (short circuit, mis-wiring, ...) both signals are identical and are recognized by the controller as a fault condition. Monitoring must be implemented with a safety PLC or with a safety relay.

Safety Notice

The components supplied with Balluff's Zone Limit Systems are suitable for use in personnel safety applications only when installed and used in compliance with all applicable provisions of American National Standards Institute / Robotic Industries Association American National Standard for Industrial Robots and Robot Systems - Safety Requirements ANSI/RIA R15.06-1999 or subsequent editions thereof, and all other relevant industrial and governmental standards and requirements.

Type	Multiple position switch with extended range inductive sensors
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
Not Field Replaceable	PNP, complementary, 10...60 V DC, short circuit protected, 200mA	4 mm	0...3.2 mm

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

BNS 816-X####-B_ _-00-12-602-11

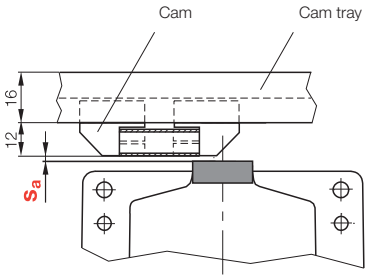
No. of switch positions

02 2×
03 3×
04 4×
05 5×
06 6×

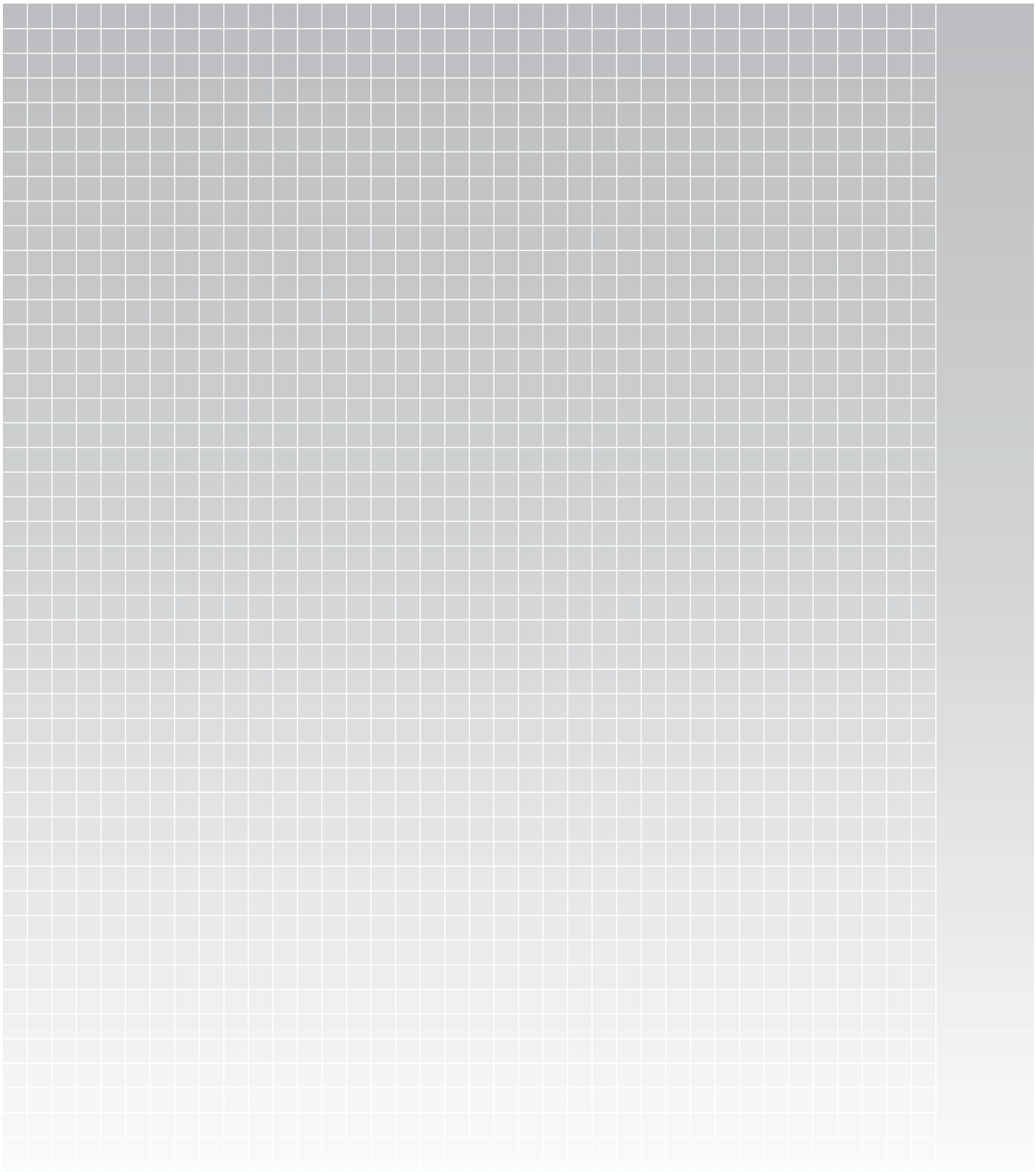
Note: See page 15.14 for connector options

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
standard switches without special wiring or connectors
X580 = 2 position
X603 = 4 and 6 postitions

Installation



Caution!
To ensure switching function s_a must be in a range of $0 < s_a \leq 3.2$



Mechanical Switches
Contents

Series 62 Multiple Position Switches

- Smaller flange dimensions compared to 100 series
- Smaller wiring chamber
- Up to 10 positions
- I/O Link
- Full size switch elements
- 12 or 16 mm spacing

2.2 Standard 819
2.4 Safety 813

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

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Connection options

- Thread for cable gland M20×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

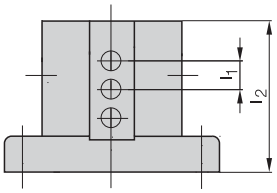
Multiple position switches with function indication

- Optional function indication for two voltage ranges

Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension	l_1 = 12 mm	64	72	84	96	112	130	160
l_2 when	l_1 = 16 mm	64	84	96	112	130	160	192

Dimensions in mm



Ordering example:
BNS 819-D04-D12-62-10-FD-S80S

BNS 819-X####-D_ _-_ _ _-62-10-_ _-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushing

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

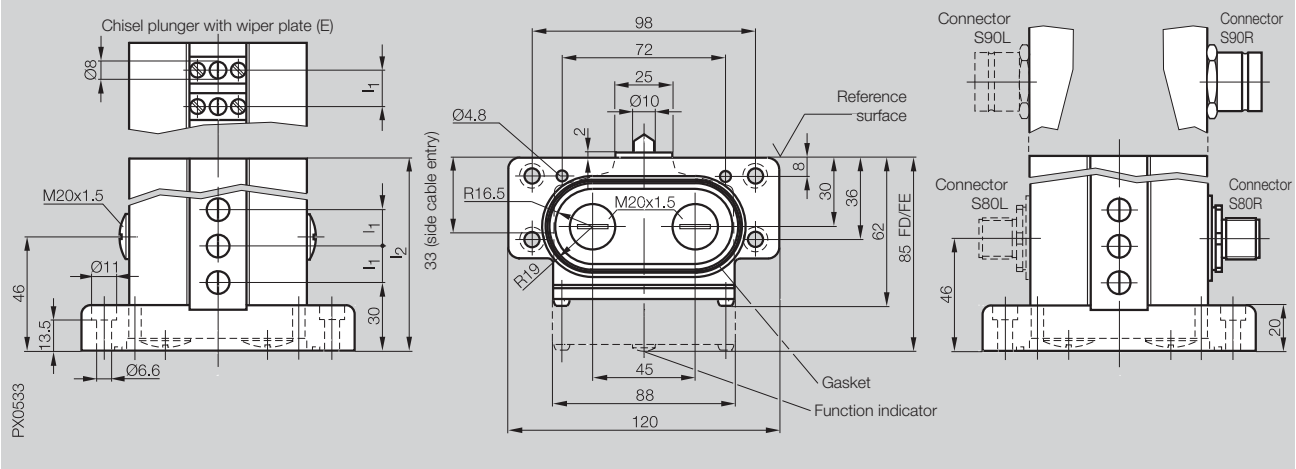
Plunger spacing
- **12** 12 mm
- **16** 16 mm

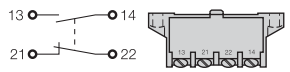
optional
Function indication
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

See page 15.14 for connector options

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

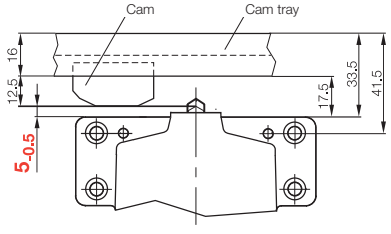


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable 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**)
With switch element	**BSE 30.0**
Part number	BNS 819-D_ _-_ _ _-62-**10**-_ _-_ _ _ _
Wiring diagram, style	

IO-Link

Switch element		
Contact material		Silver, gold plated
Switching principle		Snap switch
Contact system		Dual changeover, one normally-open and one normally-closed, galvanically isolated
Electrical data		see page 15.2
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
Repeatability	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.
Dimension is 3-0.5 to the face of the switch housing (the area around the plungers)

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

- Optional function indication for three voltage ranges

Multiple position switches with wiper plate

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

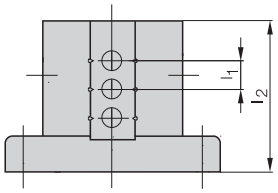
Connection options

- Thread for cable gland M20×1.5 on side and in flange (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.6)

Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension	l_1 = 12 mm	64	72	84	96	112	130	160
l_2 when	l_1 = 16 mm	64	84	96	112	130	160	192

Dimensions in mm



Ordering example:
BNS 813-D04-R12-62-10-02-FD-S80S

BNS 813-X####-D_ _-_ _ _-62-_ _-_ _-_ _ -_ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)
X512
Hardened aluminum bushings

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

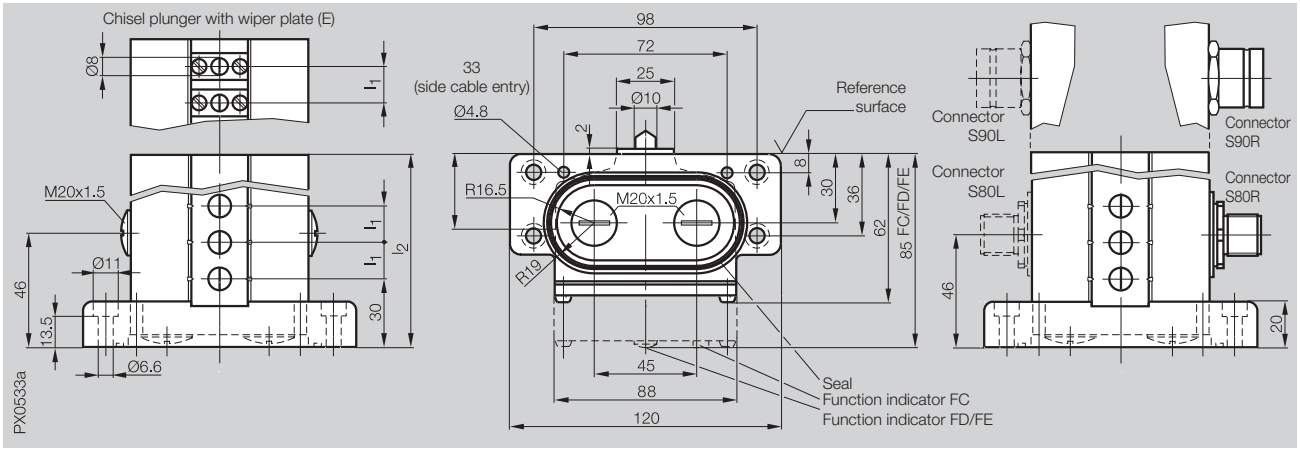
Switch elements
10 BSE 61 Remaining switch positions BSE 30.0
12 Only BSE 61
20 BSE 85 Remaining switch positions BSE 30.0
22 Only BSE 85

Safety switch elements
No. from flange

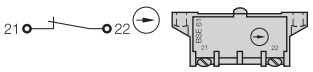
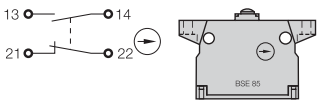
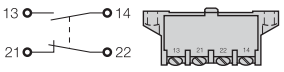
optional **Function indication**
FD 6...60 V AC/DC (for BSE 30.0 and BSE 61)
FE 90...250 V AC/DC (for BSE 30.0 and BSE 61)
FC 24...28 V DC (only for BSE 85)

optional **Connector**
See page 15.14 for connector options
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway left
S80S 5-pin, dual keyway right and left
S90R 12-pin, right
S90L 12-pin, left
S90S 12-pin, right and left

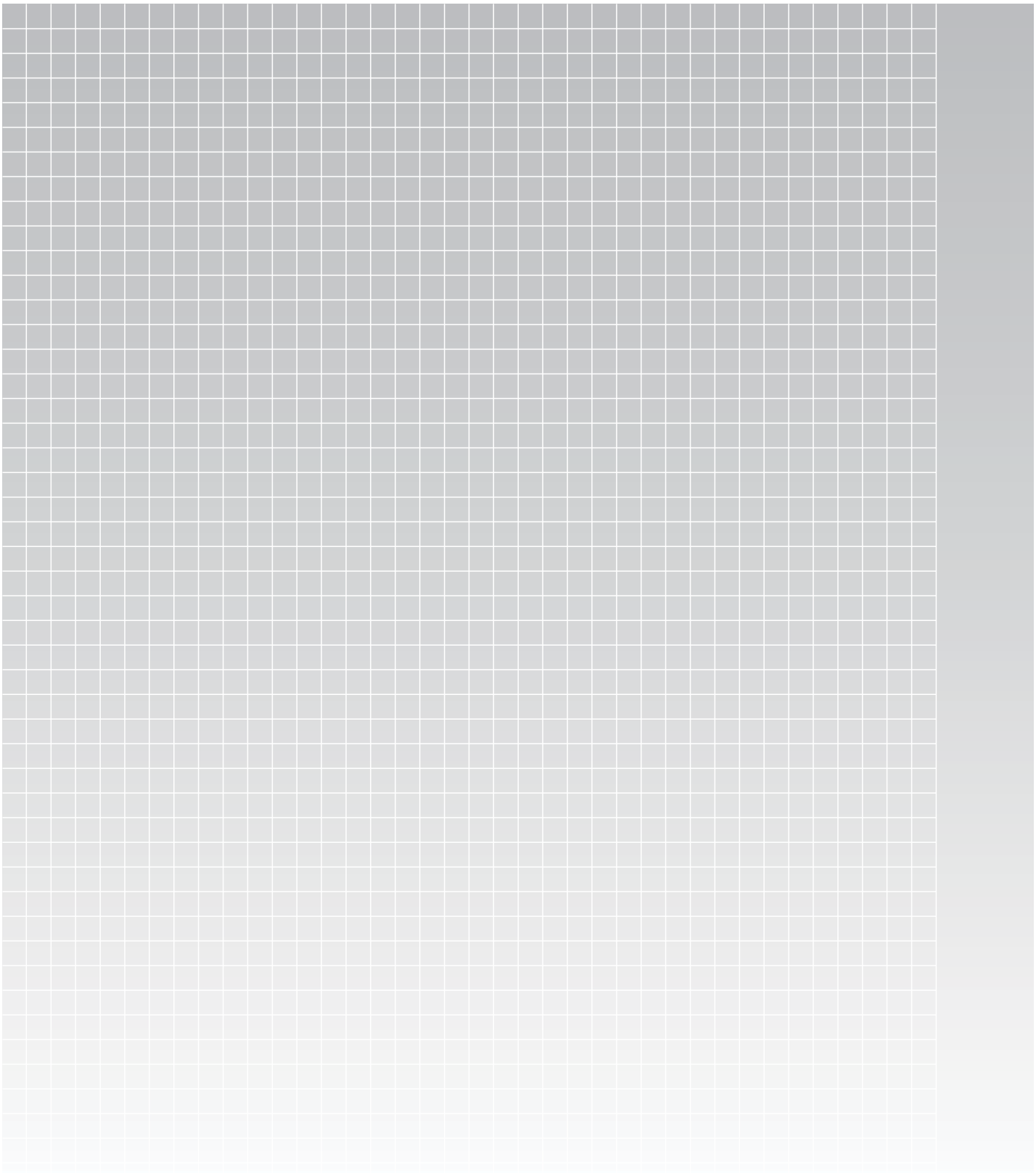
Type	Multiple position switch with positive-opening contacts
Plunger spacing	12 mm or 16 mm



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 24...28 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**
Part number		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
Electrical data		see page 15.2	see page 15.2	see page 15.2
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
	Plunger E	30 m/min	30 m/min	30 m/min
	Plunger K	10 m/min	10 m/min	10 m/min
	Plunger R	60 m/min	60 m/min	60 m/min
	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
	Plunger R, L	± 0.01 mm	± 0.02 mm	± 0.01 mm

For installation and notes, see page 2.3



Mechanical Switches
Contents

Series 61 Multiple Position Switches

- Compact housing with smaller wiring chamber
- Full size switch elements
- Up to 6 positions
- IO-Link
- Quick chance plunger block
- Inductive
- Inductive with extended range
- 12 or 16 mm spacing

3.2 Standard 819
3.4 Safety 813
3.6 Standard with quick change block 829
3.8 Safety with quick change block 823
3.10 Inductive 610-11, 611-11, 612-11, 613-11
3.12 Inductive with extended 4 mm range 610-11

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

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Connection options

- Thread for cable gland M20×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

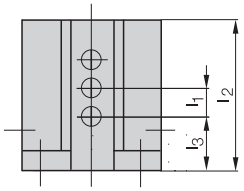
Multiple position switches with function indication

- Optional function indication for two voltage ranges

Available sizes

No. of plungers	Plunger spacing	Housing B Standard		Housing B		Housing C	
	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
						60	30
3	12	48	12	60	24	60	24
4	12	60	12				
5	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



Ordering example:
BNS 819-B04-D12-61-12-10-FD-S80S

BNS 819-X####-_ _ _-_ _ _-61-_ _-10-_ _-_ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)
X512
Hardened aluminum bushings

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**

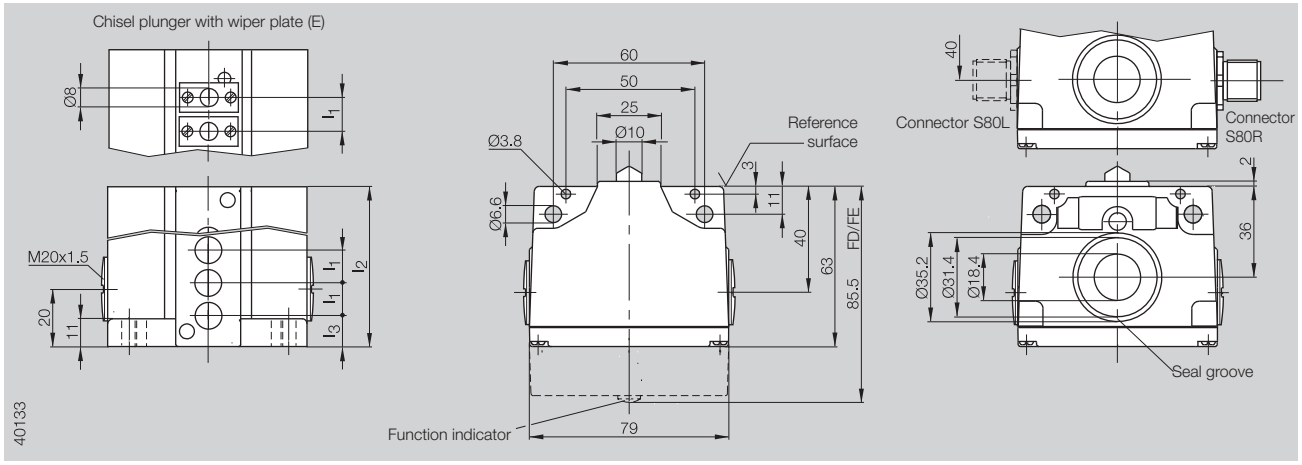
FD	6...60 V AC/DC
FE	90...250 V AC/DC

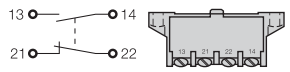
See page 15.14 for connector options

optional **Connector**

S80R	5-pin, dual keyway right
S80L	5-pin, dual keyway left
S80S	5-pin, dual keyway 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

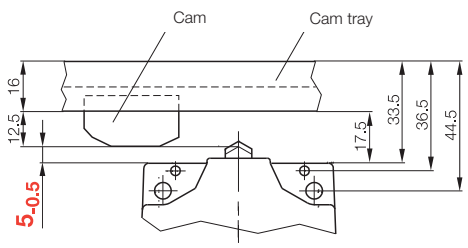


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable 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**)
With switch element	**BSE 30.0**
Part number	BNS 819-___-____-61-___-**10**-__-_____
Wiring diagram, style	

IO-Link

Switch element		
Contact material		Silver, gold plated
Switching principle		Snap switch
Contact system		Dual changeover, one normally-open and one normally-closed, galvanically isolated
Electrical data		see page 15.2
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.
Dimension is 3-.05 to the face of the switch housing (the area around the plungers)

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

- Optional function indication for three voltage ranges

Multiple position switches with wiper plate

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

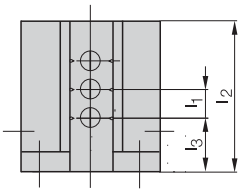
Connection options

- Thread for cable gland M20×1.5 on side and in flange (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Available sizes

No. of Plungers	Plunger spacing Dimension	Housing B Standard		Housing B		Housing C	
		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
						60	30
3	12	48	12	60	24	60	24
4	12	60	12				
5	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



Ordering example:
BNS 813-B06-L12-61-A-12-02-FE-S90R

BNS 813-X####-_ _ _-_ _ _-61-_-_ _-_ _-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)
X512
Hardened aluminum bushings

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

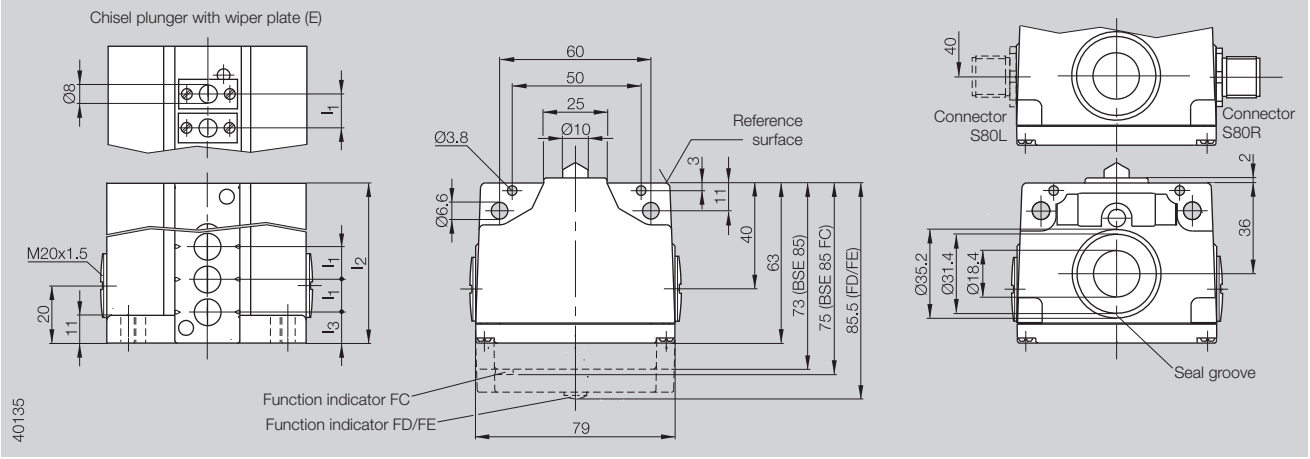
Switching elements
10 BSE 61 Remaining switch positions BSE 30.0
12 Only BSE 61
20 BSE 85 Remaining switch positions BSE 30.0
22 Only BSE 85

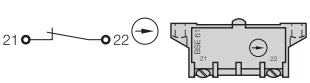
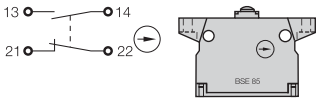
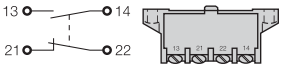
Safety switch elements
No. from flange

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 24...28 V DC (only for BSE 85)

optional **Connector**
See page 15.14 for connector options
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway link
S80S 5-pin, dual keyway 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 24...28 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**
Part number	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
Electrical data	see page 15.2	see page 15.2	see page 15.2
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

For installation and notes, see page 3.3

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 sides and in flange (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

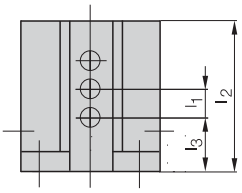
Multiple position switches with function indication

- Function indication for two voltage ranges

Available sizes

No. of plungers	Plunger spacing	Housing B Standard		Housing B		Housing C	
	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
						60	30
3	12	48	12	60	24	60	24
4	12	60	12				
5	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



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

BNS 829-X####-_ _ _-_ _ _-61-_ _-10-_ _-_ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)

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 a cable ent 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

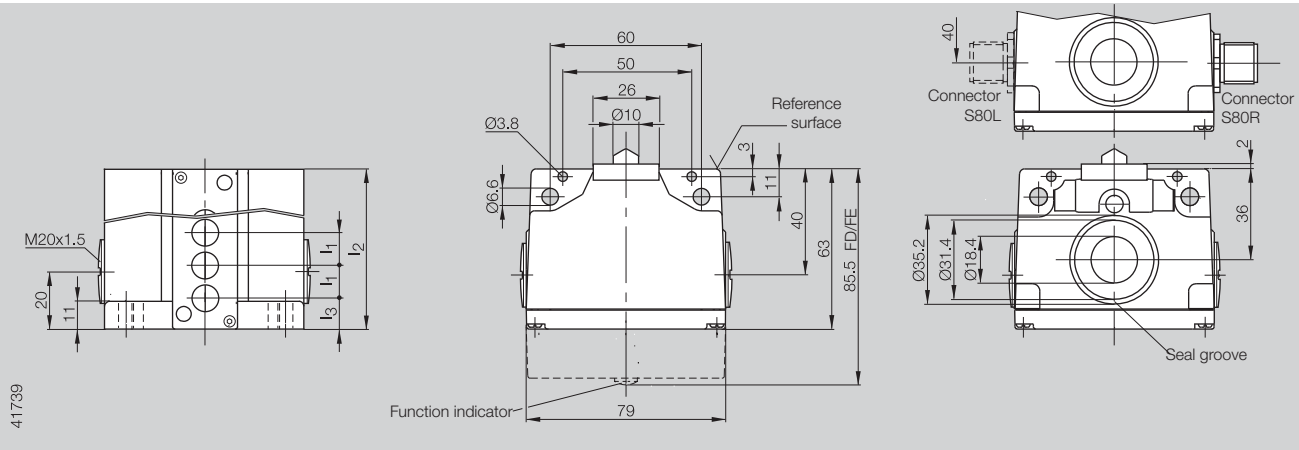
optional **Function indicator**
- **FD** 6...60 V AC/DC
- **FE** 90...250 V AC/DC

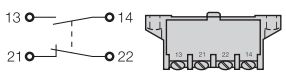
See page 15.14 for connector options

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

Note! See accessory section for replacement plunger block and plungers.

Type	Multiple position switch with quick change plunger block
Plunger spacing	12 mm or 16 mm

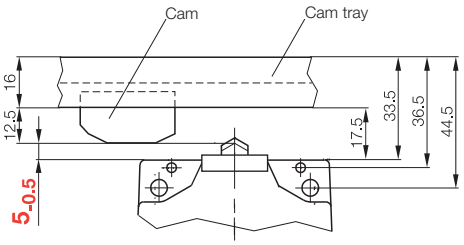


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**) Roller Bearing (**L**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M20×1.5 for connector or cable gland
Ambient temperature range	–5...+85 °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**)
With switch element	**BSE 30.0**
Part number	BNS 829-_ _ _-_ _ _-61-_ _ _-**10**-_ _ _-_ _ _ _
Wiring diagram, style	

IO-Link

Switch element		
Contact material		Silver, gold plated
Switching principle		Snap switch
Contact system		Dual changeover, one normally-open and one normally-closed, galvanically isolated
Electrical data		see page 15.2
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.
Dimension is 3-0.5 to the face of the switch housing (the area around the plungers)

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

- 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 sides and in flange (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

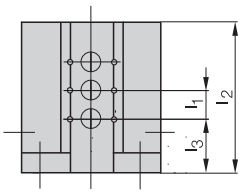
Multiple position switches with function indication

- Optional function indication for three voltage ranges

Available sizes

No. of plungers	Plunger spacing dimension	Housing B standard dimension		Housing B dimension		Housing C dimension	
	l_1	l_2	l_3	l_2	l_3	l_2	l_3
2	12	36	12	60	30	48	24
						60	30
3	12	48	12	60	24	60	24
4	12	60	12				
5	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



Ordering example:
BNS 823-B02-L12-61-A-12-02-FE-S80R

BNS 823-X####_ _ _-_ _ _-61-_-_ _-_ _-_ _-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)

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

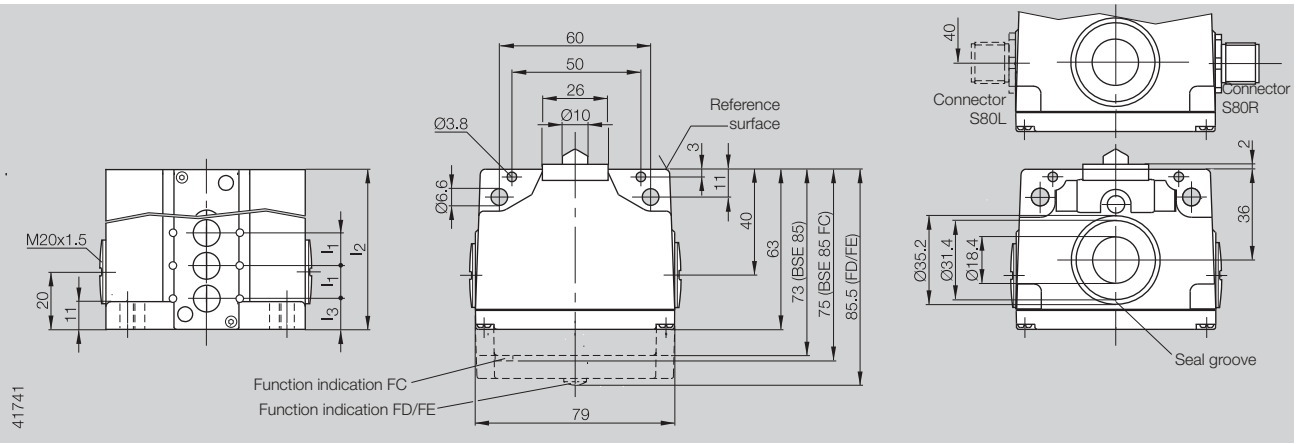
optional **Function indication**
- **FD** 6...60 V AC/DC (for BSE 30.0 and BSE 61)
- **FE** 90...250 V AC/DC (for BSE 30.0 and BSE 61)
- **FC** 24...28 V DC (only for BSE 85)

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

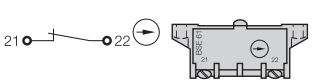
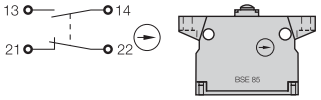
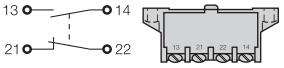
See page 15.14 for connector options

Note! See accessory section for replacement plunger block and plungers.

Type	Multiple position switch with forced-opening contacts and quick change plunger block
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 24...28 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**
Part number	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
Electrical data	see page 15.2	see page 15.2	see page 15.2
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

For installation and notes, see page 3.7

Multiple position switches for standard applications

- Can be used under extreme conditions such as shock, temperature fluctuations, coolant flooding, high speed and abrasive applications
- 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

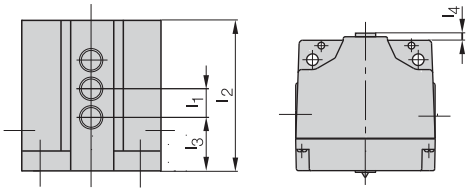
- Thread for cable gland M20×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Available sizes

No. of Switch positions	Switch position spacing	Series 610 Housing B Standard		Series 611 Housing B Standard		Series 612 Housing B		Series 612 housing C		Series 613 Housing B		Series 613 housing C	
	Dimension	Dimension		Dimension		Dimension		Dimension		Dimension		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	12	60	12										
5	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 ∅ 10 mm
Dimension l_4 = 2 mm for inductive switch elements with sensing head ∅ 15.5 mm



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

BNS 816-X####-_ _ _-_ _ _-_ _-_ _ _-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

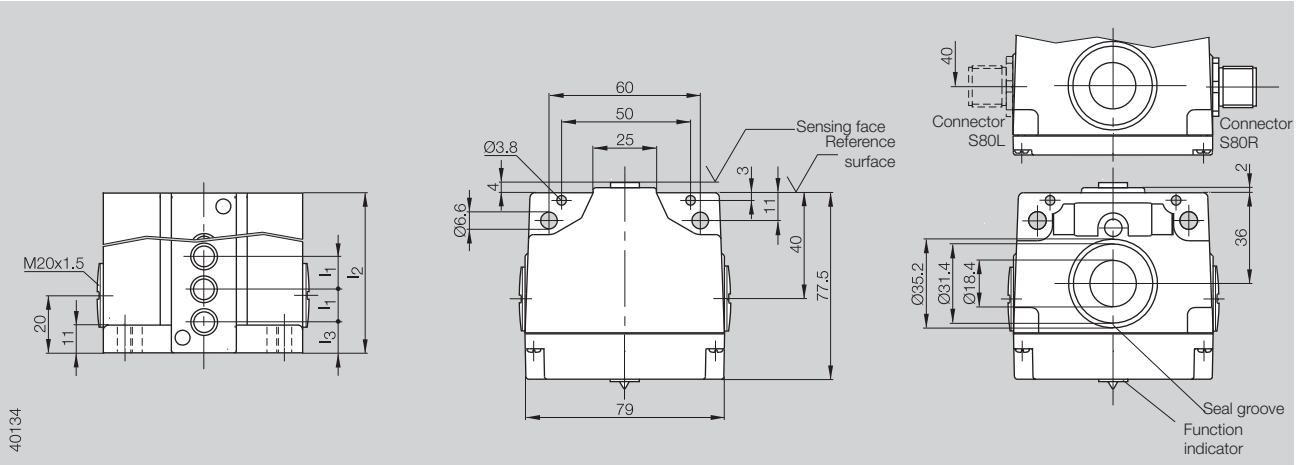
Distance l_3
- **610** 12 mm
- **611** 16 mm
- **612** 24 mm
- **613** 30 mm

See page 15.14 for connector options

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

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

Type	Multiple position switch with inductive sensors
Switch position spacing	12 mm or 16 mm



Part number	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-RK	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	BES 517-108-RK	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	BES 517-410-RK	NO, up to 250 V AC	2 mm	0...1.6 mm
WO	BES 517-421-RK	NC, up to 250 V AC	2 mm	0...1.6 mm
KHG	BES 517-560-H-RK	2-wire, NO, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
KHH	BES 517-561-H-RK	2-wire, NC, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
NG	BES 516-314-N-RK	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

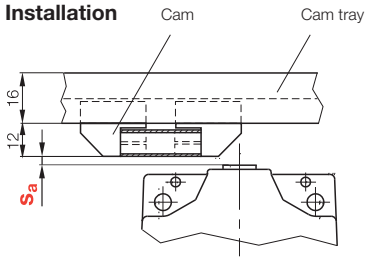
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
THA	BES 517-142-Y-RK	PNP, complementary, 10...30 V DC, short circuit protected	5 mm	0...4 mm
EJA	BES 517-463-RK	NO, up to 250 V AC	5 mm	0...4 mm
AAA	BES 517-464-RK	NC, up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

For additional electrical data, see pages 15.4-15.7

Installation



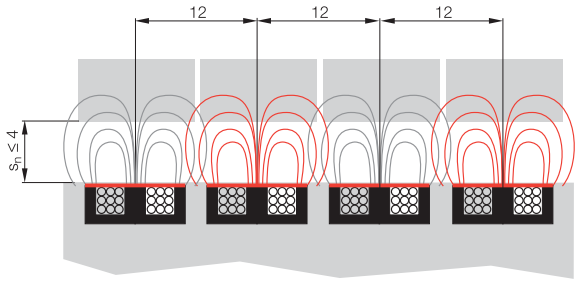
Note!
To ensure switching function s_a must be in a range of
$0 < s_a \leq 1.6$ mm @ 12mm spacing s_n.
$0 < s_a \leq 4$ @ 16mm spacing s_n.

Mechanical Switches
Series 610-11

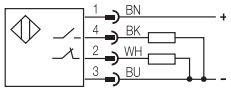
Extended Range Inductive Multiple Position

Inductive sensors from Balluff are characterized by a compact housing and generous switching distances. The result is a non-contacting, wear-free sensor.

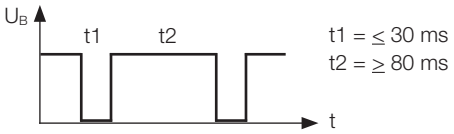
The tuned sensing coil oscillator frequences of the inductive sensors allow them to be installed very close to each other. Mutual interference is precluded at 12 mm spacing and 4 mm switching distance.



Complementary electronic switching elements allow the sensor to be used either as normally open or normally closed.



Sensor compatible with pulsed power supply.



Robot Zone Limits

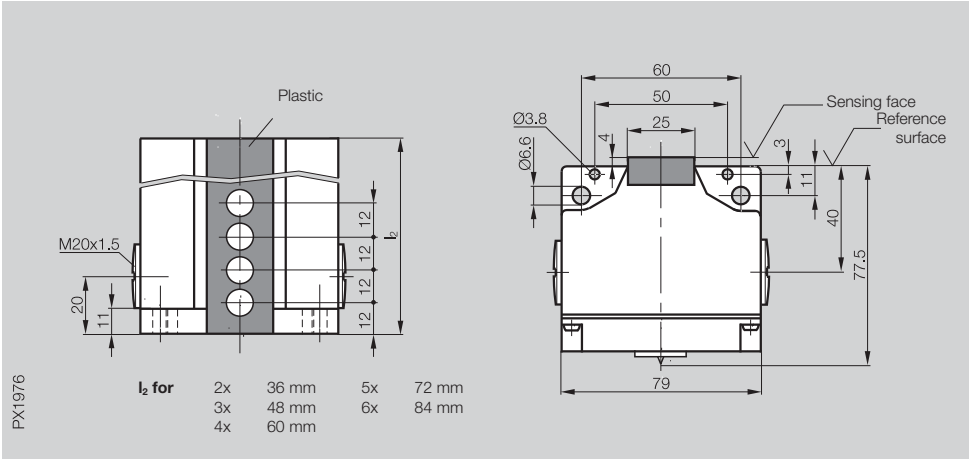
Two diverse, complementary, redundant channels are required for control reliable operation of each zone.

In case of error (short circuit, mis-wiring, ...) both signals are identical and are recognized by the controller as a fault condition. Monitoring must be implemented with a safety PLC or with a safety relay.

Safety Notice

The components supplied with Balluff's Zone Limit Systems are suitable for use in personnel safety applications only when installed and used in compliance with all applicable provisions of American National Standards Institute / Robotic Industries Association American National Standard for Industrial Robots and Robot Systems - Safety Requirements ANSI/RIA R15.06-1999 or subsequent editions thereof, and all other relevant industrial and governmental standards and requirements.

Type	Multiple position switch with extended range inductive sensors
Switch position spacing	12 mm



Part number	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
Not Field Replaceable	PNP, complementary, 10...60 V DC, short circuit protected, 200mA	4 mm	0...3.2 mm

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

BNS 816-X####-B _ _-00-12-610-11

X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)

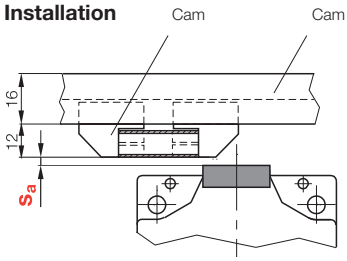
No. of switch positions

02	2×
03	3×
04	4×
05	5×
06	6×

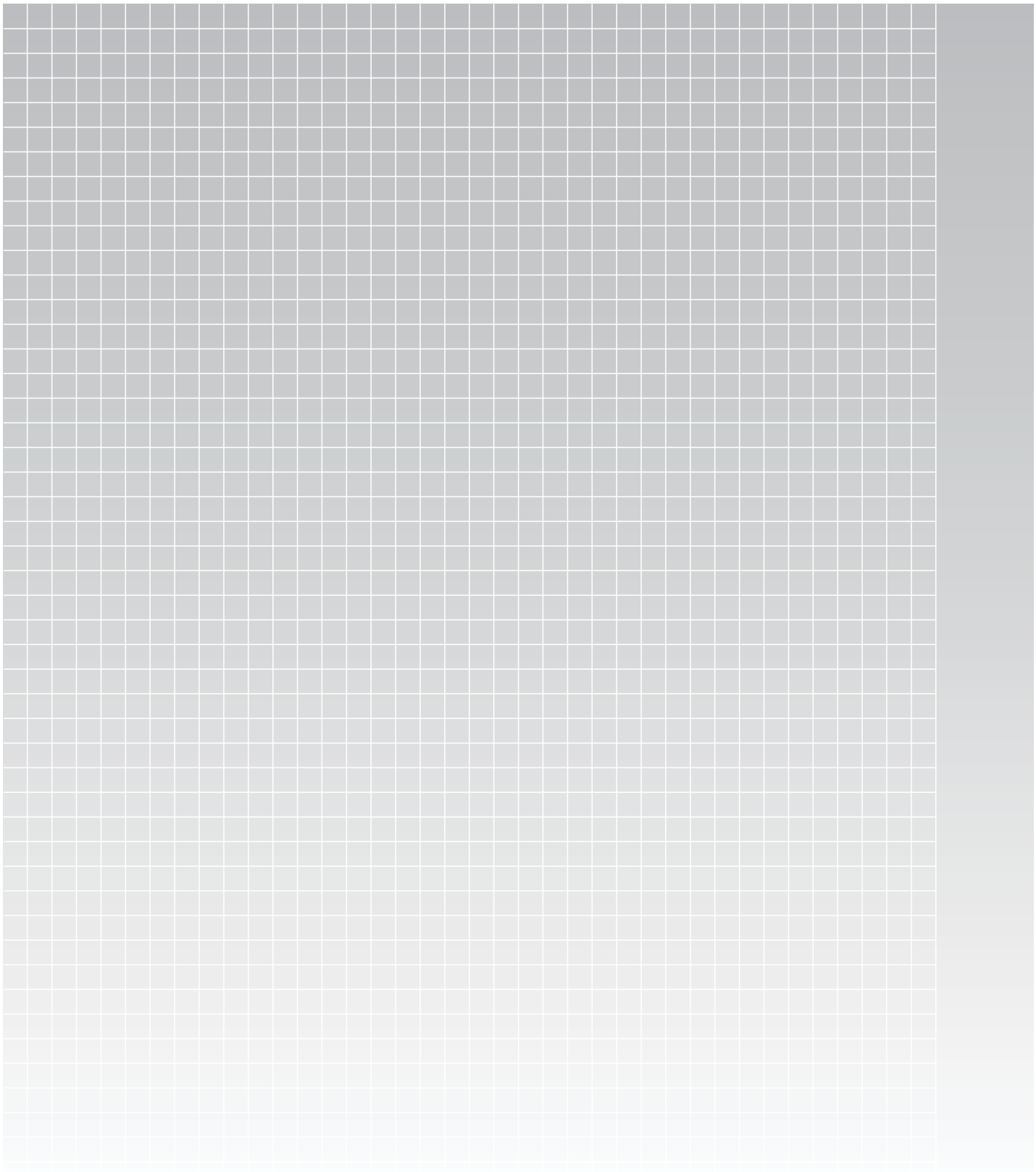
Standard switch without special wiring or connector
X580 = 2 Position
X709 = 3 Position
X594 = 4 Position
X603 = 6 Position

Note:
See page 15.14 for connector options

Installation



Caution!
To ensure switching function s_a must be in a range of $0 < s_a \leq 3.2$



Mechanical Switches
Contents

Series 72 Multiple Position Switches

- Horizontal plungers for perpendicular cam approach
- Compact housing
- Full size switch elements
- Up to 10 positions
- Inductive
- Inductive with extended range
- 12 or 16 mm spacing

4.2 Standard 819
4.4 Safety 813
4.6 Inductive 605-11
4.8 Inductive with extended 4 mm range 605-11

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

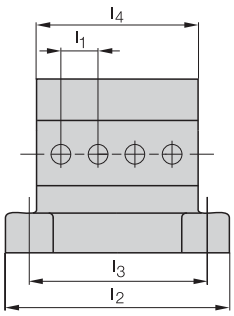
- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in guide

Connection options

- Thread for cable gland M25×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Multiple position switches with function indication

- Optional function indication for two voltage ranges



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

Dimensions in mm

Ordering example:
BNS 819-B04-D12-72-10-FD-S80S

BNS 819-X####-B_ _-_ _ _-72-10-_ _-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushings

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

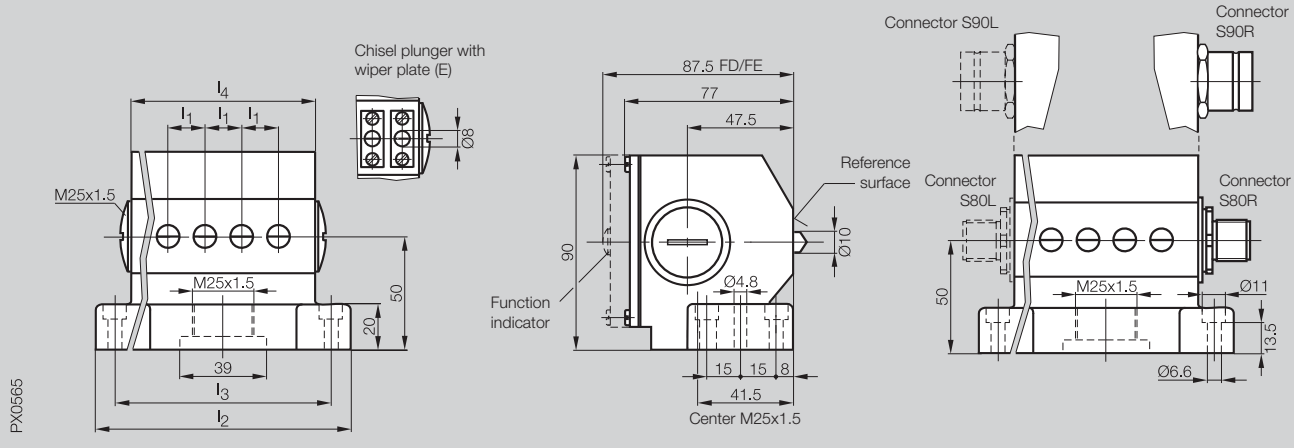
FD	6...60 V AC/DC
FE	90...250 V AC/DC

See page 15.14 for connector options

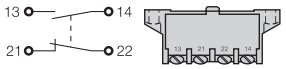
optional
Connector

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

Type	Multiple position switch
Plunger spacing	12 mm or 16 mm

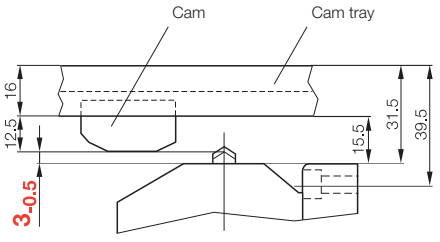


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M25×1.5 for connector or cable 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**
Part number	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
Electrical data		see page 15.2
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 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

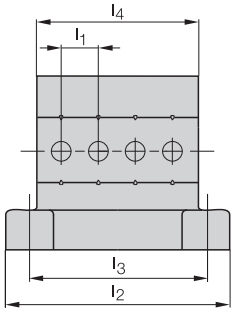
- Function indication for three voltage ranges

Multiple position switches with wiper plate

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Connection options

- Thread for cable gland M25×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)



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

Dimensions in mm

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

BNS 813-X####-B_ _-_ _ _-72-_ _-_ _-_ _-_ _-_ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushing

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

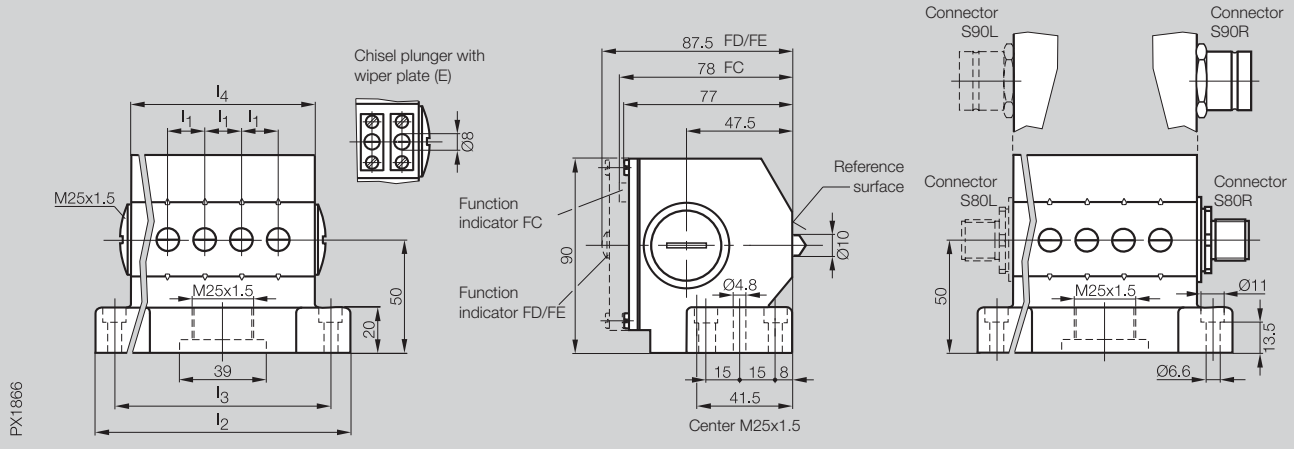
Safety switch elements
No. from left to right facing plungers

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 24...28 V DC (only for BSE 85)

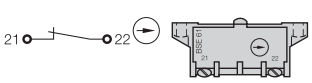
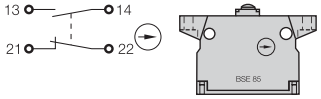
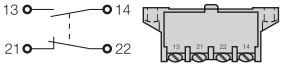
See page 15.14 for connector options

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

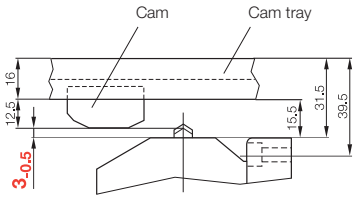
Type	Multiple position switch with positive-opening contacts
Plunger spacing	12 mm or 16 mm



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	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 24...28 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**
Part number		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
Electrical data		see page 15.2	see page 15.2	see page 15.2
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
	Plunger E	30 m/min	30 m/min	30 m/min
	Plunger K	10 m/min	10 m/min	10 m/min
	Plunger R	60 m/min	60 m/min	60 m/min
	Plunger L	120 m/min	80 m/min	120 m/min
Repeata-bility	Plunger D, E, K	± 0.002 mm	± 0.02 mm	± 0.002 mm
	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.

Multiple position switches for standard applications

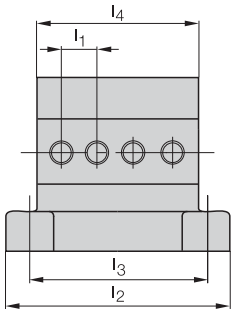
- Can be used under extreme conditions such as shock, temperature fluctuations, coolant flooding, high speed and abrasive applications
- Reliability comparable with inductive sensors

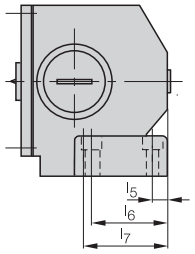
Multiple position switches with function indication

- 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 sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)





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

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

BNS 816-X####-B_ _-_ _ _-_ _-605-11-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

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

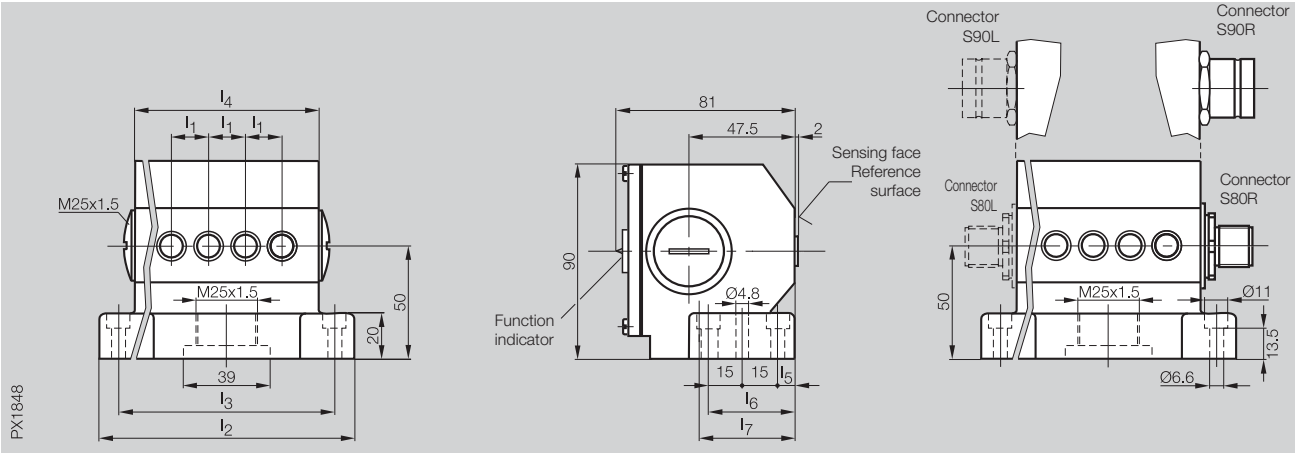
Code for switch elements
(see table at right)

Plunger spacing
12 12 mm
16 16 mm

See page 15.14 for connector options

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

Type	Multiple position switch with inductive sensors
Switch position spacing	12 mm or 16 mm



Part number	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-RK	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	BES 517-108-RK	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	BES 517-410-RK	NO, up to 250 V AC	2 mm	0...1.6 mm
WO	BES 517-421-RK	NC, up to 250 V AC	2 mm	0...1.6 mm
KHG	BES 517-560-H-RK	2-wire, NO, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
KHH	BES 517-561-H-RK	2-wire, NC, 10...55 V DC, short circuit protected	2 mm	0...1.6 mm
NG	BES 516-314-N-RK	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

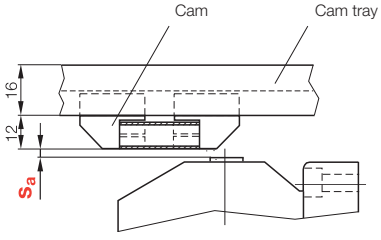
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
THA	BES 517-142-Y-RK	PNP, complementary, 10...30 V DC, short circuit protected	5 mm	0...4 mm
EJA	BES 517-463-RK	NO, up to 250 V AC	5 mm	0...4 mm
AAA	BES 517-464-RK	NC, up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

For additional electrical data see pages 15.4-15.7

Installation



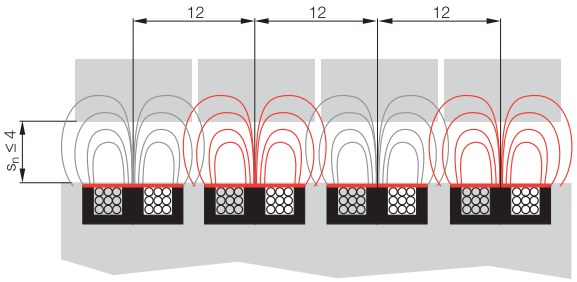
Note!
To ensure switching function s_a must
be in a range of
$0 < s_a \leq 1.6$ @ 12 mm spacing s_n.
$0 < s_a \leq 4$ @ 16 mm spacing s_n.

Mechanical Switches
Series 605-11

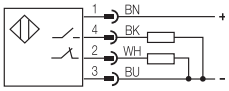
Extended Range Inductive Multiple Position

Inductive sensors from Balluff are characterized by a compact housing and generous switching distances. The result is a non-contacting, wear-free sensor.

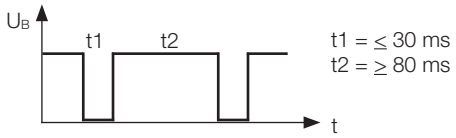
The tuned sensing coil oscillator frequences of the inductive sensors allow them to be installed very close to each other. Mutual interference is precluded at 12 mm spacing and 4 mm switching distance.



Complementary electronic switching elements allow the sensor to be used either as normally open or normally closed.



Sensor compatible with pulsed power supply.



Robot Zone Limits

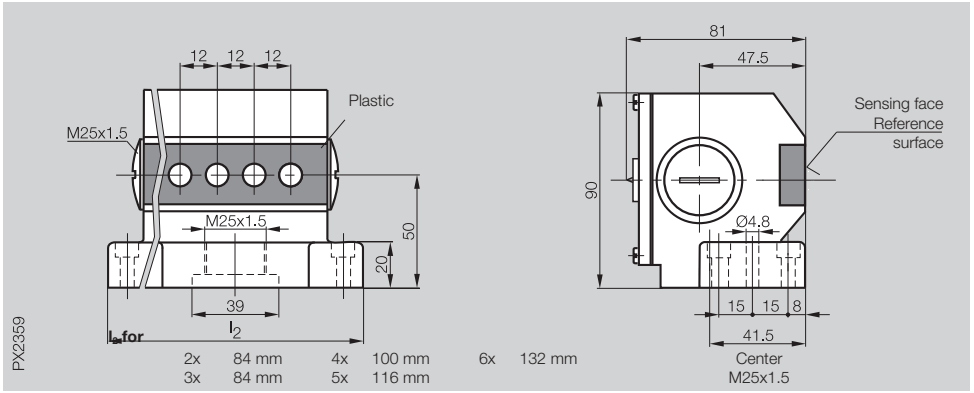
Two diverse, complementary, redundant channels are required for control reliable operation of each zone.

In case of error (short circuit, mis-wiring, ...) both signals are identical and are recognized by the controller as a fault condition. Monitoring must be implemented with a safety PLC or with a safety relay.

Safety Notice

The components supplied with Balluff's Zone Limit Systems are suitable for use in personnel safety applications only when installed and used in compliance with all applicable provisions of American National Standards Institute / Robotic Industries Association American National Standard for Industrial Robots and Robot Systems - Safety Requirements ANSI/RIA R15.06-1999 or subsequent editions thereof, and all other relevant industrial and governmental standards and requirements.

Type	Multiple position switch with extended range inductive sensors
Switch position spacing	12 mm



Part number	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
Not field replaceable	PNP, complementary, 10...60 V DC, short circuit protected, 200 mA	4 mm	0...3.2 mm

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

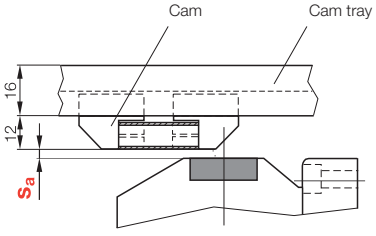
BNS 816-X603-B_ _-00-12-605-11

No. of switch positions

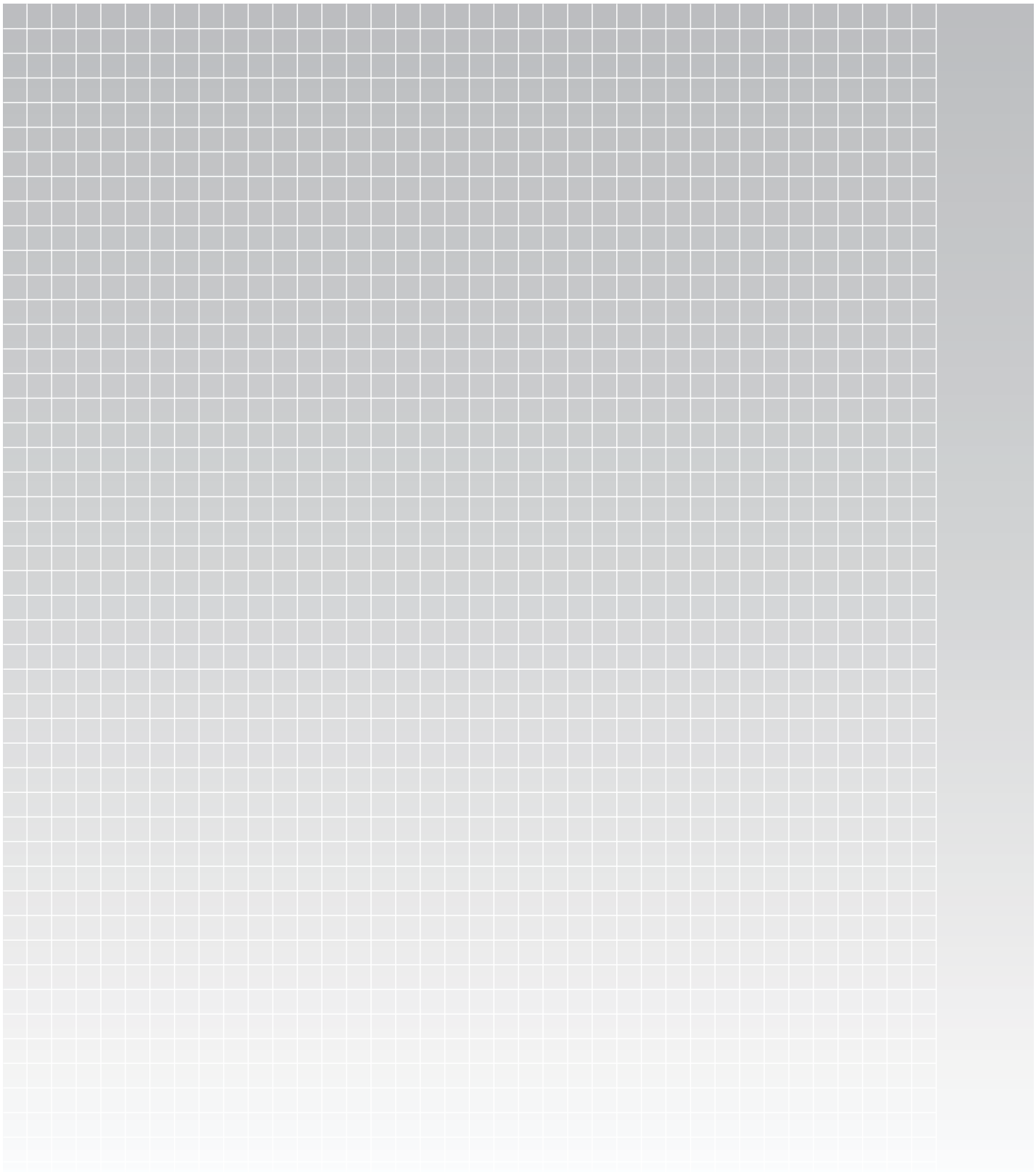
02 2×
03 3×
04 4×
05 5×
06 6×

Note: See page 15.14 for connector options

Installation



Caution!
To ensure switching function s_a must be in a range of $0 < s_a \leq 3.2$



Mechanical Switches
Contents

Series 46 Multiple Position Switches

- Miniature housing with mounting flange
- Miniature switch elements
- Up to 10 positions
- IO-Link
- Inductive
- 8 or 10 mm spacing
- Switch elements for low current applications

5.2 Standard 819
5.4 Safety 813
5.6 Inductive 603-11

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

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Connection options

- Thread for cable gland M16×1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

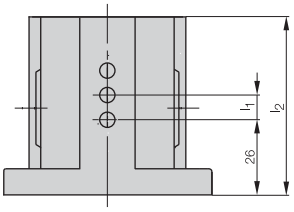
Switching elements for low-current applications

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_1 = 8 mm	49	59	64	72	80	96	112
l_2 when	l_1 = 10 mm	49	59	72	80	89	112	129

Dimensions in mm



Ordering example:
BNS 819-B04-D08-46-11-FC-S80S

BNS 819-X####-B_ _-_ _ _-46-1_-_ _-_ _ _ _

See page 15.14 for connector options

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

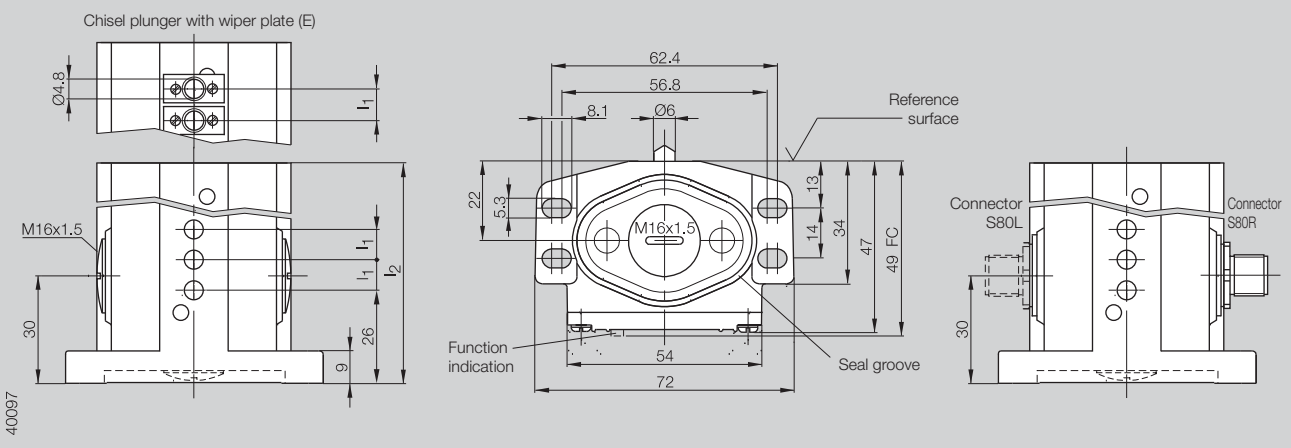
Switch elements
0 BSE 69.1
1 BSE 70.1
2 BSE 73.1
3 BSE 74.1

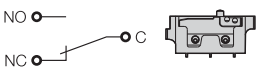
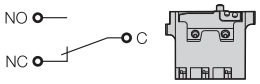
optional
Function indication
FC 24...28 V DC

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

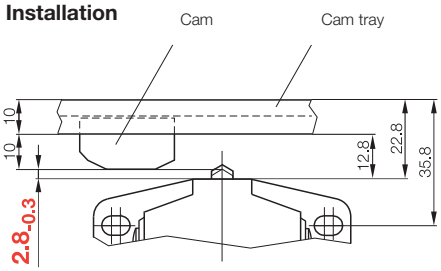
X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushings

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 24...28 V DC (**FC**)			
With switch element	**BSE 69.1**	**BSE 73.1**	**BSE 70.1**	**BSE 74.1**
Part number	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 page 15.3		see page 15.3	
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	
Repeata-bility – Plunger D, E	± 0.02 mm		± 0.02 mm	
Repeata-bility – Plunger K	±0.03 mm		±0.03 mm	
Repeata-bility – Plunger R	±0.05 mm		±0.05 mm	

Installation



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

IO-Link

Multiple position switches with forced opening

- Smallest plunger spacing for mechanical multiple position switches (8 or 10 mm)
- Switch element with forced opening with rigid plungers
- 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

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

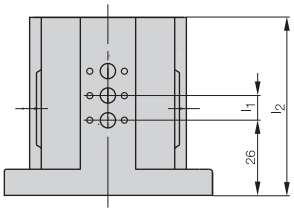
Connection options

- Thread for cable gland M16×1.5 on side and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Available sizes

Number of plungers		2	3	4	5	6	8	10
Dimension l_2 when	l_1 = 8 mm	49	59	64	72	80	96	112
	l_1 = 10 mm	49	59	72	80	89	112	129

Dimensions in mm



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

BNS 813-X####-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

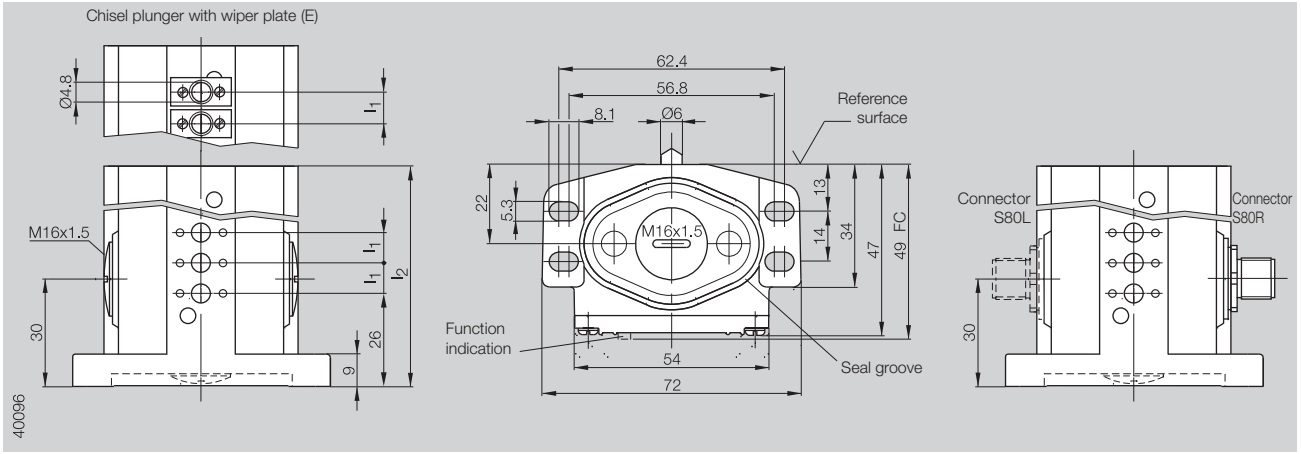
optional
Function indication
FC 24...28 V DC

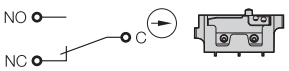
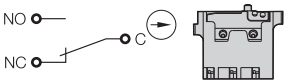
See page 15.14 for connector options

optional
Connector
S4R 4-pin, right
S4L 4-pin, left
S4S 4-pin, right and left
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway left
S80S 5-pin, dual keyway right and left

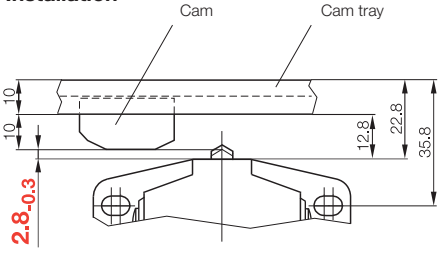
X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushings

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 24...28 V DC (**FC**)	
With switch element		**BSE 63**	**BSE 64**
Part number		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 15.3	see page 15.3
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 $2.8_{-0.5}$ is especially critical.

Multiple position switches for standard applications

- Smallest sensor spacing for inductive multiple position switches (8 mm or 10 mm)
- Can be used under extreme conditions such as shock, temperature fluctuations, coolant flooding, high speed and abrasive applications
- 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.

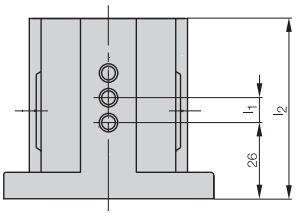
Connection options

- Thread for cable gland M16×1.5 on side and in flange (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Available sizes

Number of switch positions		2	3	4	5	6	8	10
Dimension l_2 for	l_1 = 8 mm	49	59	64	72	80	96	112
	l_1 = 10 mm	49	59	72	80	89	112	129

Dimensions in mm



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

BNS 816-X####-B_ _-_ _ _-_ _-603-11-_ _ _ _

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

Code for switch elements
(see table at right)

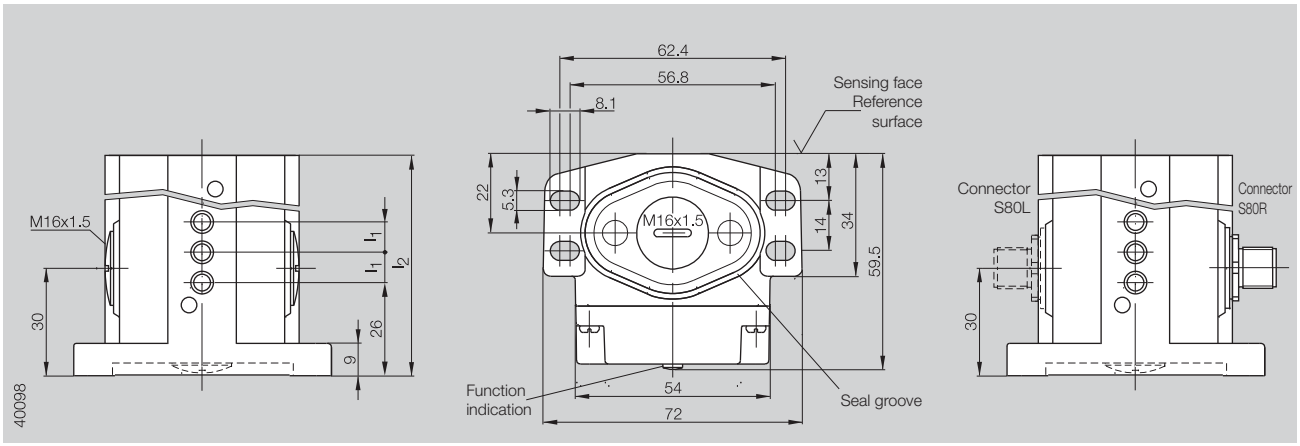
Plunger spacing
08 8 mm
10 10 mm

See page 15.14 for connector options

optional
Connector
S4R 4-pin, right
S4L 4-pin, left
S4S 4-pin, right and left
S80R 5-pin, right
S80L 5-pin, left
S80S 5-pin, right and left

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

Type	Multiple position switch with inductive sensors
Switch position spacing	8 mm or 10 mm



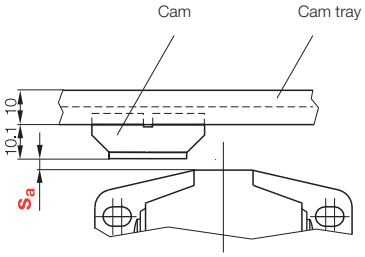
Part number	BNS 816-B_ _-_ _ _-_ _-603-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements

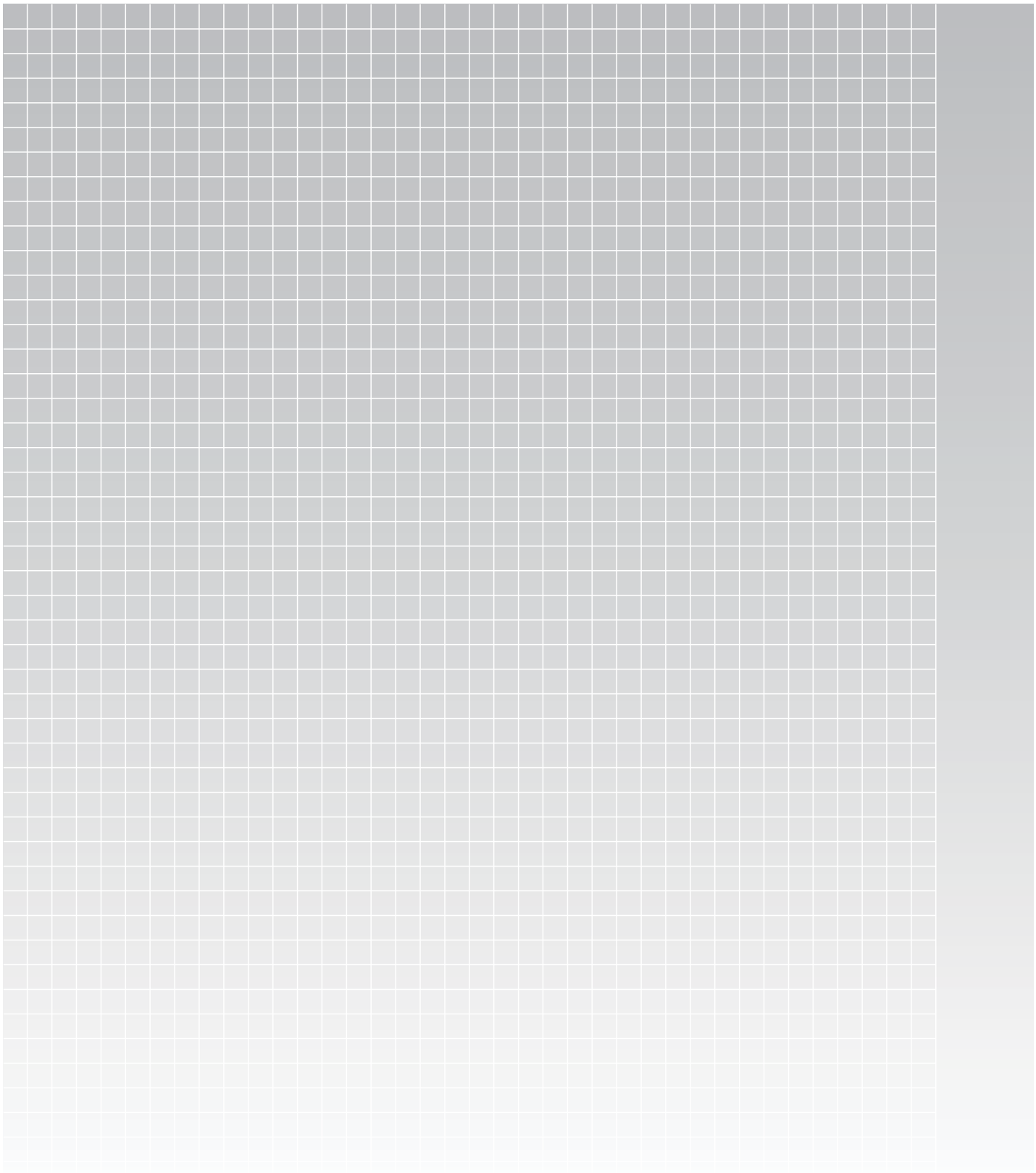
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
TOB	BES 517-312-Y-RK	PNP, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm
TNB	BES 517-311-Y-RK	NPN, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm

For additional electrical data, see page 15.4.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq .9$



Mechanical Switches
Contents

Series 40 Multiple Position Switches

- Miniature housing with minimum footprint
- Miniature switch elements
- Up to 6 positions
- IO-Link
- Inductive
- 8 mm spacing
- Switch elements for low current applications

6.2 Standard 819
6.4 Safety 813
6.6 Inductive 650-11

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

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Connection options

- Thread for cable gland M16×1.5 on sides (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

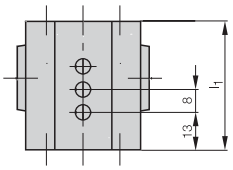
Switching elements for low-current applications

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

Dimensions in mm



Ordering example:
BNS 819-B04-D08-40-10-FC-S80S

BNS 819-X####-B_ _-_ 08-40-1_-_ _-_ _ _ _

See page 15.14 for connector options

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

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

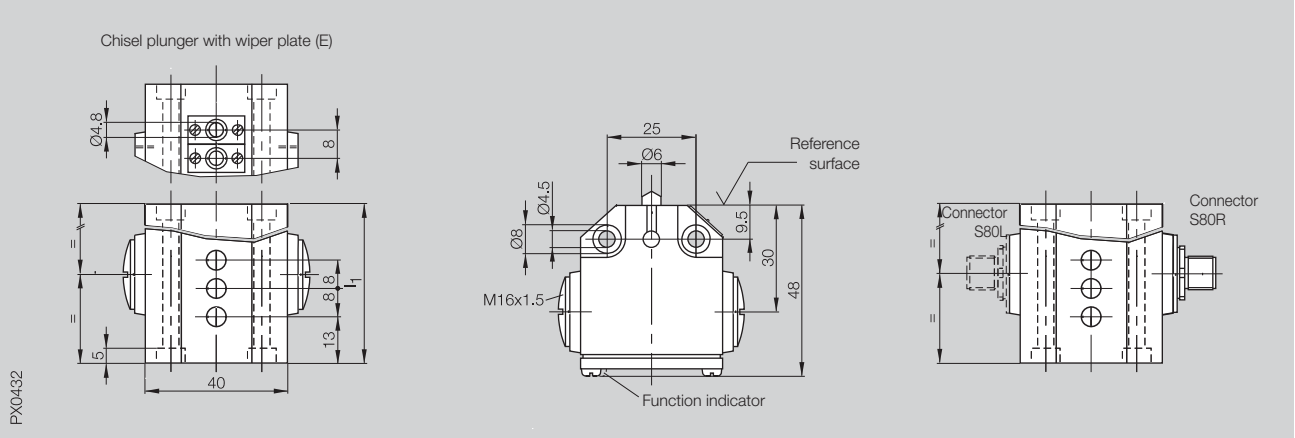
Switch elements
- **0** BSE 69.1
- **1** BSE 70.1
- **2** BSE 73.1
- **3** BSE 74.1

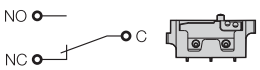
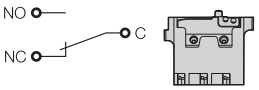
optional **Function indication**
- **FC** 24...28 V DC

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

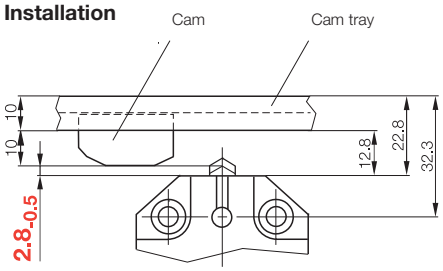
X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushing

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 24...28 V DC (**FC**)			
With switch element	**BSE 69.1**	**BSE 73.1**	**BSE 70.1**	**BSE 74.1**
Part number	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 page 15.3		see page 15.3	
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	
Repeata-bility – Plunger D, E	± 0.02 mm		± 0.02 mm	
Repeata-bility – Plunger K	±0.03 mm		±0.03 mm	
Repeata-bility – Plunger R	±0.05 mm		±0.05 mm	

Installation



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

IO-Link

Multiple position switches with forced opening

- Smallest plunger spacing for mechanical multiple position switches (8 mm)
- Switch element with forced opening with rigid plungers
- 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

- Available with chisel plunger only
- Use in wet areas with adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

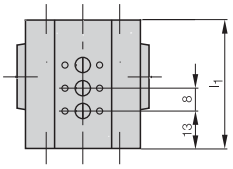
Connection options

- Thread for cable gland M16×1.5 on sides (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Available sizes

No. of plungers	2	3	4	5	6
Dimension l_1	34	42	50	58	66

Dimensions in mm



Ordering example:
BNS 813-B04-D08-40-49-01-FC-S80S

BNS 813-X####-B_ _-_ 08-40-_ _-_ _-_ _-_ _ _ _

No. of plungers
02 2×
03 3×
04 4×
...

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

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

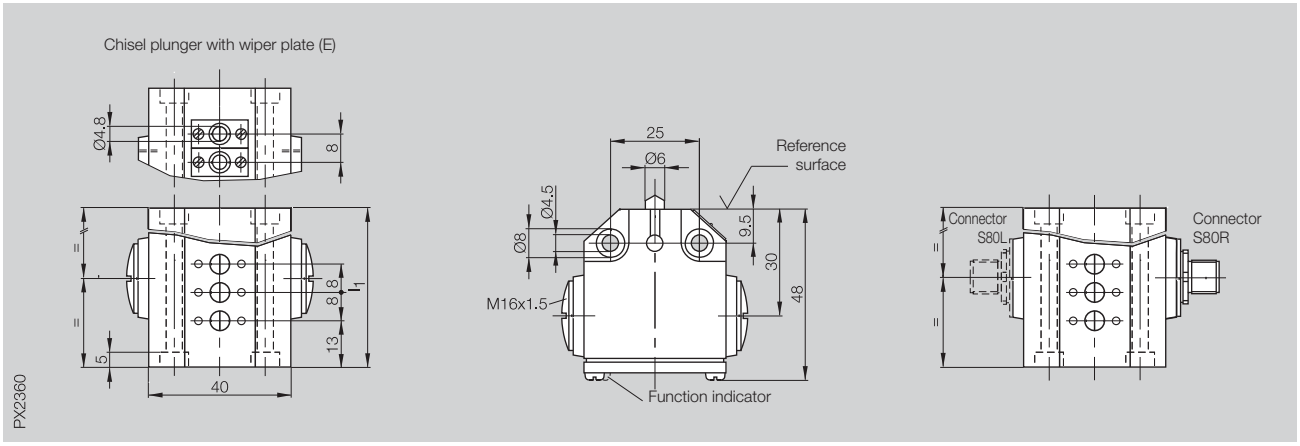
optional
Function indication
FC 24...28 V DC

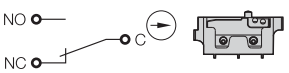
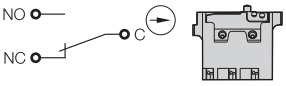
See page 15.14 for connector options

optional
Connector
S4R 4-pin, right
S4L 4-pin, left
S4S 4-pin, right and left
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway left
S80S 5-pin, dual keyway right and left

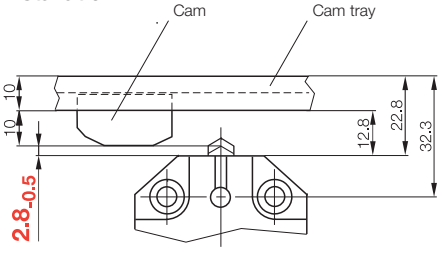
X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)
X512
Hardened aluminum bushing

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 24...28 V DC (**FC**)	
With switch element		**BSE 63**	**BSE 64**
Part number		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 15.3	see page 15.3
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 $2.8_{-0.5}$ is especially critical.

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, coolant flooding, high speed and abrasive applications
- 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.

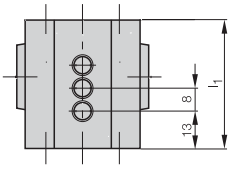
Connection options

- Thread for cable gland M16×1.5 on side (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Available sizes

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

Dimensions in mm



Ordering example:
BNS 816-B04-TNB-08-650-11-S80S

BNS 816-X####-B_ _-_ _ _-08-650-11-_ _ _ _

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

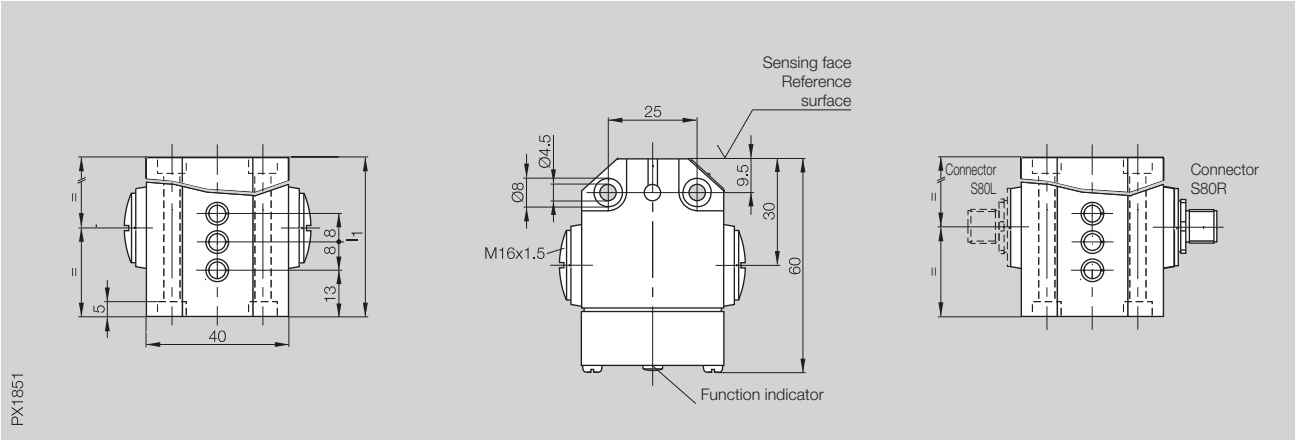
Code for switch elements
(see table at right)

See page 15.14 for connector options

optional
Connector
S4R 4-pin, right
S4L 4-pin, left
S4S 4-pin, right and left
S80R 5-pin, dual keyway right
S80L 5-pin, dual keyway left
S80S 5-pin, dual keyway right and left

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)

Type	Multiple position switch with inductive sensors
Switch position spacing	8 mm



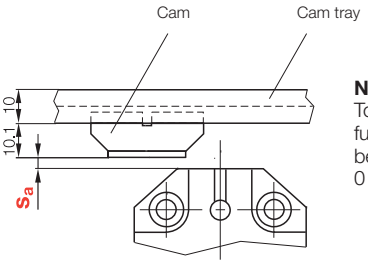
Part number	BNS 816-B_ _-_ _ _-_ _-650-11-_ _ _
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
Ambient temperature range	–25...+70 °C
Degree of protection per IEC 60529	IP 67
Function indicator	LED

Inductive switch elements

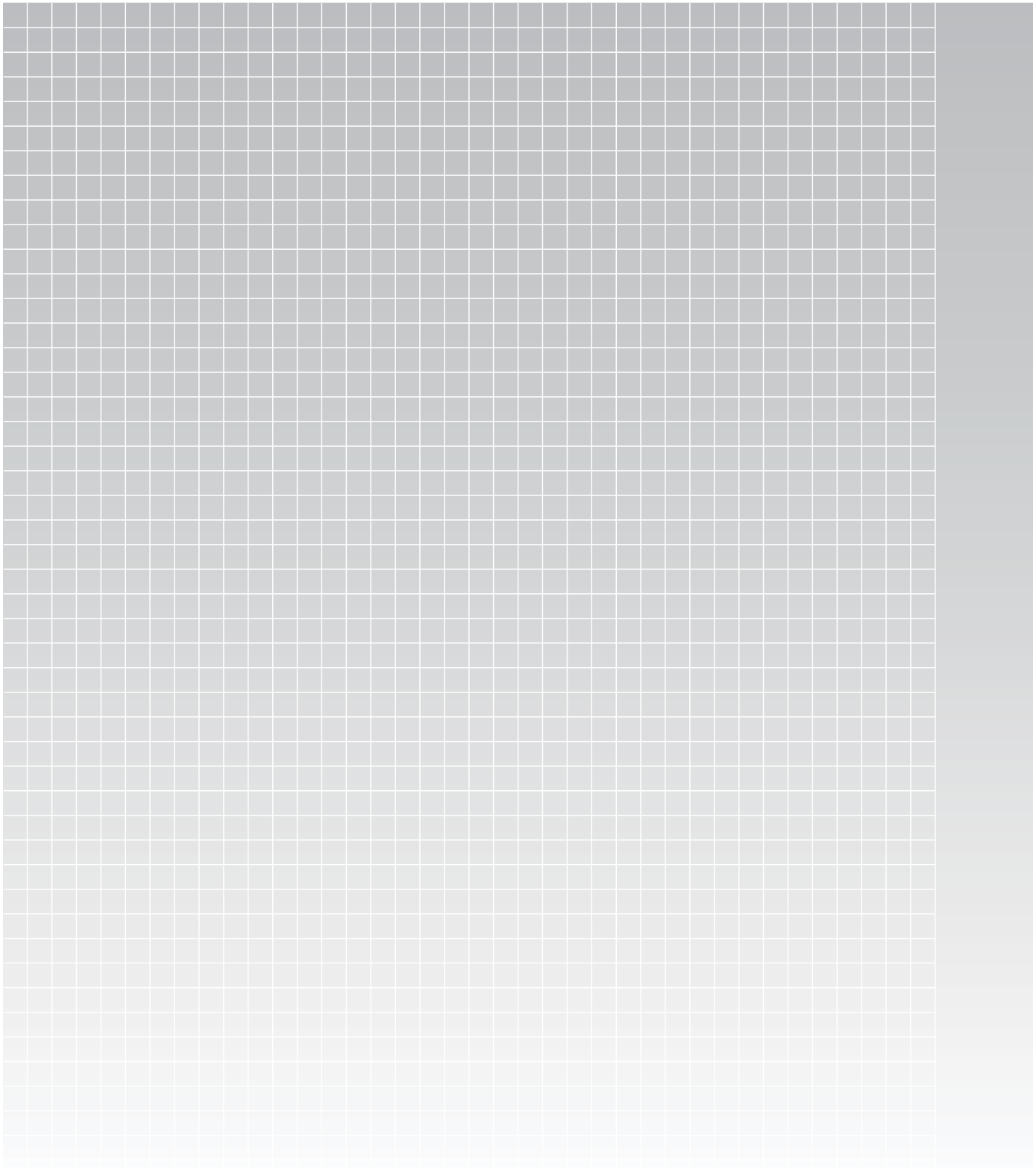
Code	Ordering code for replacement switch elements	Electrical version	Rated operating distance s_n	Assured operating distance s_a
TOB	BES 517-312-Y-RK	PNP, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm
TNB	BES 517-311-Y-RK	NPN, NO, 10...30 V DC, short circuit protected	1.1 mm	0...0.9 mm

For additional electrical data see page 15.4.

Installation



Note!
To ensure switching function s_a must be in a range of $0 < s_a \leq .9$

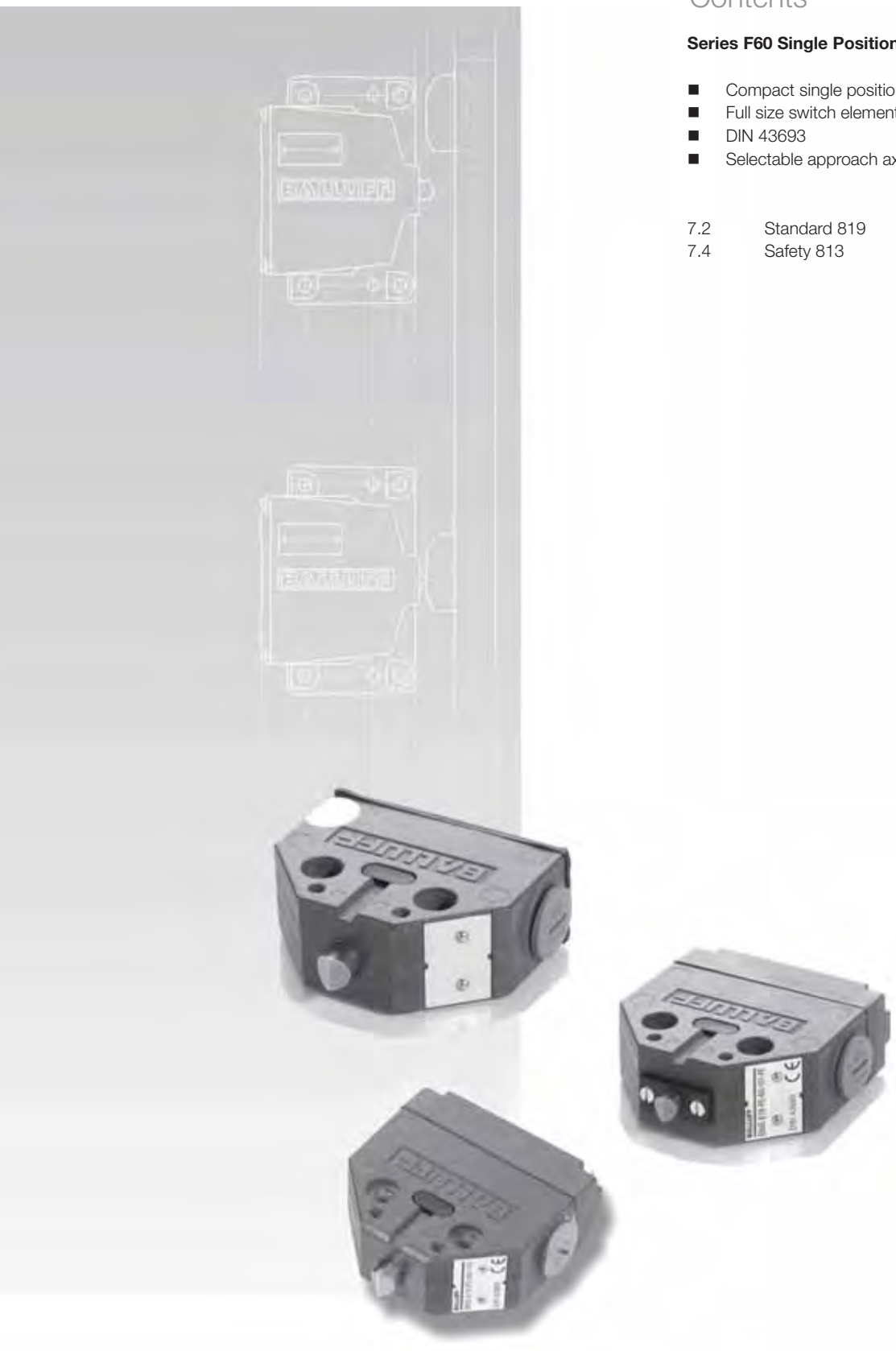


Mechanical Switches
Contents

Series F60 Single Position Switches

- Compact single position switch
- Full size switch element
- DIN 43693
- Selectable approach axis

7.2 Standard 819
7.4 Safety 813



Series F 60

7

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
- Available with chisel plungers only

Connection options

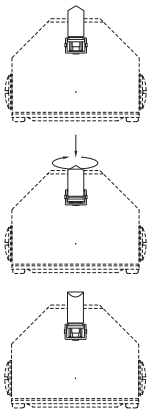
- Thread for cable gland M16×1.5 (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Single position switch with function indicator

- Function indication for two voltage ranges

Approach from two directions possible (parallel or perpendicular)

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



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

BNS 819-X####-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

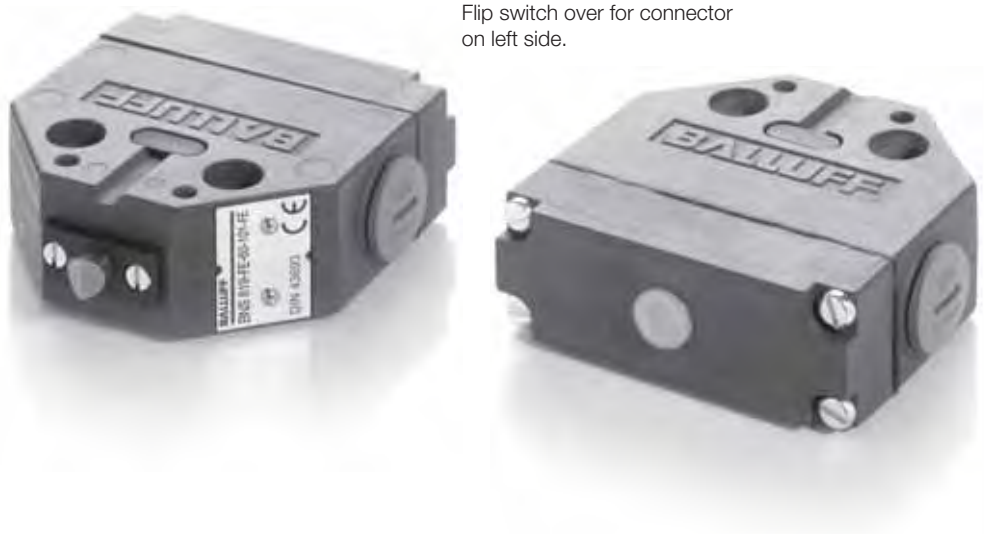
See page 15.14 for connector options

optional **Connector**

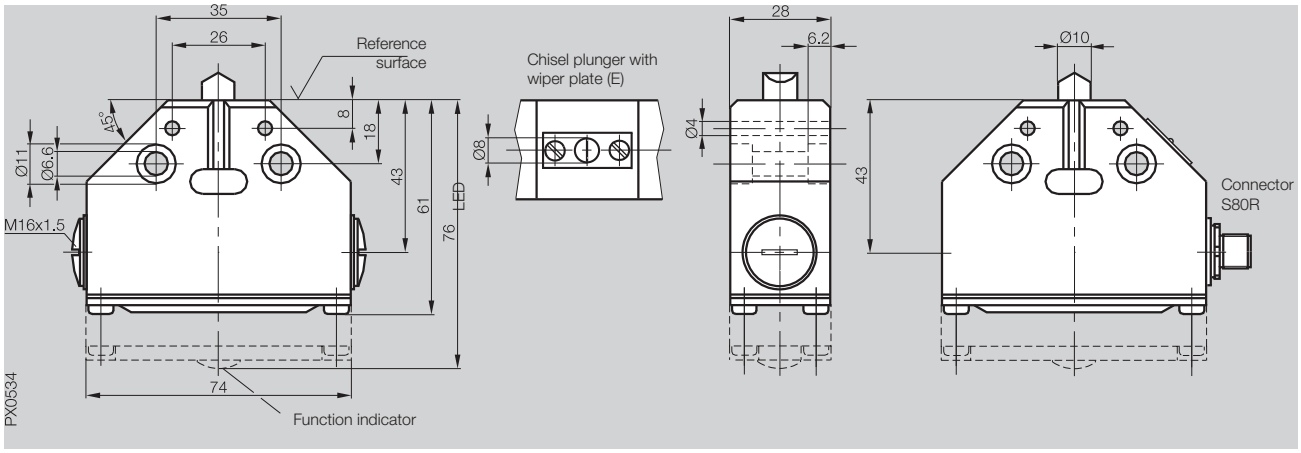
S4R	4-pin, right
S80R	5-pin, dual keyway right

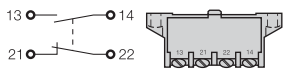
X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushing

Note:
Flip switch over for connector on left side.



Type	Single position switch
Mounting and function dimensions	per DIN 43693

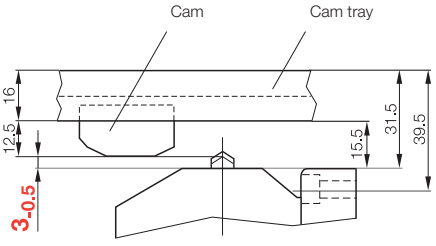


Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
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**
Part number	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
Electrical data		see page 15.2

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 $3_{-0.5}$ 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
- Available with chisel plungers only

Connection options

- Thread for cable gland M16×1.5 (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

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

BNS 813-X####-F_-60-18_-_ _-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushing

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	24...28 V DC (for BSE 85)

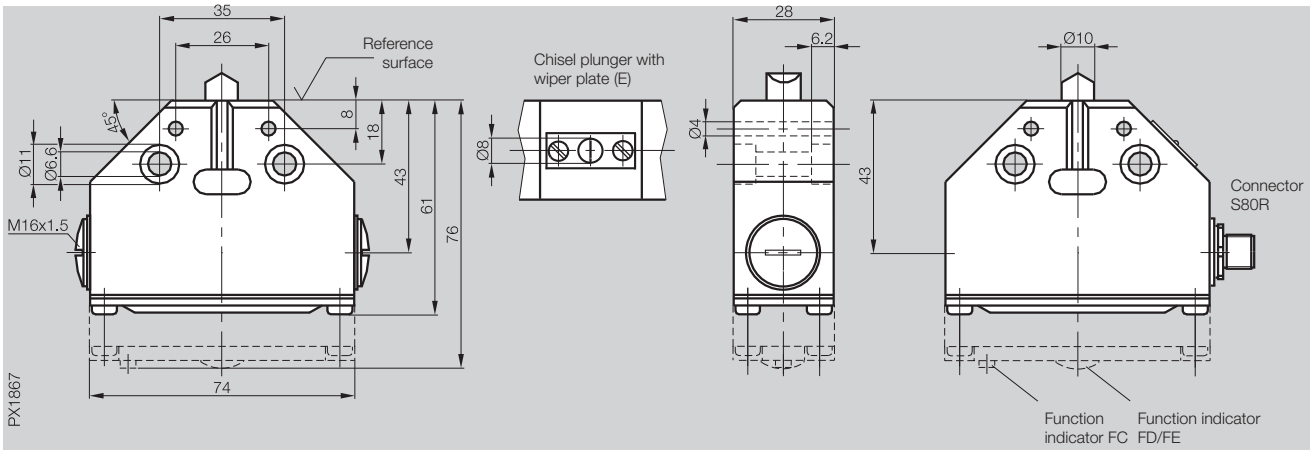
See page 15.14 for connector options

optional
Connector

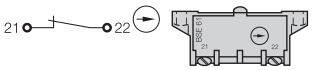
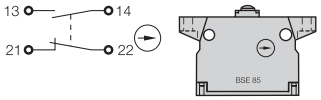
S80R	5-pin, dual keyway right
S80L	5-pin, dual keyway left

Note:
Flip switch over for connector on left side.

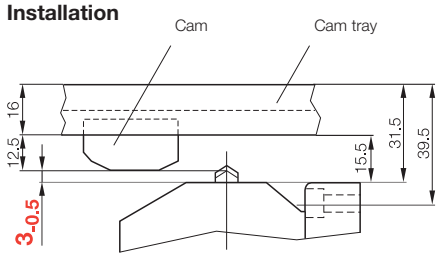
Type	Single position switch with positive-opening contacts
Mounting and function dimensions	per DIN 43693



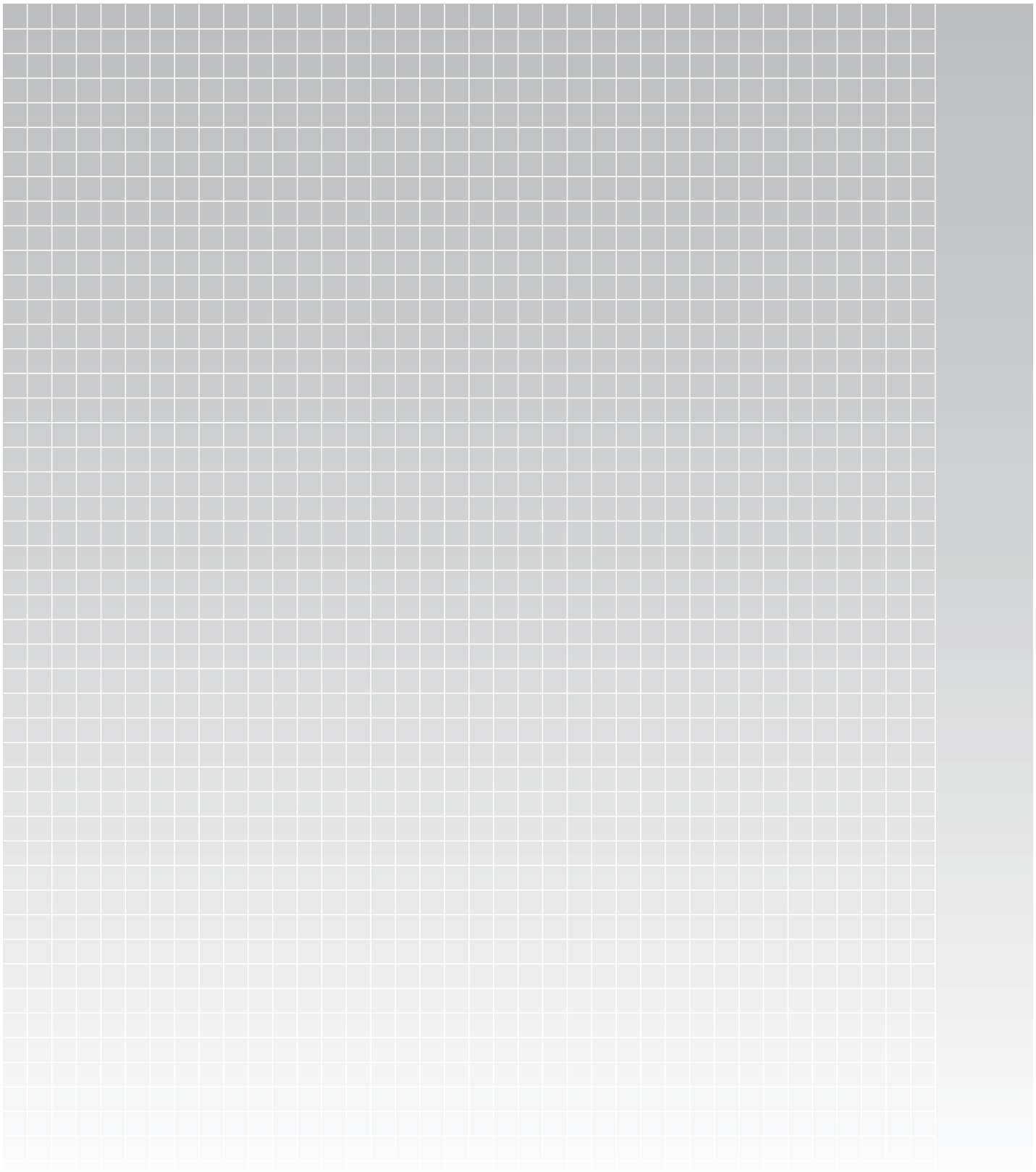
Plunger style	Chisel (**D**), Ball (**K**), Roller (**R**), Roller bearing (**L**) or Chisel with wiper plate (**E**)
Plunger material	Stainless steel, contact surfaces induction hardened
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Connection type	M16×1.5 for cable gland or connector
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 24...28 V DC (**FC**)

With switch element	**BSE 61 per DIN EN 60204-1/VDE 0113**	**BSE 85 to DIN EN 60204-1/VDE 0113**
Part number	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 15.2	see page 15.2
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
Approach speed – Plunger E	30 m/min	30 m/min
Approach speed – Plunger K	10 m/min	10 m/min
Approach speed – Plunger R	60 m/min	60 m/min
Approach speed – Plunger L	120 m/min	80 m/min
Repeatability – Plunger D,E,K	± 0.002 mm	± 0.02 mm
Repeatability – Plunger R, L	± 0.01 mm	± 0.02 mm

Installation



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



Mechanical Switches
Contents

Series 99/100 Single Position Switches

- Miniature single position limit switch
- Miniature switch elements
- Switch elements for low power
- Selectable approach axis

8.2 Standard 819
8.4 Safety 813

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

- Available with chisel plunger only
- Use in wet areas wtih adhering media
- Use in dry areas with small chip presence
- Prevents plunger from sticking in the guide

Switching elements for low-current applications

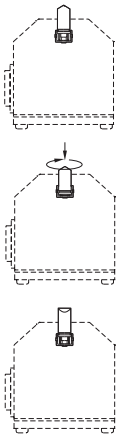
Snap switch elements BSE 73.1 or BSE 74.1 have specially formed gold contacts making them suitable for low currents ≥ 10 mA.

Connection variants

- Thread for cable gland M12×1.5 for series 99, Thread for cable gland M16×1.5 for series 100 (gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Approach from two directions possible (parallel or perpendicular)

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



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

BNS 819-X####-_ _ _-_-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

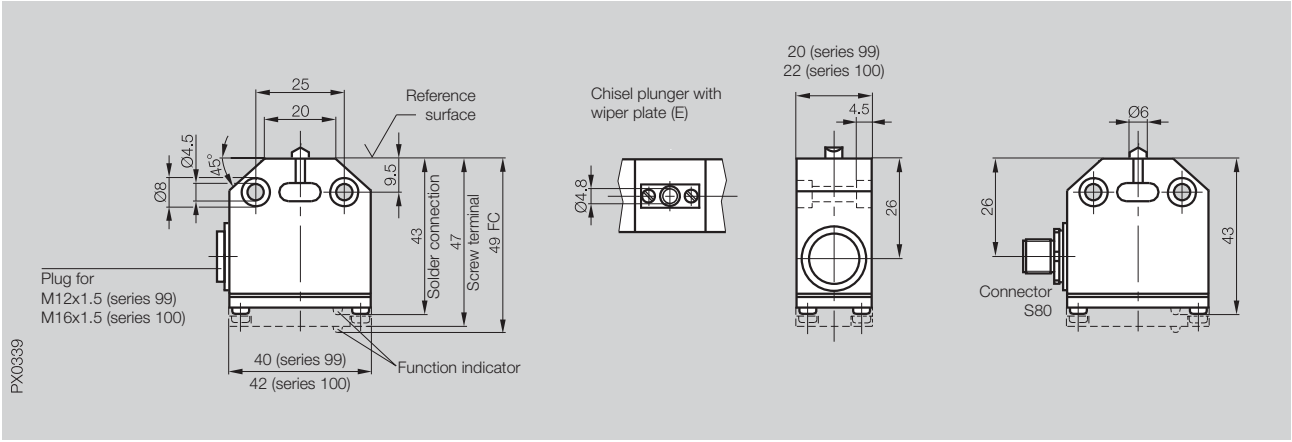
optional
Function indication
FC 24...28 V DC

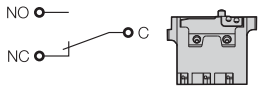
See page 15.14 for connector options

optional
Connector
S4 4-pin
S80 5-pin, dual keyway

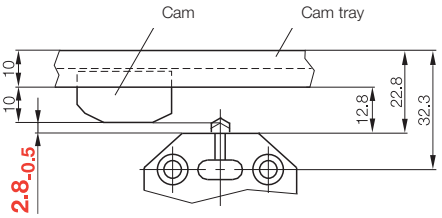
X####
Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)
X512
Hardened aluminum bushing

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 24...28 V DC (**FC**)				
With switch element	**BSE 69.1**	**BSE 73.1**	**BSE 70.1**	**BSE 74.1**	
Part number	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 15.3		see page 15.3		
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		

Installation



Note!
To ensure switching function, the dimension $2.8_{-0.5}$ 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
- Available with chisel plunger only

Connection options

- Thread for cable gland M12×1.5 for Series 99, Thread for cable gland M16×1.5 for Series 100 (gasketed plugs included
- Connector (note permissible operating voltage for the connectors, see page 15.16)

Ordering example:
BNS 813-100-E-49-FC-S80

BNL 813-X####-_ _-_ _ _-_ _-_ _-_ _ _ _

X####
Unique number to indicate special configuration, such as custom pre-wired connector
(blank = standard assembly)
X512
Hardened aluminum bushing

Series
99 Series 99
100 Series 100

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

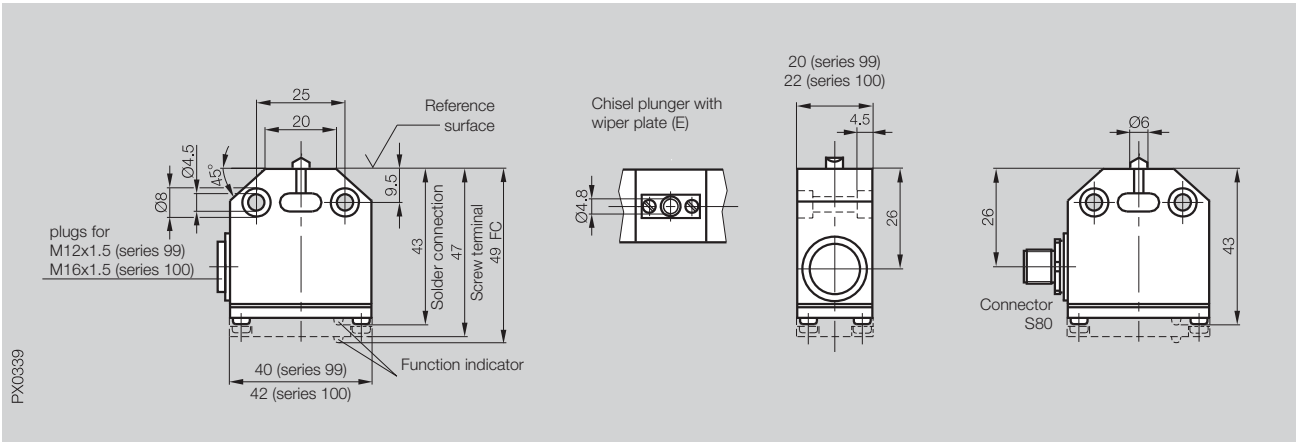
Switch elements
38 BSE 63
Approach direction lateral, 90° to mounting surface
39 BSE 63
Approach direction longitudinal, parallel to mounting surface
48 BSE 64
Approach direction lateral, 90° to mounting surface
49 BSE 64
Approach direction longitudinal, parallel to mounting surface

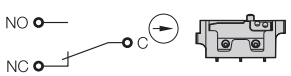
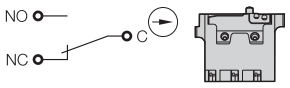
optional
Function indicator
FC
24...28 V DC

optional
Connector
S80 5-pin dual keyway

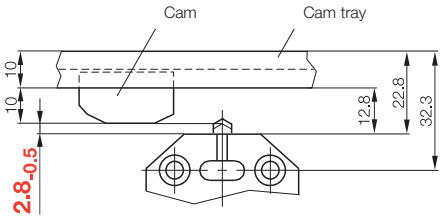
See page 15.14 for connector options

Type	Single position switch with forced opening contacts



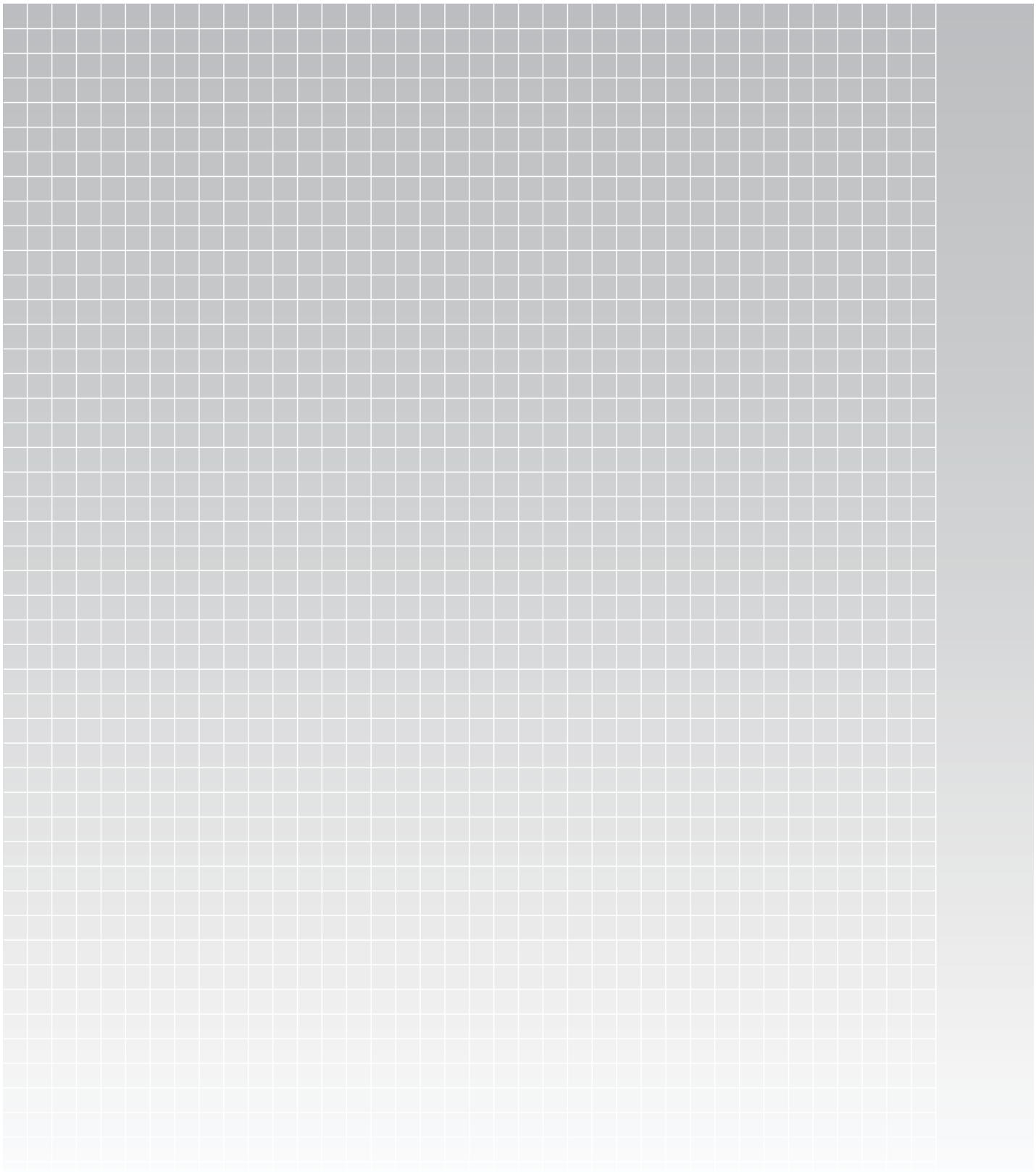
Plunger style		Chisel (**D**), Ball (**K**), Roller (**R**) or Chisel with wiper plate (**E**)	
Plunger material		Stainless steel, contact surfaces induction hardened	
Housing material		Cast aluminum, corrosion-resistant, anodized finish	
Connection type		Cable gland (M12×1.5 series 99, M16×1.5 series 100) or connector	
Ambient temperature range		–5...+85 °C	
Degree of protection per IEC 60529		IP 67	
Function indicator		LED 24...28 V DC (**FC**)	
With switch element		**BSE 63**	**BSE 64**
Part number		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 15.3	see page 15.3
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
Repeatability	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.

8



Mechanical Switches
Contents

Series H2 and H3 Single Position Switches

- Miniature single position inductive
- PNP and NPN
- Complementary

9.2 Inductive

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

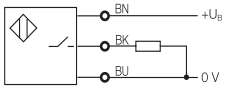
The basis for all electrical versions is the wide variety of tubular sensors.

Features

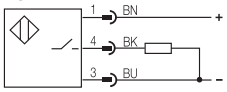
- Reliable inductive operating principle
- All switches equipped with LEDs
- The mounting dimensions of standardized mechanical housing styles can be used
- Simple combination with bus-compatible systems using customer-specific connectors

Wiring diagrams

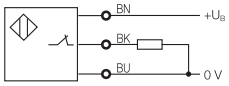
PNP
NO



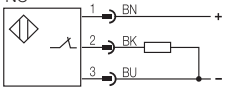
NO



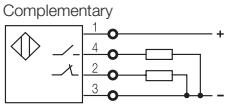
NC



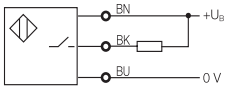
NC



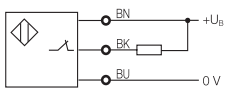
Complementary



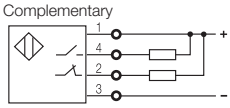
NPN
NO



NC

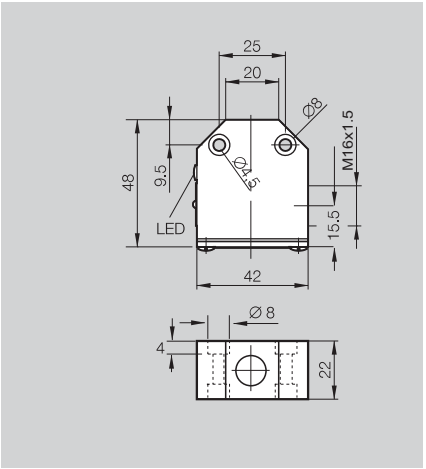


Complementary



Housing Size	**42×48×22**
Mounting	flush
Rated Operating Distance s_n	**5 mm**
Assured Operating Distance s_a	0...4 mm

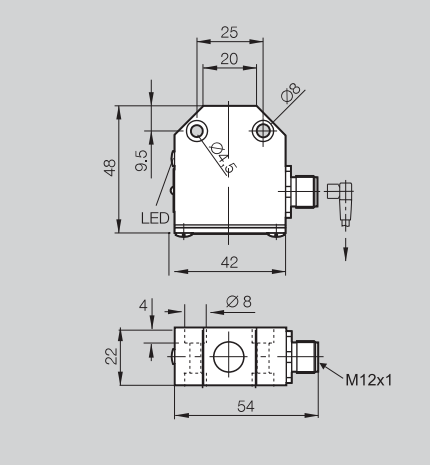
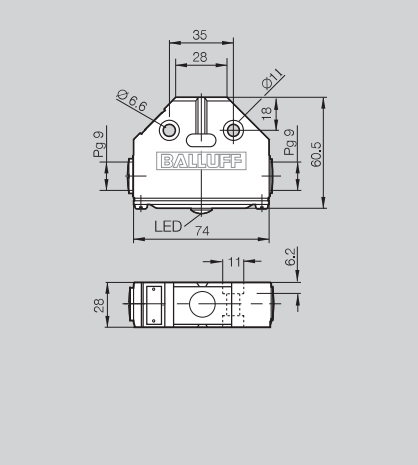
CE

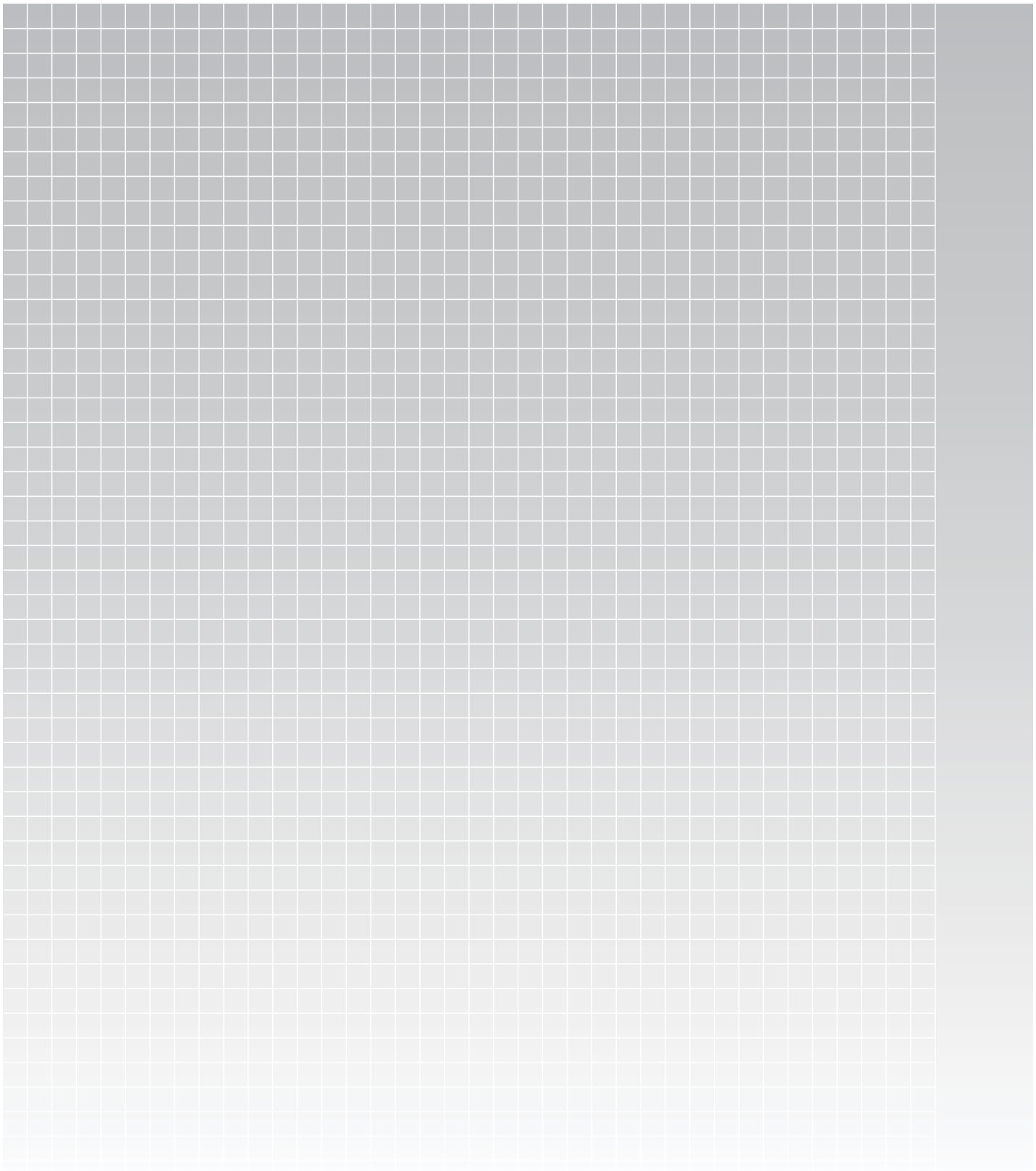


PNP	Normally-open	BES 516-346-H2-Y
	Normally-closed	BES 516-341-H2-Y
	Complementary	
NPN	Normally-open	BES 516-344-H2-Y
	Normally-closed	
	Complementary	

Rated Operational Voltage U_e	24 Vdc
Supply Voltage U_B	10...30 Vdc
Voltage Drop U_d at I_e	≤ 3.5 V
Rated Insulation Voltage U_i	250 Vac
Load Current Capacity	130 mA
Current Consumption (closed/open)	≤25 mA/≤15 mA
Off-state Current I_r	≤ 80 µA
Protected Against Polarity Reversal	yes
Short Circuit Protected	yes
Load Capacitance	≤1.0 µF
Repeat Accuracy R	≤ 5 %
Ambient Temperature Range T_a	–25...+70 °C
Operating Frequency f	500 Hz
Function/Supply Voltage Indication	yes/—
Degree of Protection per IEC 60529	IP 67
Housing Material	aluminum alloy
Material of Sensing Face	PA 12
Connection	screw terminals
Recommended Connector	

Other cable lengths and jacket materials may be available. Additional models may also exist. Refer to company website for details.

42×48×22	**60.5×74×28**
flush	flush
5 mm	**7 mm**
0...4 mm	0...5.7 mm
	
BES 516-346-H2-Y-S4 BES 516-341-H2-Y-S4	BES 516-161-H3-L
BES 516-160-H3-L	
24 Vdc	24 Vdc
10...30 Vdc	10...30 Vdc
≤ 3.5 V	≤ 1.5 V
75 Vdc	75 Vdc
130 mA	400 mA
≤25 mA/≤12 mA	≤30 mA/≤20 mA
≤ 80 µA	≤ 130 µA
yes	yes
yes	no
≤1.0 µF	≤1.0 µF
≤ 5 %	≤ 5 %
–25...+70 °C	–25...+70 °C
500 Hz	300 Hz
yes/—	yes/—
IP 67	IP 67
aluminum alloy	aluminum alloy
PA 12	PA 12
connector	screw terminals
BCC M415-0000-1A-003-VX44T2-050	



Mechanical Switches
Contents

Mixed Assembly

10.2 Multiple position switches with mechanical and inductive switch positions

Mechanical Switches
Mixed Assembly

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:

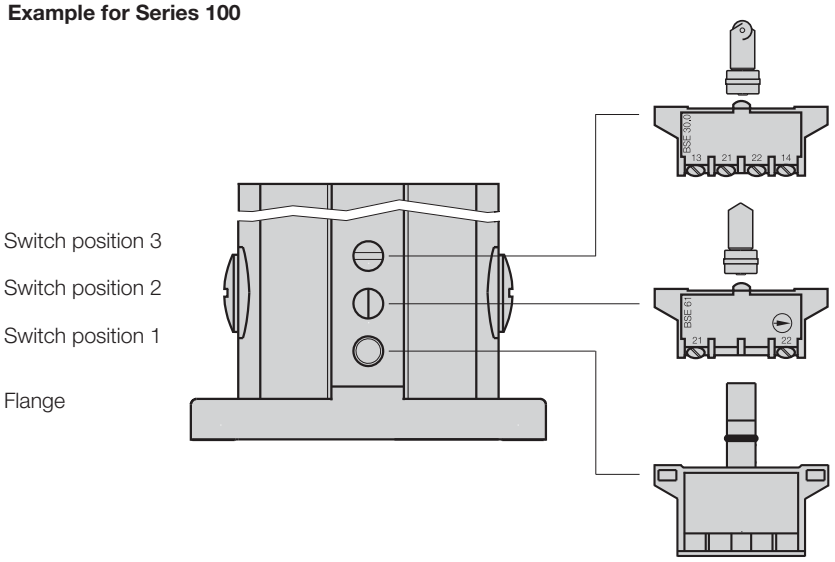
- Mechanical switch element actuated with telescoping plunger
- Safety switch element per DIN EN 60204-1/VDE 0113 actuated with rigid plunger
- Inductive switch element

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

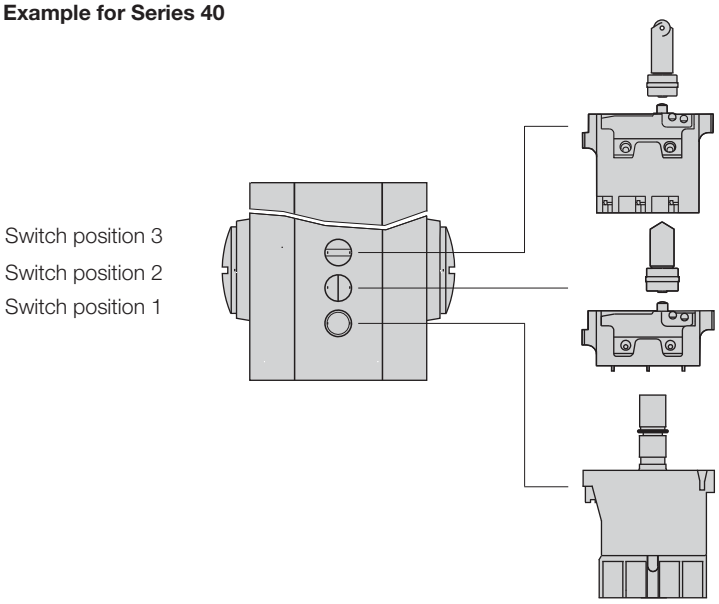
Detailed information on switch elements and plungers can be found in:

Section 5
Mechanical and Inductive Switch

Elements

Section
Principles

Example for Series 40



Plunger styles

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

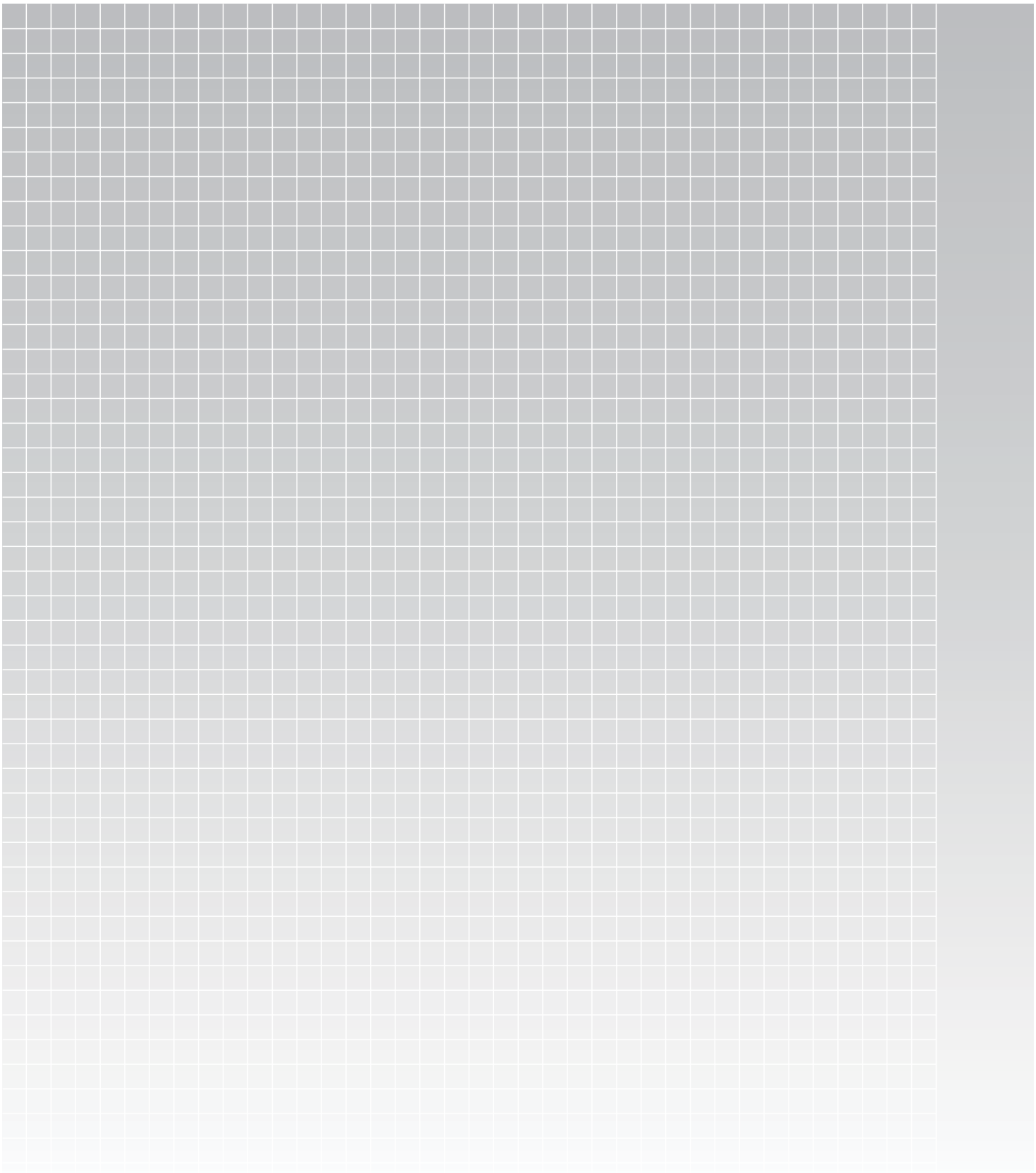
Mechanical switch elements

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

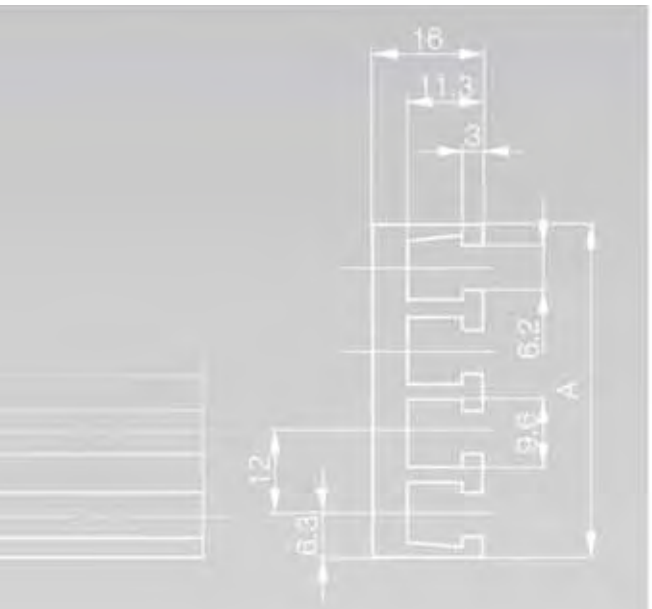
Inductive switch elements

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

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



Contents



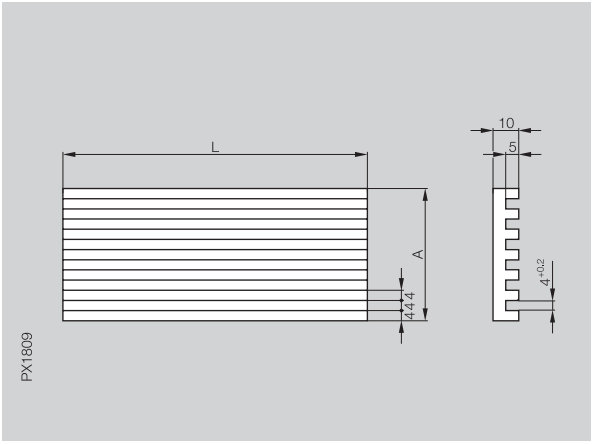
Linear Cam Trays

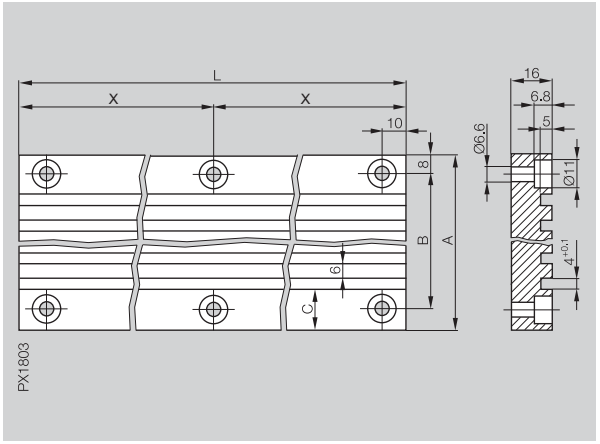
- 8, 12, and 16 mm spacing
- Aluminum extruded U-channel for drop-in cam installation
- Aluminum extruded T-slot for drop-in captive cam installation
- With or without mounting holes or side flanges

11.2 8 mm U-channel without side flanges, with mounting holes
11.2 8 mm U-channel with side flanges, with mounting holes
11.3 12 mm U-channel with side flanges, with and without mounting holes*
11.4 12 mm U-channel without side flanges, with mounting holes*
11.4 12 mm U-channel without side flanges, without mounting holes
11.5 12 mm T-slot without side flanges, without mounting holes
11.5 12 mm T-slot with side flanges, without mounting holes
11.6 12 mm T-slot with side flanges, with mounting holes
11.6 12 mm T-slot without side flanges, with mounting holes

*16 mm versions available

Type	Aluminum cam trays with **8 mm** U-slot spacing w/o side flanges and w/o mounting holes	Aluminum cam trays with **8 mm** U-slot spacing w/ side flanges and w/ mounting holes or w/o mounting holes
Cams	BNN 520-81-S-_ _ _ or BEN 516-19- _ _ _	BNN 520-81-S-_ _ _ or BEN 516-19- _ _ _
Switches	40, 46, 99/100, 603-11, 650-11	40, 46, 99/100, 603-11, 650-11





Part number	BNL 5304-080- _ _-_ _ _ _ without holes	BNL 5304-080-S_ _-_ _ _ _ without holes BNL 5307-080-S _ _ -_ _ _ _ with holes

	Number of slots	Dimension A
	02	20
	03	28
	04	36
	05	44
	06	52
	08	68
	10	84

Number of slots	Dimension A	Dimension B	Dimension C
02	44	28	16
03	52	36	16
04	60	44	16
05	68	52	16
06	76	60	16
08	92	76	16
10	109	92	16

Dimensions in mm

L = Standard cam tray lengths: 1000, 1500, 2000 or 2500 mm
Special length on request.

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 5304-080-S04-1000

BNL 53_ _-080-_ _ _-_ _ _ _

Version
04 Aluminum, no holes
07 Aluminum, with holes

Slot spacing
080 8 mm

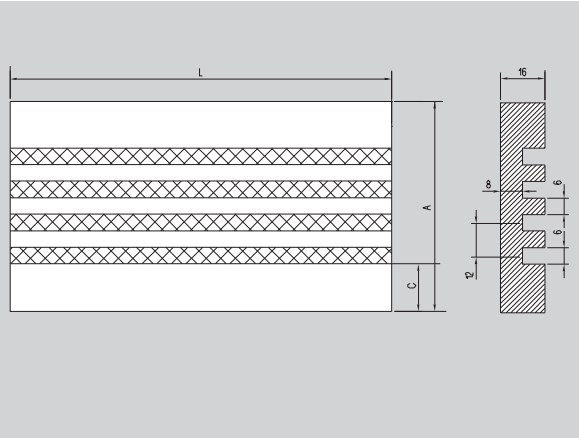
Number of slots
02 2 slots
...
(see table)

Total length L
(see standard lengths)

S Aluminum w/ side flange
Blank
w/o side flanges

Cam Tray Mounting Hole Dimensions			
Length (L)	0 - 499 mm	500 - 1599 mm	1600 - 2500 mm
Mounting Holes	(4) 2 Rows of 2	(6) 2 Rows of 3	(8) 2 Rows of 4
X Dimension	L - 20 mm	(L - 20 mm) / 2	(L - 20 mm) / 3

Aluminum cam trays with **12 mm** U-slot spacing w/ side flanges and w/o mounting holes
BNN 520-UA/UB-_ _ _ or BEN 516-14- _ _ _
61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11

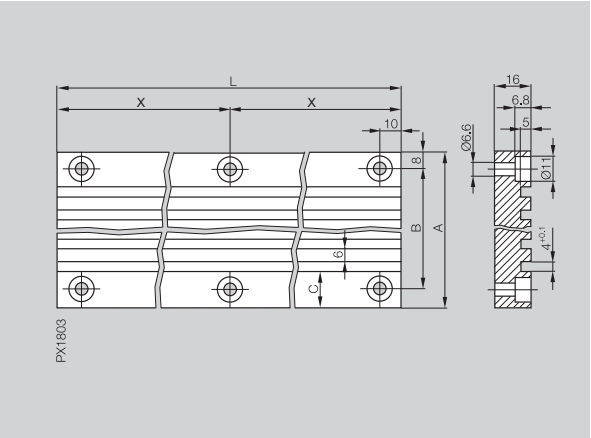


BNL 5304-120-S_ _-_ _ _ _ without holes

Number of slots	Dimension A
02	50
03	62
04	74
05	86
06	98
08	122

L = Standard cam tray lengths: 1000, 1500, 2000 or 2500 mm
Special length on request.

Aluminum cam trays with **12 mm** U-slot spacing w/side flanges and w/ mounting holes
BNN 520-UA/UB-_ _ _ or BEN 516-14- _ _ _
61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



BNL 5307-120-S_ _-_ _ _ _ with holes

Number of slots	Dimension A	Dimension B	Dimension C
02	50	34	16
03	62	46	16
04	74	58	16
05	86	70	16
06	98	82	16
08	122	106	16

Ordering example:
BNL 5304-120-S04-1000

BNL 53_ _-120-S_ _-_ _ _ _

Version
04 Aluminum, no holes
07 Aluminum, with holes

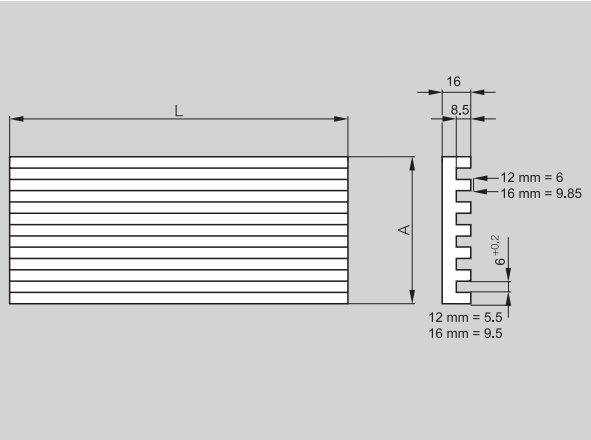
Slot spacing
120 12 mm

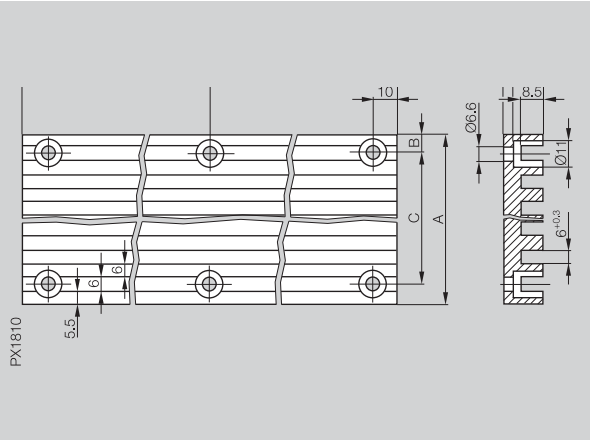
Number of slots
02 2 slots
...
(see table)

Total Length L
(see standard lengths)

Cam Tray Mounting Hole Dimensions			
Length (L)	0 - 499 mm	500 - 1599 mm	1600 - 2500 mm
Mounting Holes	(4) 2 Rows of 2	(6) 2 Rows of 3	(8) 2 Rows of 4
X Dimension	L - 20 mm	(L - 20 mm) / 2	(L - 20 mm) / 3

Type	Aluminum cam trays with **12 mm** U-slot spacing w/o side flanges and w/o mounting holes	Aluminum cam trays with **12 mm** U-slot spacing w/o side flanges and w/ mounting holes
Cams	BNN 520-UA/UB-_ _ _ or BEN 516-14- _ _ _	BNN 520-UA/UB _ _ _ _ or BEN 516-14-_ _ _ _
Switches	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11





Part number	BNL 5304-120-_ _-_ _ _ _ without holes		BNL 5307-120-_ _-_ _ _ _ with holes					
	Number of slots	Dimension A		Number of slots	Dimension A		Dimension B		Dimension C	
		12 mm	16 mm		12 mm	16 mm	12 mm	16 mm	12 mm	16 mm
	01	17		01	17		8.5			
	02	29	41	02	29	41	14.4	20.5		
	03	41.5	57	03	41.5	57	20.8	28.5		
	04	53	73	04	53	73	26.5	36.5		
	06	77	105	06	77	105	8.5	12.5	60	80
	08	101	137	08	101	137	8.5	12.5	84	112
	10	125		10	125		8.5		108	
Dimensions in mm	L = Standard cam tray lengths: 1000, 1500, 2000 or 2500 mm Special length on request									

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

Slot spacing
120 12 mm
160 16 mm

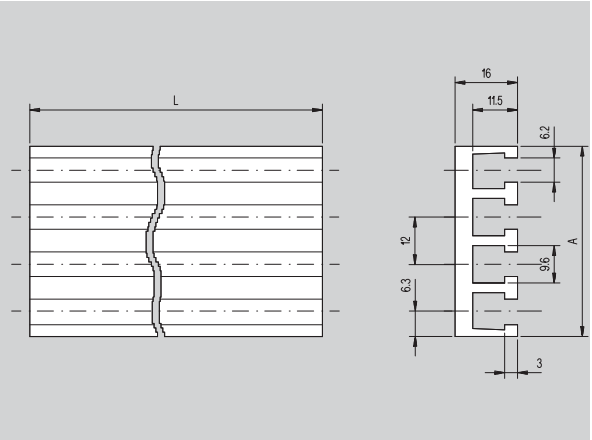
Number of slots
02 2 slots
...
(see table)

Total length L
(see standard lengths)

Cam Tray Mounting Hole Dimensions			
Length (L)	0 - 499 mm	500 - 1599 mm	1600 - 2500 mm
Mounting Holes* 1, 2, 3 & 4 Channels	(2) 1 Row of 2	(3) 1 Row of 3	(4) 1 Row of 4
Mounting Holes 6, 8 & 10 Channels	(4) 2 Rows of 2	(6) 2 Rows of 3	(8) 2 Rows of 4
X Dimension	L - 20 mm	(L - 20 mm) / 2	(L - 20 mm) / 3

*Mounting holes in center of tray

Aluminum cam trays with **12 mm** T-slot spacing w/o side flange
BNN 520-TA,TB-_ _ _ or BEN 516-13- _ _ _
61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11

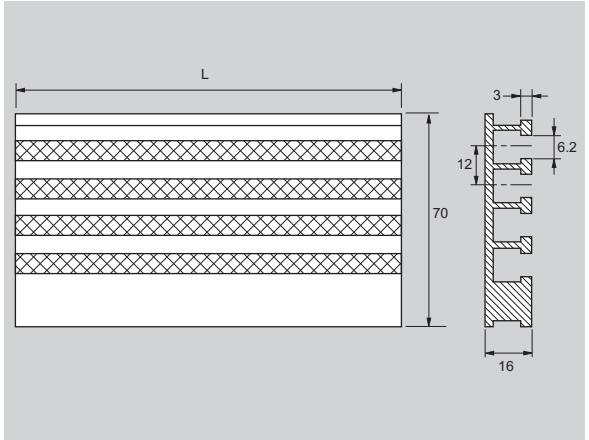


BNL 5310-120-_ _-_ _ _ _ without holes

Number of slots	Dimension A
04	48.6
06	72.6

L = Standard cam tray lengths: 1000, 1500, 2,000 or 2500 mm
Special length on request.

Aluminum cam trays with **12 mm** T-slot spacing w/side flange w/o mounting holes
BNN 520-TA,TB-_ _ _ or BEN 516-13- _ _ _
61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



BNL 5310-120-S_ _-_ _ _ _ without holes

Number of slots
04

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 5310-120-04-1000

BNL 5310-120-_ _ _-_ _ _ _

Version
10 Aluminum, no holes, T-slot

Slot spacing
120 12 mm

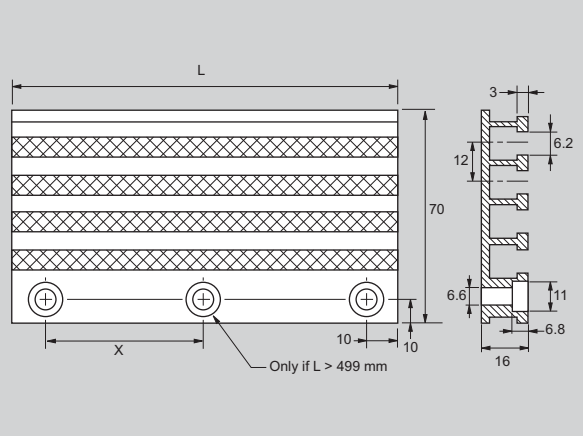
S Aluminum w/ side flange
Blank w/o side flange

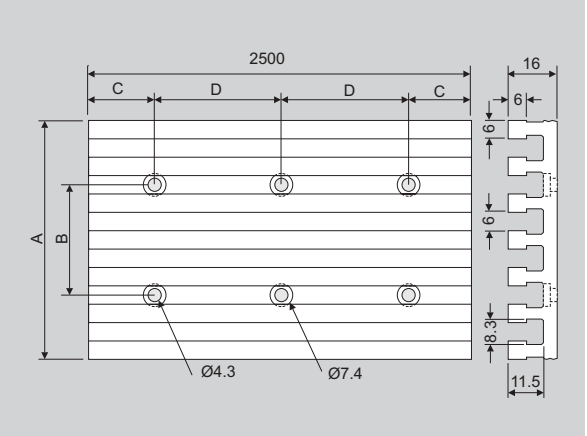
Number of slots
02 2 slots
...
(see table)

Total Length L (see standard lengths)

11

Type	Aluminum cam trays with **12 mm** T-slot spacing w/ side flange and w/ mounting holes	Aluminum cam trays with **12 mm** T-slot spacing w/o side flange w/ mounting holes
Cams	BNN 520-TA,TB-_ _ _ or BEN 516-13- _ _ _	BEN 516-11-1000
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11





Part number	BNL 5311-120-S04-_ _ _ _ with holes	BNL 5315-120-_ _-2500 with holes

	Number of slots	Number of slots	Dimension A	Dimension B	Dimension C	Dimension D
	04	04	53.8	36	125	450
		06	77.8	36	125	450
		08	101.8	60	125	450

Dimensions in mm	L = Standard cam tray lengths: 1000, 1500, 2000 or 2500 mm Special length on request.	Standard cam tray length = 2500 mm

Cam trays

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

Installation note

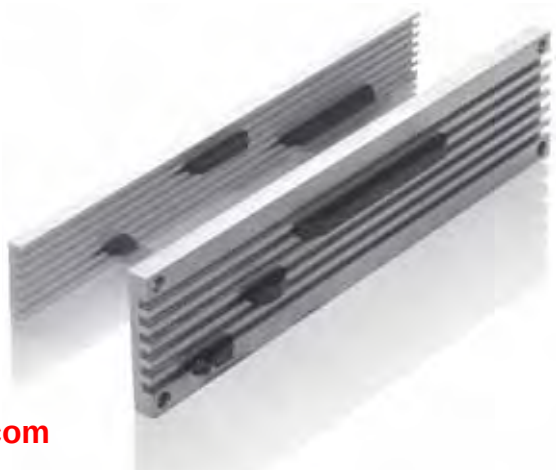
Cam trays should be mounted on flat surfaces or machined members.

Ordering example:
BNL 5311-120-04-1000

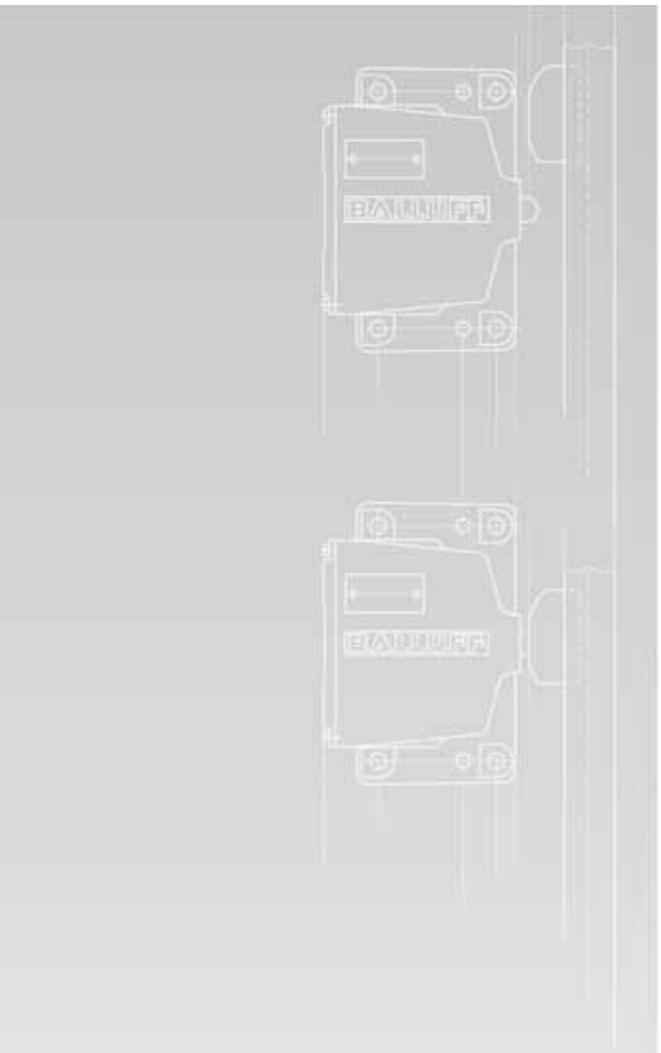
BNL 53_ _-_ _ _-_ _-_ _ _ _

Version	Slot spacing	Number of slots	Total length L
11 Aluminum w/ side flange w/ mounting holes	**120** 12 mm	**04** 4 slots	(see standard lengths)
15 Aluminum w/o flange w/ mounting holes			

Cam Tray Mounting Hole Dimensions			
Length (L)	0 - 499 mm	500 - 1500 mm	1600 - 2500 mm
Mounting Holes	(2) 1 Row of 2	(3) 1 Row of 3	(4) 1 Row of 4
X Dimension	L - 20 mm	(L - 20 mm) / 2	(L - 20 mm) / 3



Mechanical Switches
Contents



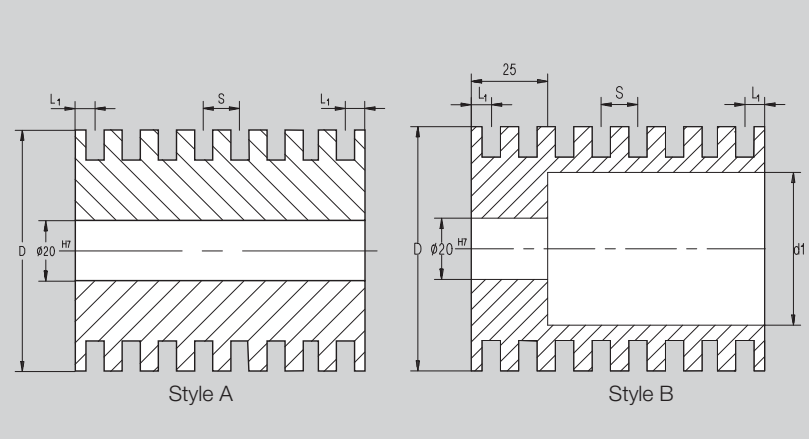
Rotary Cam Drums and Trays

- 12 and 16 mm spacing
- Rotary cam drums are machined solid aluminum
- Rotary cam drums are extruded aluminum rolled into a semi-circle
- U-channel for drop-in installation
- T-slot for drop-in captive cam installation

12.2 12 mm U-channel rotary drums*
12.3 12 mm T-slot rotary drums*
12.4 12 mm T-slot rotary cam trays

*16 mm versions available

Type	Machined aluminum cam drums with **12 mm** U-slot spacing
Cams	BNN UR-_ _ _
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



	Style A	Style B
Part number	BNL URN-12_ _-_ _ _-A	BNL URN-12_ _-_ _ _-B

	Drum Diameter and Style											
	80		100		150		200		250		320	
Number of Slots	A	B	A	B	A	B	A	B	A	B	A	B
01	■		■		■		■		■		■	
02	■		■		■		■		■		■	
03	■		■		■	■	■		■		■	
04	■		■			■		■		■	■	
05	■		■			■		■		■	■	
06	■		■			■		■		■	■	
07	■		■			■		■		■	■	
08	■		■			■		■		■	■	

Cam Drums
Cam drums are used for holding radial cams.
We offer these in standard diameters.

Notes
Machined drums are specified by diameter and cams are specified by radius.

Standard drums are furnished with a 20 mm diameter smooth bore (no keyway).

Ordering example:
BNL URN-1204-150-B

BNL URN-_ _ _ _-_ _ _-_

Slot spacing
12 12 mm
16 16 mm

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

Drum Diameter
see table

Style
A
B

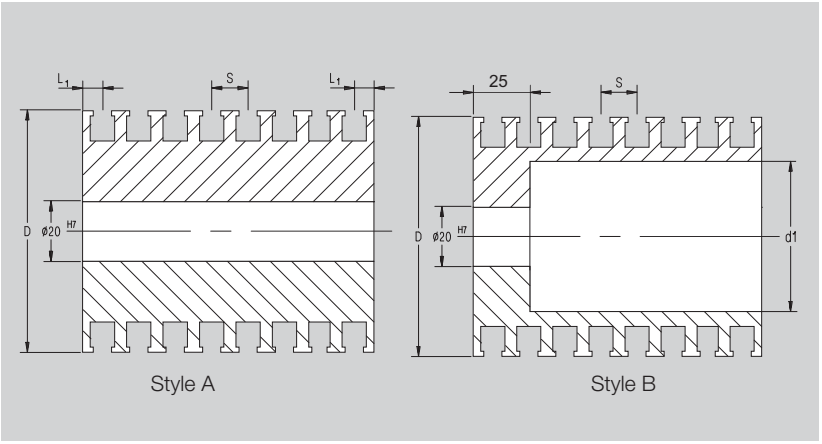
Inside diameter d_1 mm

Drum	Diameter
80mm	N/A
100mm	N/A
150mm	120
200mm	170
250mm	220
320mm	290

Length L_1

Spacing	Length
12mm	7mm
16mm	8mm

Type	Machined aluminum cam drums with **12 mm** T-slot spacing
Cams	BNN TR-_ _ _
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



Style A Style B

	Style A	Style B
Part number	BNL TRN-12_ _-_ _ _-A	BNL TRN-12_ _-_ _ _-B

	Drum Diameter and Style											
Number of Slots	80		100		150		200		250		320	
	A	B	A	B	A	B	A	B	A	B	A	B
01												
02	■		■		■		■		■		■	
03	■		■		■		■		■		■	
04	■		■		■	■	■		■		■	
05	■		■			■		■		■	■	
06	■		■			■		■		■	■	
07	■		■			■		■		■	■	
08	■		■			■		■		■	■	
	■		■			■		■		■	■	

Cam Drums
Cam drums are used for holding radial cams.
We offer these in standard diameters.

Notes
Machined drums are specified by diameter and cams are specified by radius.

Standard drums are furnished with a 20 mm diameter smooth bore (no keyway).

Ordering example:
BNL TRN-1204-150-B

BNL TRN-_ _ _ _-_ _ _-_

Slot spacing
12 12 mm
16 16 mm

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

Drum Diameter
see table

Style
A
B

Inside diameter d_1 mm

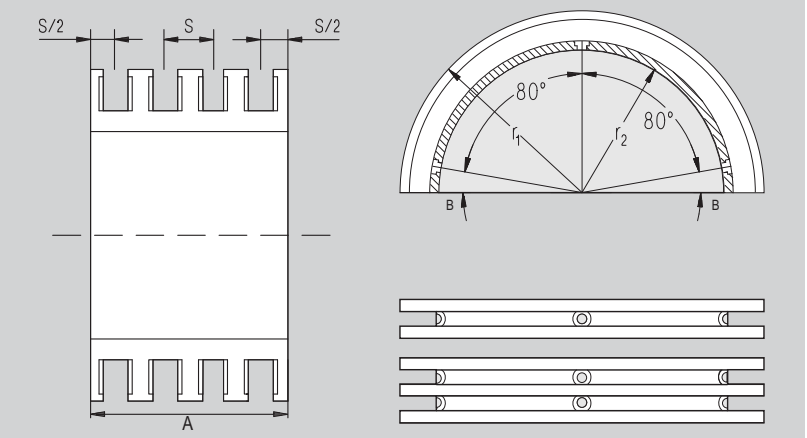
Drum	Diameter
80mm	N/A
100mm	N/A
150mm	120
200mm	170
250mm	220
320mm	290

Length L_1

Spacing	Length
12mm	7mm
16mm	8mm

12

Type	Aluminum cam trays with **12 mm** T-slot spacing, extruded semicircle
Cams	BEN 516-17_ _ _, BNN 520-R_ _ _, or BNN 550-R _ _ _
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



Part number	BNL LAH-12_ _-_ _ _-B			
Number of Slots	Dimension A	Outside Radius r1	Inside Radius r2	Hole Center
02	24	75	59	12
04	48	100	84	36
06	72	125	109	36
08	96	160	144	
		250	234	60
		395	379	
		400	384	
		450	434	
		545	529	

Special radius on request, quantities may be required.

Mounting hole locations - B
Less than 250 mm radius = 10°, 90°, 170°
Greater than 250 mm radius = 6°, 90°, 174°

Number of mounting holes
01 channel = 1 row of 3
02, 04, 06, 08 channels = 2 rows of 3

Cam Drum Halves
Cam drums are used for holding radial cams.
We offer these in standard diameters.

Note
Drum halves are specified by cam radius and cams are specified by radius.

M4 button head screws are required for mounting.

Ordering example:
BNL LAH-1206-395-B

BNL LAH-12_ _-_ _ _-B

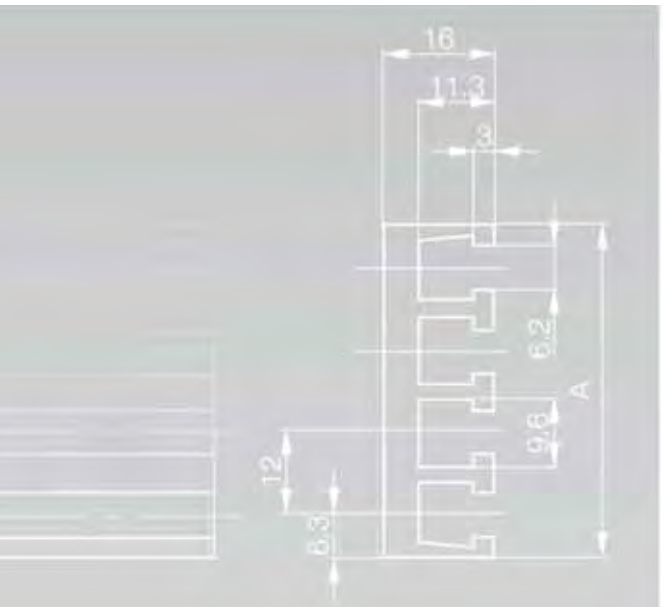
Slot spacing
12 12 mm

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

Radius (r1)
see table

Mounting Holes

Mechanical Switches
Contents

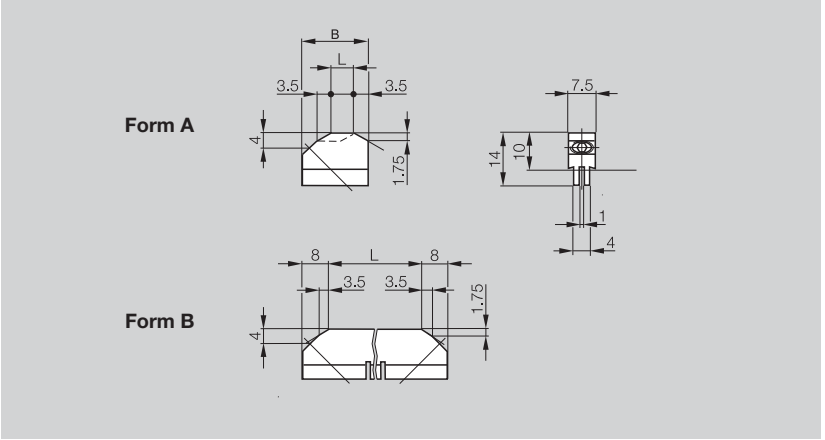


Linear Trip Cams

- Mechanical contact or inductive non-contact
- U-channel mounts by friction wedges for drop-in cam installation
- T-slot mounts by T-nuts or pressure plates for drop-in captive installation
- Single piece with single set screw for very short lengths
- Single piece with two set screws for intermediate lengths
- Modular U-channel or T-slot end ramps for longer custom lengths

13.2 8 mm U-channel mechanical
13.3 12 mm U-channel mechanical
13.4 12 mm T-slot mechanical
13.5 12 mm U-channel or T-slot modular mechanical
13.6 12 mm U-channel mechanical precision
13.7 12 mm T-slot modular inductive
13.9 8 mm U-channel inductive
13.9 12 mm T-slot inductive
13.9 12 mm U-channel inductive

Type	BNN 520-81-S-_ _ _
Cams	BNL 5304-080-... or BNL 5307-080 U-slot cam trays
Switch	40, 46, 99/100



Form A - Single set screw		L	B
Part number	BNN 520-81-S-0	0	18
	BNN 520-81-S-6.5	6.5	18
	BNN 520-81-S-10	10	21.5

Form B - Twin set screw		L	B
Part number	BNN 520-81-S-20	20	36
	BNN 520-81-S-25	25	41
	BNN 520-81-S-30	30	46
	BNN 520-81-S-40	40	56
	BNN 520-81-S-48	48	64
	BNN 520-81-S-60	60	76
	BNN 520-81-S-80	80	96
	BNN 520-81-S-100	100	116
	BNN 520-81-S-145	145	161
	BNN 520-81-S-200	200	216
	BNN 520-81-S-250	250	266
	BNN 520-81-S-440	440	416

Dimensions in mm

L = Length of switching surface.
Additional lengths on request.
Quantities may be required.

Material:
Steel with hardened and burnished surface. HRC 61+2

Installation:
As the screw is tightened, the lower portion of the cam spreads apart holding the cam firmly in place.

Replacement Set Screw:
GEW-STIFT M6x14-701533

Note!
Cams used in safety applications must be permanently secured to the cam tray.

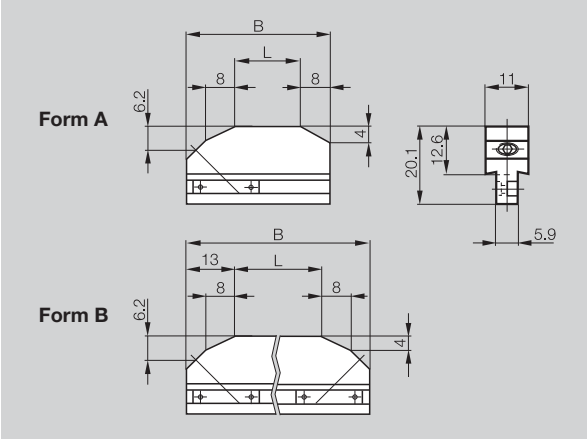
Ordering example:
BNN 520-81-S-25

BNL 520-81-S-_ _ _

U channel
8 mm spacing

Actuation Length
See Table

Type	BNN 520-UA-_ _, BNN 520-UB-_ _ _ per DIN 69639
Cams	BNL 5304/5307-120/160-... BNL 5315 U-slot
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



Dimensions in mm

L = Length of switching surface.
Additional lengths on request.
Quantities may be required.

Material:
Steel with hardened and burnished surface. HRC 61+2

Installation:
Tightening the screw causes the pressure plate to press against the side of the cam tray channel, securing the cam in the cam tray.

Replacement Set Screw:
GEW-STIFT M6x14-701533

For safety applications, use self threading screw:
SCHNEIDSHR.D7513-M4x20 ST-BE-718329

Note!
Cams used in safety applications must be permanently secured to the cam tray.

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

Form B		L	B
Part number	BNN 520-UB-25	25	51
	BNN 520-UB-30	30	56
	BNN 520-UB-40	40	66
	BNN 520-UB-50	50	76
	BNN 520-UB-63	63	89
	BNN 520-UB-80	80	106
	BNN 520-UB-100	100	126
	BNN 520-UB-120	120	146
	BNN 520-UB-130	130	156
	BNN 520-UB-140	140	166
	BNN 520-UB-150	150	176
	BNN 520-UB-160	160	186
	BNN 520-UB-180	180	206
	BNN 520-UB-185	185	211
	BNN 520-UB-190	190	216
	BNN 520-UB-200	200	226
	BNN 520-UB-225	225	251
	BNN 520-UB-250	250	276
	BNN 520-UB-300	300	326
	BNN 520-UB-350	350	376
	BNN 520-UB-400	400	426
	BNN 520-UB-450	450	476
	BNN 520-UB-480	480	506
	BNN 520-UB-500	500	526
	BNN 520-UB-600	600	626
	BNN 520-UB-650	650	676
	BNN 520-UB-700	700	726
	BNN 520-UB-800	800	826
	BNN 520-UB-1000	1000	1026
	BNN 520-UB-1100	1100	1126
	BNN 520-UB-1200	1200	1226
	BNN 520-UB-1300	1300	1326

Ordering example:
BNN 520-UB-100

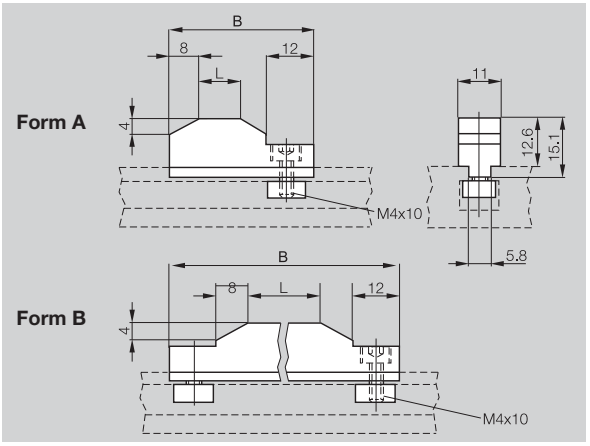
BNL 520-_ _-_ _ _

U U-slot

A Single screw set
B Twin screw set

Actuation Length
see table

Type	BNN 520-TA-_ _, BNN 520-TB-_ _ _ per DIN 69639
Use w/switch spacing	BNL 5310-120-... BNL 5311 T-slot cam trays
Use w/cam tray	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



Dimensions in mm

L = Length of switching surface.
Additional lengths on request.
Quantities may be required.

Material:
Steel with hardened and burnished surface. HRC 61+2

Installation:
Tightening the screw causes the plate to raise, sandwiching the T-flange between the cam and the plate, securing the cam to the cam tray.

Replacement Set Screw:
GEW-STIFT M6x14-701533

For safety applications, use self threading screw:
SCHNEIDSHR.D7513-M4x20 ST-BE-718329

Note!
Cams used in safety applications must be permanently secured to the cam tray.

Form A - Single set screw		**L**	**B**
Part number	BNN 520-TA-0	0	28
	BNN 520-TA-4	4	32
	BNN 520-TA-10	10	38
	BNN 520-TA-16	16	44

Form B - Twin set screw		**L**	**B**
Part number	BNN 520-TB-25	25	65
	BNN 520-TB-40	40	80
	BNN 520-TB-63	63	103
	BNN 520-TB-80	80	120
	BNN 520-TB-100	100	140
	BNN 520-TB-120	120	160
	BNN 520-TB-150	150	190
	BNN 520-TB-200	200	240
	BNN 520-TB-250	250	290
	BNN 520-TB-300	300	340
	BNN 520-TB-380	380	420
	BNN 520-TB-500	500	540
	BNN 520-TB-600	600	640
	BNN 520-TB-790	790	830
	BNN 520-TB-1000	1000	1040
	BNN 520-TB-1200	1200	1240

Ordering example:
BNN 520-TB-100

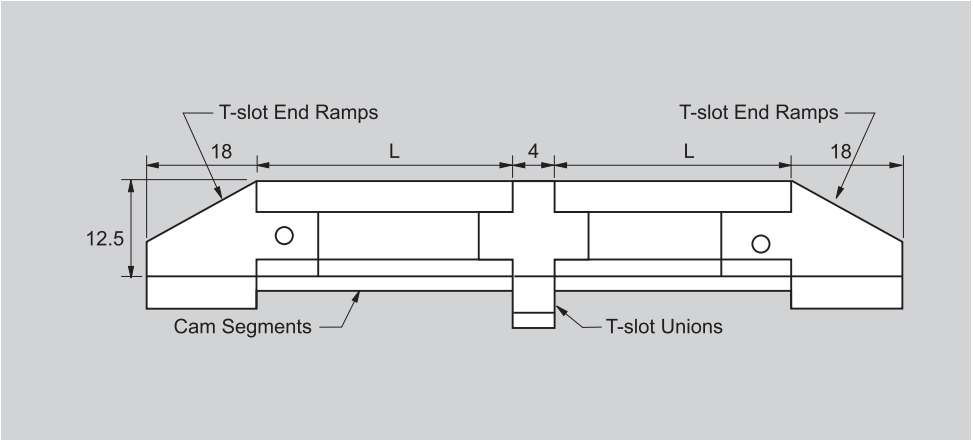
BNL 520-_ _-_ _ _

T T-slot

A Single screw set
B Twin screw set

Actuation Length
see table

Type	Modular end ramps	Modular T-slot unions	Modular Cams
Switches	61, 62, 72, 100, 602-11, 605-11	610-11, 611-11, 612-11, 613-11	



Use with cam tray:				
BNL 5310/11 T-slot	BNN MTE-012	BNN HNT		
BNL 5315 T-slot	BNN MTE-012	BNN HNAU		
BNL 5304/07, 5315 U-slot	BNN MUE-012			
				L
			BNN ZN-0025-12	25
			BNN ZN-0040-12	40
			BNN ZN-0063-12	63
			BNN ZN-0080-12	80
			BNN ZN-0100-12	100
			BNN ZN-0140-12	140
			BNN ZN-0224-12	224
			BNN ZN-0250-12	250
			BNN ZN-0350-12	350
			BNN ZN-0400-12	400
			BNN ZN-0500-12	500
			BNN ZN-0650-12	650
			BNN ZN-0700-12	700
			BNN ZN-0800-12	800
			BNN ZN-0960-12	960
			BNN ZN-1000-12	1000

U-slot Installation:
Tightening the screw causes the pressure plate to press against the side of the cam tray channel, securing the cam to the cam tray.

T-slot Installation:
Tightening the screw causes the plate to raise and sandwich the t-flange between the cam and the plate, securing the cam to the cam tray.

Replacement Mounting Shoe for T-slot and End Ramp (includes T-block, screw, and spring)
BNN MTE-012-12

Replacement Mounting Shoe for U-slot and End Ramp (includes U-block, screw, and spring)
BNN MUE-012-12

Note:
Cam assembly must be terminated with an end ramp on both ends.

Cams used in safety applications must be permanently secured to the cam tray. For safety applications, use self threading screw: SCHNEIDSHR.D7513-M4x20 ST-BE 718329.

Dimensions in mm.

L = Length of switching surface.
Additional lengths on request (quantities may be required).

Material: Hardened steel

Ordering example:

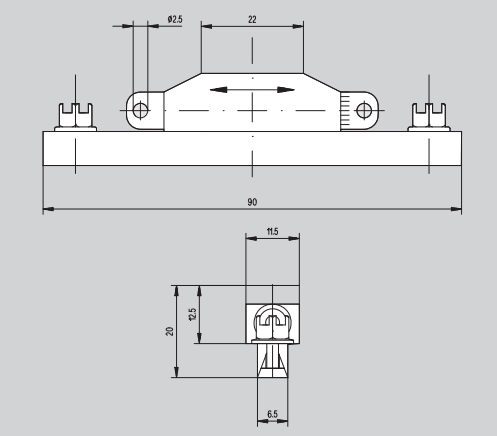
BNL ZN-_ _ _ _-12

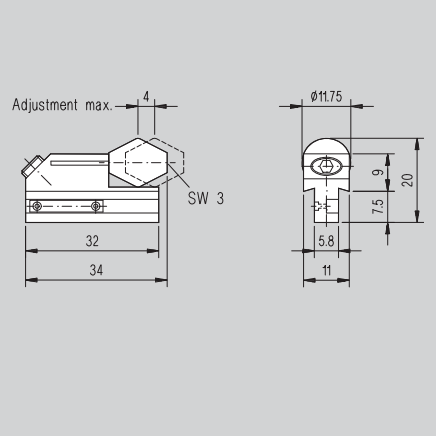
Switching length

Plunger center line spacing

13

Type	**Precision adjustment cam**	**Precision adjustment cam**
Cam trays	BNL 5304/5307-120/160, 5315	BNL 5304/5307-120/160, 5315
Switches	61, 62, 72, 100	61, 62, 72, 100





Part number	BNN 520-X-041	BNN 520-120-V

Linear cam with precision adjustment with 2.5 mm diameter pin (not included). Maximum adjustment on both sides is 5.5 mm (11 mm total). Scale has 25 graduations (1 grad = .02 mm).

Use with 12 mm and 16 mm switch spacing.

Linear cam with precision adjustment with hex wrench (not included). Maximum adjustment on both sides is 2 mm (4 mm total).

Use with 12 mm and 16 mm switch spacing.

Type	BEN 516-11
Cam tray	BNL 5315
Switches	602-11, 605-11, 610-11, 611-11, 612-11, 613-11

Non-contact Inductive Cam	
Part Number	BEN 516-11-1000
Non-contact Linear End Ramp (two required for segment)	
Part Number	BEN 516-16-12.5-00

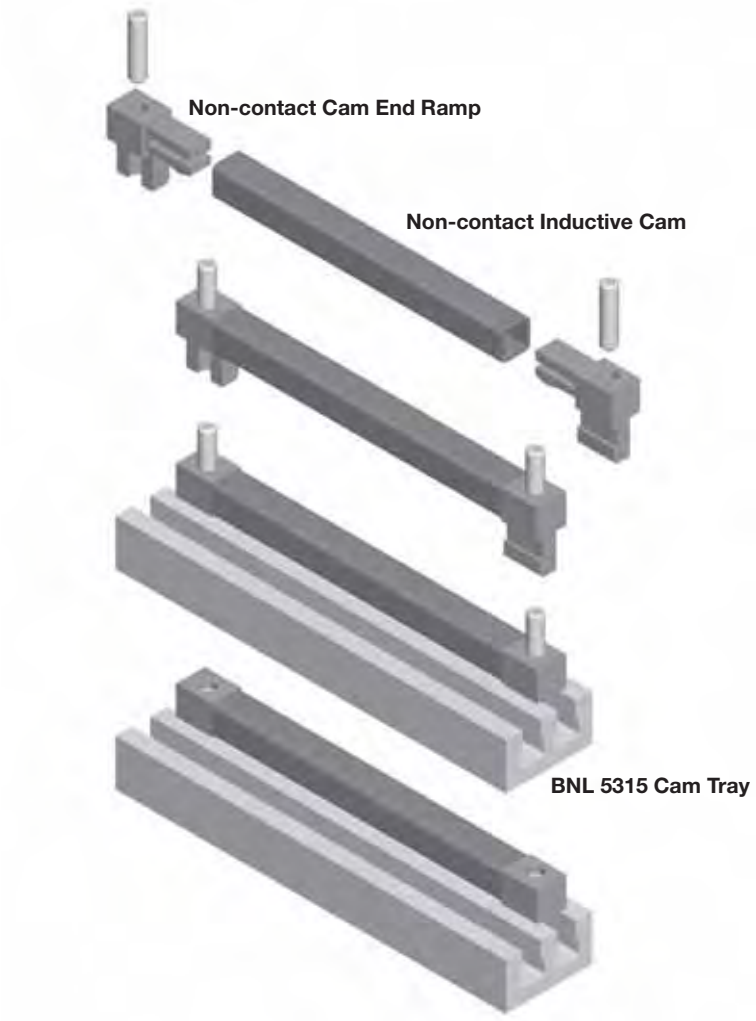
Installation:
BEN516-11
Insert end ramps into each end of linear cam. Position cam segment into BNL 5315 cam. As the set screw is tightened, the threads will grip into the T-slot side flange.

Cams are available only in one meter pieces. Cams can be cut for applications less than one meter (add 12.5 mm for each end ramp for total length).

Cams can be installed end-to-end for applications longer than one meter (add 12.5 mm for each end ramp for total length).

Notes:
Cams used in safety applications must be permanently secured to the cam tray.

BEN style cams are intended for non-contact operations or inductive sensors only. Misapplication for use as trip cams for mechanical limit switches will result in extremely rapid wear and failure.



Installation:
BEN 516-19 and BEN 516-14
As the screw is tightened, the lower part of the cam spreads apart holding the cam firmly in place

BEN 516-13
Tightening the screw causes the round bar to sandwich the T-slot flange between the bar and the cam, securing the cam to the cam tray.

BEN 516-19 Replacement Screw:
SCHRAUBE M6x7.5 SW3-703297

BEN 516-13 Replacement Ramp:
BEN 516-13-00

BEN 514-14 Replacement Screw:
GEW-STIFT M5 BEN-707777

Replacement End Ramp:
BEN516-514-00

Note:
Cams used in safety applications must be permanently secured to the cam tray.

BEN style cams are intended for non-contact operations of inductive sensors only. Inappropriate used as trip cams for mechanical limit switches will result in extremely rapid wear and failure.

Dimensions in mm.

L = Length of switching surface.
Additional lengths on request
(quantities may be required).

Ordering example:
BEN 516-14-100

BNL 516-_ _-_ _ _

Electronic (inductive) cams

13 6mm T-Slot
14 6mm U-Slot
19 4mm U-Slot

Actuation Length
see table

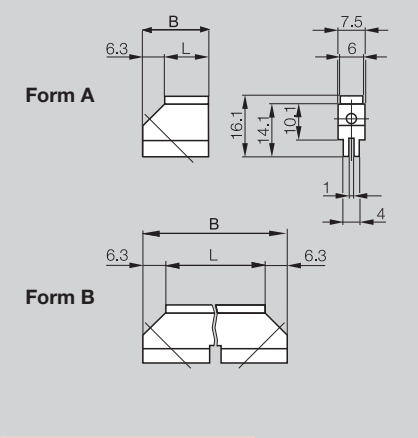
Type	
Cam	
Switches	

Form A - Single set screw	
Part Number	

Form B - Twin set screw	
Part Number	

BEN 516-19

BNL 5304/5307-080-...
603-11, 650-11



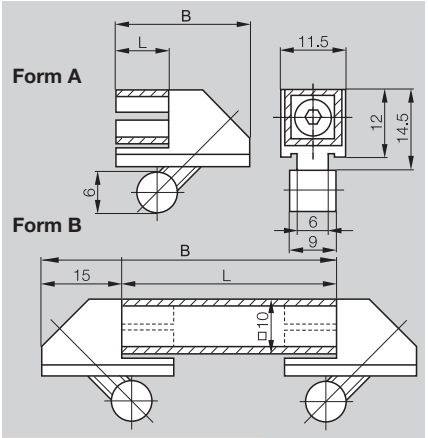
	L	B
BEN 516-19-10	10	16.3
BEN 516-19-15	15	21.3

	L	B
BEN 516-19-20	20	32.6
BEN 516-19-30	30	42.6
BEN 516-19-40	40	52.6
BEN 516-19-50	50	62.6
BEN 516-19-60	60	72.6
BEN 516-19-80	80	92.6
BEN 516-19-90	90	102.6
BEN 516-19-100	100	112.6
BEN 516-19-120	120	132.6
BEN 516-19-150	150	162.6
BEN 516-19-250	250	262.6

Material: Steel with burnished surface.

BEN 516-13

BNL 5310-120-...
602-11, 605-11, 610-11, 611-11, 612-11, 613-11



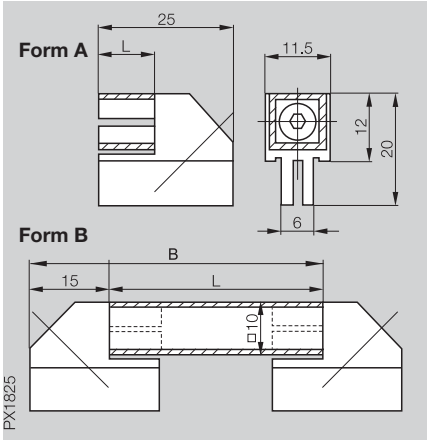
	L	B
BEN 516-13-00	0	15
BEN 516-13-10	10	25
BEN 516-13-20	20	35

	L	B
BEN 516-13-30	30	60
BEN 516-13-40	40	70
BEN 516-13-50	50	80
BEN 516-13-100	100	130
BEN 516-13-180	180	210
BEN 516-13-200	200	230
BEN 516-13-300	300	330
BEN 516-13-675	675	705

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

BEN 516-14

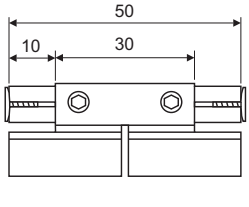
BNL 5304/5307-120/160-..., 5315
602-11, 605-11, 610-11, 611-11, 612-11, 613-11

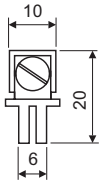


	L	B
BEN 516-14-00	0	15
BEN 516-14-10	10	25
BEN 516-14-20	20	35

	L	B
BEN 516-14-25	25	55
BEN 516-14-30	30	60
BEN 516-14-40	40	70
BEN 516-14-50	50	80
BEN 516-14-63	63	93
BEN 516-14-80	80	110
BEN 516-14-90	90	120
BEN 516-14-100	100	130
BEN 516-14-120	120	150
BEN 516-14-130	130	160
BEN 516-14-140	140	170
BEN 516-14-150	150	180
BEN 516-14-160	160	190
BEN 516-14-180	180	210
BEN 516-14-200	200	230
BEN 516-14-250	250	280
BEN 516-14-280	280	310
BEN 516-14-300	300	330
BEN 516-14-360	360	390
BEN 516-14-400	400	430
BEN 516-14-500	500	530
BEN 516-14-600	600	630
BEN 516-14-650	650	680
BEN 516-14-700	700	730
BEN 516-14-750	750	780
BEN 516-14-800	800	830
BEN 516-14-900	900	930
BEN 516-14-1000	1000	1030
BEN 516-14-1200	1200	1230

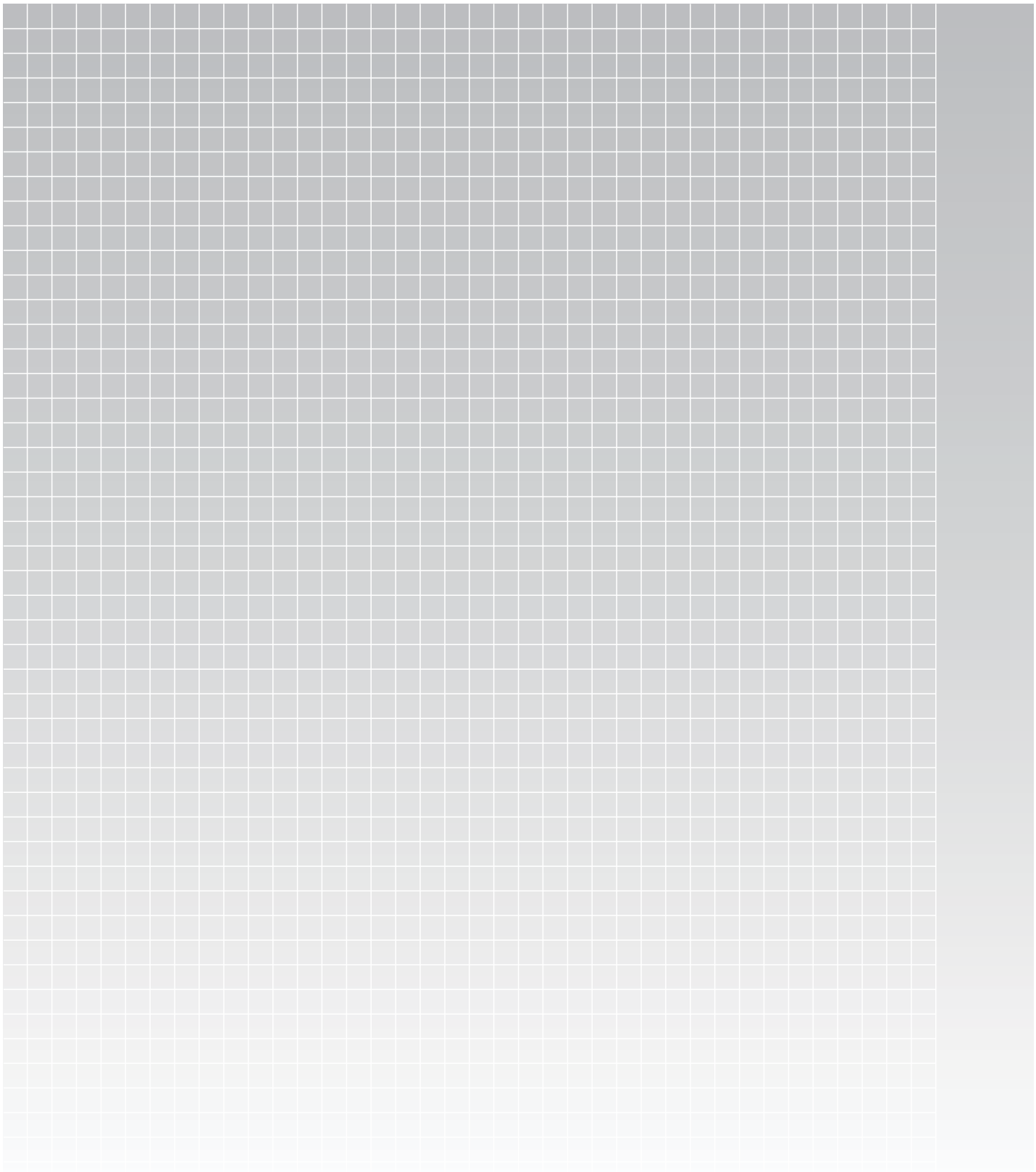
Material: Steel damping element with burnished surface and base made of PA 6.6.





BEN 516-14V
Union for non-contact cams

13

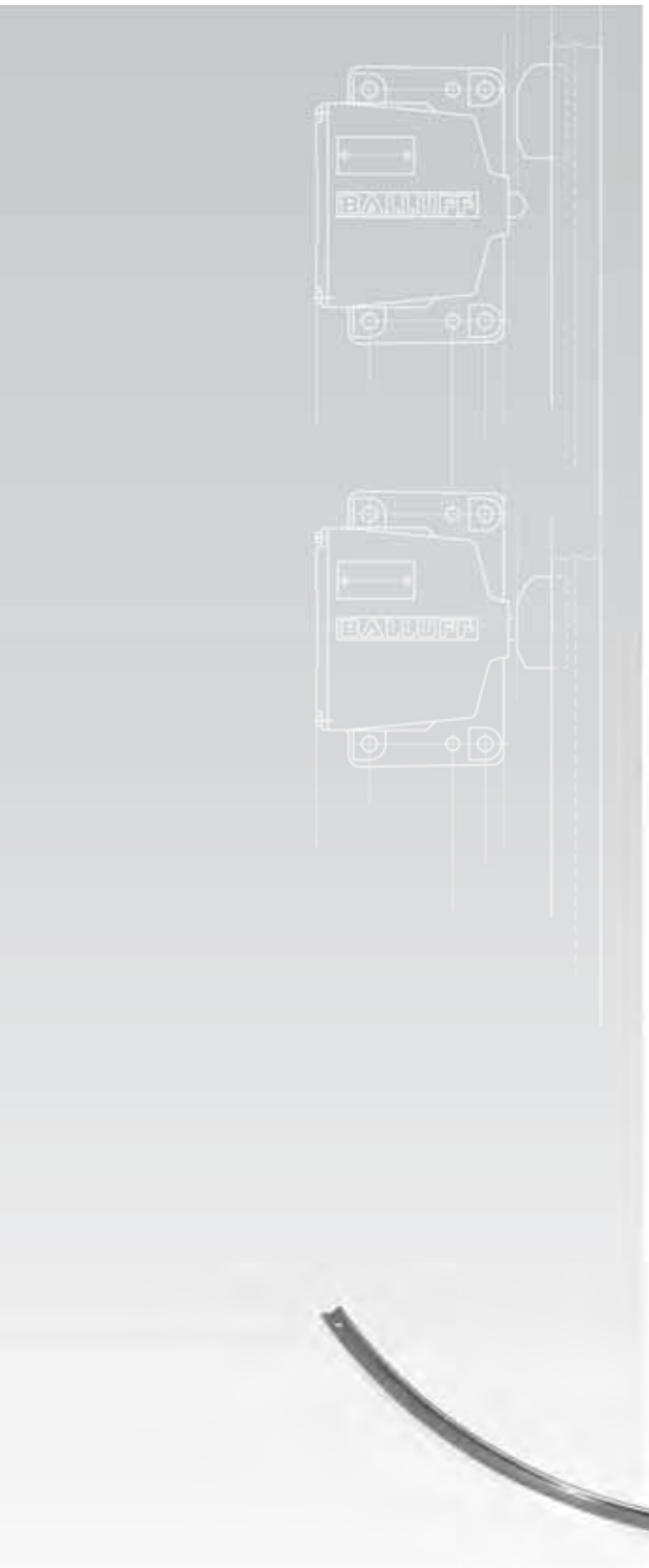


Mechanical Switches
Contents

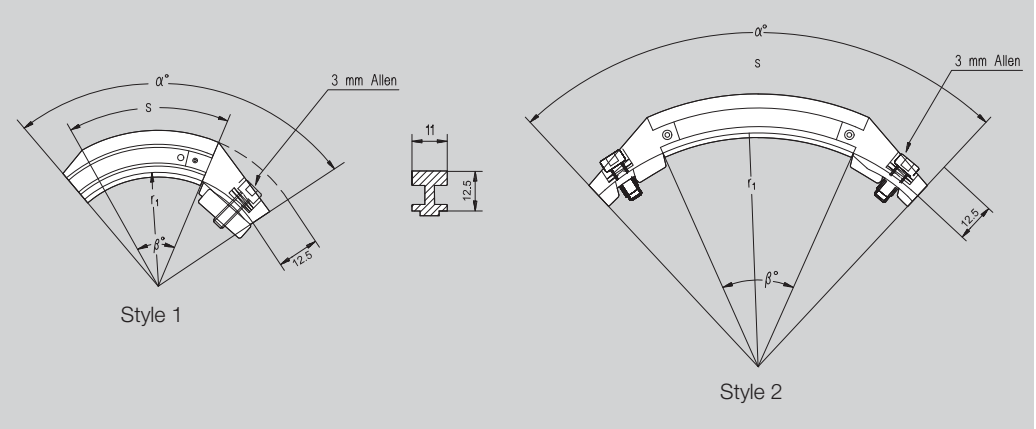
Radial Trip Cams

- Mechanical contact or inductive non-contact
- U-channel mount by friction wedges for drop-in cam installation
- T-slot mount by T-nuts or pressure plates for drop-in captive installation
- Two piece with single set screw for small angles
- Three piece with two set screws for larger angles

14.2 12 mm U-channel mechanical
14.4 12 mm T-slot mechanical
14.6 12 mm T-slot inductive
14.8 12 mm U-channel segmented mechanical cam kits for robot zone limit systems
14.10 12 mm T-slot segmented inductive cam kits for robot zone limit systems



Type	BNN UR
Cam drum	BNL URN
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



U-slot Installation:
Tightening the set screw causes the pressure plate to press against the side of the cam drum channel, securing the cam.

Replacement End Ramps:

Radius	Part number
40-50 mm	BNN URE-040-12
75-124 mm	BNN URE-75-12
125-249 mm	BNN URE-125-12

Replacement Pressure Block:
BNN URENU-1202

Note:
Cams used in safety applications must be permanently secured to the cam drum. For safety applications, use: SCHNEIDSHR.D7513-M4x20ST-BE 718329

Material:
Steel with hardened burnished surface and chrome plated. HRC 63+2

Dimensions in mm.

Additional radii and swept angles available on requst (quantities may be required).

See ordering example on bottom of page 14.3.

Nominal Radius	Part number	Swept angle (°)	S Arc length (mm)	Total angle (°)	Style
40 mm	BNN UR-004-040-12C	4	4	46	1
	BNN UR-010-040-12C	10	10	52	1
	BNN UR-015-040-12C	15	14	57	1
	BNN UR-030-040-12C	30	28	72	1
	BNN UR-045-040-12C	45	41	87	1
	BNN UR-060-040-12C	60	55	116	2
	BNN UR-075-040-12C	75	69	131	2
	BNN UR-090-040-12C	90	83	156	2
50 mm	BNN UR-004-050-12C	4	4	37	1
	BNN UR-009-050-12C	9	10	42	1
	BNN UR-015-050-12C	15	16	49	1
	BNN UR-030-050-12C	30	33	63	1
	BNN UR-045-050-12C	45	49	78	1
	BNN UR-060-050-12C	60	65	104	2
	BNN UR-075-050-12C	75	82	119	2
	BNN UR-090-050-12C	90	98	134	2
	BNN UR-180-050-12C	180	196	224	2
75 mm	BNN UR-003-075-12C	3	4	26	1
	BNN UR-007-075-12C	7	10	30	1
	BNN UR-015-075-12C	15	23	38	1
	BNN UR-030-075-12C	30	46	60	2
	BNN UR-045-075-12C	45	69	75	2
	BNN UR-060-075-12C	60	92	90	2
	BNN UR-075-075-12C	75	114	105	2
	BNN UR-090-075-12C	90	137	120	2
	BNN UR-120-075-12C	120	184	150	2
	BNN UR-180-075-12C	180	274	210	2
100 mm	BNN UR-003-100-12C	3	4	19	1
	BNN UR-005-100-12C	5	10	22	1
	BNN UR-010-100-12C	10	20	27	1
	BNN UR-015-100-12C	15	29	37	2
	BNN UR-030-100-12C	30	56	56	2
	BNN UR-045-100-12C	45	88	67	2
	BNN UR-060-100-12C	60	118	82	2
	BNN UR-075-100-12C	75	147	97	2
	BNN UR-090-100-12C	90	177	112	2
	BNN UR-105-100-12C	105	206	127	2
	BNN UR-120-100-12C	120	236	144	2
	BNN UR-180-100-12C	180	354	202	2

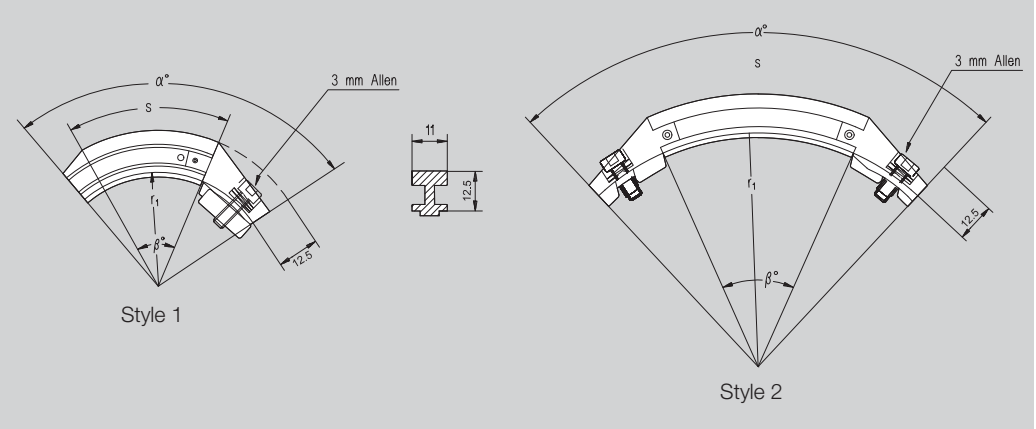
Nominal Radius	Part Number	Swept angle (°)	S Arc length (mm)	Total angle (°)	Style
125 mm	BNN UR-002-125-12C	2	4	16	1
	BNN UR-004-125-12C	4	10	18	1
	BNN UR-009-125-12C	9	20	23	1
	BNN UR-015-125-12C	15	36	33	2
	BNN UR-030-125-12C	30	72	48	2
	BNN UR-045-125-12C	45	108	63	2
	BNN UR-060-125-12C	60	144	78	2
	BNN UR-075-125-12C	75	180	93	2
	BNN UR-090-125-12C	90	216	108	2
	BNN UR-100-125-12C	100	240	118	2
	BNN UR-105-125-12C	105	252	123	2
	BNN UR-120-125-12C	120	288	138	2
	BNN UR-150-125-12C	150	360	168	2
	BNN UR-180-125-12C	180	432	198	2
	BNN UR-210-125-12C	210	504	228	2
	BNN UR-225-125-12C	225	240	243	2
	BNN UR-240-125-12C	240	576	258	2
	BNN UR-255-125-12C	255	612	273	2
	BNN UR-260-125-12C	260	624	278	2
	BNN UR-270-125-12C	270	648	288	2
	BNN UR-285-125-12C	285	684	303	2
	BNN UR-300-125-12C	300	720	318	2
	BNN UR-315-125-12C	315	756	333	2
	BNN UR-320-125-12C	320	768	338	2
	BNN UR-330-125-12C	330	792	348	2
160 mm	BNN UR-001-160-12C	1	4	12	1
	BNN UR-003-160-12C	3	10	14	1
	BNN UR-007-160-12C	7	20	18	1
	BNN UR-015-160-12C	15	45	29	2
	BNN UR-030-160-12C	30	90	44	2
	BNN UR-045-160-12C	45	135	59	2
	BNN UR-060-160-12C	60	181	74	2
	BNN UR-075-160-12C	75	226	89	2
	BNN UR-090-160-12C	90	271	104	2
	BNN UR-105-160-12C	105	316	119	2
	BNN UR-120-160-12C	120	361	134	2
250 mm	BNN UR-001-250-12C	1	4	9	1
	BNN UR-002-250-12C	2	10	10	1
	BNN UR-004-250-12C	4	20	12	1
	BNN UR-015-250-12C	15	69	25	2
	BNN UR-030-250-12C	30	137	40	2
	BNN UR-045-250-12C	45	206	55	2
	BNN UR-060-250-12C	60	275	70	2
	BNN UR-075-250-12C	75	343	85	2
	BNN UR-090-250-12C	90	412	100	2
	BNN UR-105-250-12C	105	481	115	2
	BNN UR-120-250-12C	120	549	130	2

Ordering example:
BNN UR-030-125-12C

BNL UR-_ _ _-_ _ _-12C

- Radial U-slot mechanical cams
- Swept angle
- Cam Radius
- For 12 mm plunger spacing, slot width 6mm chromed hardened surface

Type	BNN TR
Cam drum	BNL TRN, BNL LAH
Switch	61, 62, 72, 100, 602-11, 605-11, 610-11, 611-11, 612-11, 613-11



T-slot Installation:
Tightening the screw causes the plate to raise and sandwich the T-flage between the plate and cam, securing the cam to the drum

Replacement End Ramps:

Radius	Part number
40-50 mm	BNN TRE-040-12
75-124 mm	BNN TRE-75-12
125-249 mm	BNN TRE-125-12

Replacement Pressure Block:
BNN URENU-1202

Note:
Cams used in safety applications must be permanently secured to the cam drum. For safety applications, use: SCHNEIDSHR.D7513-M4x20ST-BE 718329

Material:
Steel with hardened burnished surface and chrome plated. HRC 63+2

Dimensions in mm.

Additional radii and swept angles available on requst (quantities may be required).

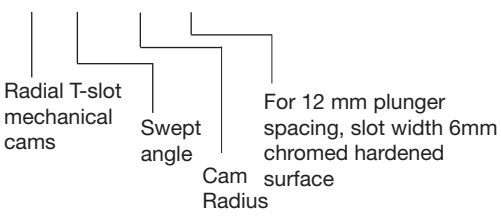
See ordering example on bottom of page 13.5.

Nominal Radius	Part number	Swept angle (°)	S Arc length (mm)	Total angle (°)	Style
40 mm	BNN TR-004-040-12C	4	4	46	1
	BNN TR-010-040-12C	10	10	52	1
	BNN TR-015-040-12C	15	14	57	1
	BNN TR-030-040-12C	30	28	72	1
	BNN TR-045-040-12C	45	41	87	1
	BNN TR-060-040-12C	60	55	116	2
	BNN TR-075-040-12C	75	69	131	2
	BNN TR-090-040-12C	90	83	156	2
50 mm	BNN TR-004-050-12C	4	4	37	1
	BNN TR-009-050-12C	9	10	42	1
	BNN TR-015-050-12C	15	16	49	1
	BNN TR-030-050-12C	30	33	63	1
	BNN TR-045-050-12C	45	49	78	1
	BNN TR-060-050-12C	60	65	104	2
	BNN TR-075-050-12C	75	82	119	2
	BNN TR-090-050-12C	90	98	134	2
75 mm	BNN TR-003-075-12C	3	4	26	1
	BNN TR-007-075-12C	7	10	30	1
	BNN TR-015-075-12C	15	23	38	1
	BNN TR-030-075-12C	30	46	60	2
	BNN TR-045-075-12C	45	69	75	2
	BNN TR-060-075-12C	60	92	90	2
	BNN TR-075-075-12C	75	114	105	2
	BNN TR-090-075-12C	90	137	120	2
100 mm	BNN TR-002-100-12C	2	4	19	1
	BNN TR-003-100-12C	3	4	19	1
	BNN TR-005-100-12C	5	10	22	1
	BNN TR-010-100-12C	10	20	27	1
	BNN TR-015-100-12C	15	29	37	2
	BNN TR-030-100-12C	30	56	56	2
	BNN TR-045-100-12C	45	88	67	2
	BNN TR-060-100-12C	60	118	82	2
	BNN TR-075-100-12C	75	147	97	2
	BNN TR-090-100-12C	90	177	112	2
	BNN TR-105-100-12C	105	206	127	2
	BNN TR-120-100-12C	120	236	144	2

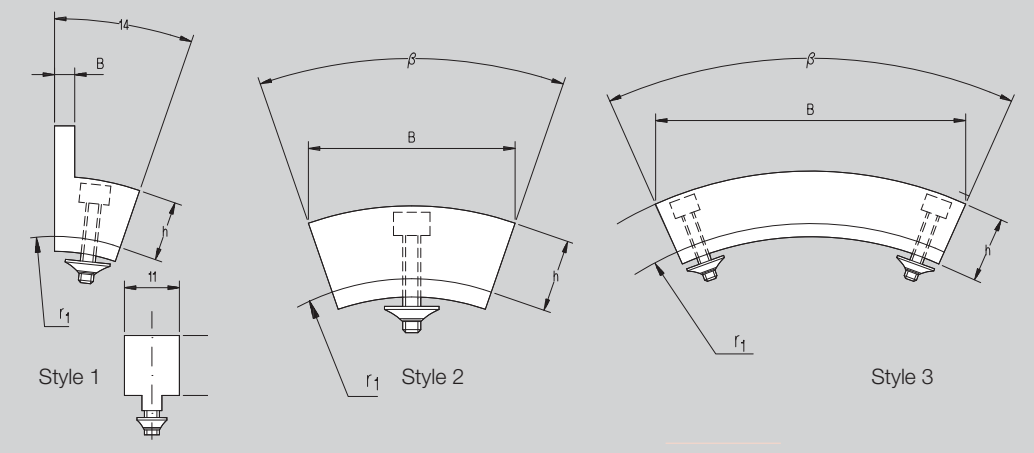
Nominal Radius	Part Number	Swept angle (°)	Arc length (mm)	Total angle (°)	Style
125 mm	BNN TR-002-125-12C	2	4	16	1
	BNN TR-004-125-12C	4	10	18	1
	BNN TR-009-125-12C	9	20	23	1
	BNN TR-015-125-12C	15	36	33	2
	BNN TR-030-125-12C	30	72	48	2
	BNN TR-045-125-12C	45	108	63	2
	BNN TR-060-125-12C	60	144	78	2
	BNN TR-075-125-12C	75	180	93	2
	BNN TR-090-125-12C	90	216	108	2
	BNN TR-105-125-12C	105	252	123	2
	BNN TR-120-125-12C	120	288	138	2
	BNN TR-345-125-12C	345	828	363	2
160 mm	BNN TR-001-160-12C	1	4	12	1
	BNN TR-003-160-12C	3	10	14	1
	BNN TR-004-160-12C	4	12	15	1
	BNN TR-007-160-12C	7	20	18	1
	BNN TR-015-160-12C	15	45	29	2
	BNN TR-030-160-12C	30	90	44	2
	BNN TR-045-160-12C	45	135	59	2
	BNN TR-060-160-12C	60	181	74	2
	BNN TR-075-160-12C	75	226	89	2
	BNN TR-090-160-12C	90	271	104	2
	BNN TR-105-160-12C	105	316	119	2
	BNN TR-120-160-12C	120	361	134	2
	BNN TR-180-160-12C	180	543	194	2
250 mm	BNN TR-001-250-12C	1	4	9	1
	BNN TR-002-250-12C	2	10	10	1
	BNN TR-004-250-12C	4	20	12	1
	BNN TR-015-250-12C	15	69	25	2
	BNN TR-030-250-12C	30	137	40	2
	BNN TR-045-250-12C	45	206	55	2
	BNN TR-060-250-12C	60	275	70	2
	BNN TR-075-250-12C	75	343	85	2
	BNN TR-090-250-12C	90	412	100	2
	BNN TR-105-250-12C	105	481	115	2
	BNN TR-120-250-12C	120	549	130	2
	BNN TR-135-250-12C	135	618	145	2
	BNN TR-150-250-12C	150	687	160	2
	BNN TR-165-250-12C	165	756	175	2
	BNN TR-180-250-12C	180	824	190	2
	BNN TR-225-250-12C	225	1030	235	2
	BNN TR-240-250-12C	240	1099	250	2
	BNN TR-255-250-12C	255	1065	265	2
	BNN TR-270-250-12C	270	1236	280	2
	BNN TR-315-250-12C	315	1442	325	2
	BNN TR-345-250-12C	345	1579	355	2

Ordering example:
BNN UR-030-125-12C

BNL TR-_ _ _-_ _ _-12C



Type	BEN IR
Cam	BNL TRN
Switch	602-11, 605-11, 610-11, 611-11, 612-11, 613-11



T-slot Installation:
BEN IR cams use channel locks. As the screw is tightened, the lock is raised to the T-flange and conforms to the drum.

Replacement Channel Lock without Screw
BEN IRNU-1202

Note:
Cams used in safety applications must be permanently secured to the cam drum.

BEN style cams are intended for non-contact operations of inductive sensors only. Misapplications for use as trip cams for mechanical limit switches will result in extremely rapid wear and failure.

Material:
Mild solid steel, Oxide coated.

Dimensions in mm.

Additional radii and swept angles available on requst (quantities may be required).

See ordering example on bottom of page 14.7.

Nominal Radius	Part number	Swept angle (°)	Arc length (mm)	Style
40 mm	BEN IR-004-040-12	4	4	1
	BEN IR-010-040-12	10	10	2
	BEN IR-015-040-12	15	14	2
	BEN IR-030-040-12	30	28	2
	BEN IR-045-040-12	45	41	3
	BEN IR-060-040-12	60	55	3
	BEN IR-075-040-12	75	69	3
	BEN IR-090-040-12	90	83	3
50 mm	BEN IR-004-050-12	4	4	1
	BEN IR-009-050-12	9	10	2
	BEN IR-015-050-12	15	16	2
	BEN IR-030-050-12	30	33	2
	BEN IR-045-050-12	45	49	3
	BEN IR-060-050-12	60	65	3
	BEN IR-075-050-12	75	82	3
	BEN IR-090-050-12	90	98	3
75 mm	BEN IR-003-075-12	3	4	1
	BEN IR-007-075-12	7	10	2
	BEN IR-015-075-12	15	23	2
	BEN IR-030-075-12	30	46	2
	BEN IR-045-075-12	45	69	3
	BEN IR-060-075-12	60	92	3
	BEN IR-075-075-12	75	114	3
	BEN IR-090-075-12	90	137	3
100 mm	BEN IR-003-100-12	3	4	1
	BEN IR-005-100-12	5	10	2
	BEN IR-010-100-12	10	20	2
	BEN IR-015-100-12	15	29	2
	BEN IR-030-100-12	30	56	2
	BEN IR-045-100-12	45	88	3
	BEN IR-060-100-12	60	118	3
	BEN IR-075-100-12	75	147	3
	BEN IR-090-100-12	90	177	3
	BEN IR-105-100-12	105	206	3
	BEN IR-120-100-12	120	236	3

Nominal Radius	Part Number	Swept angle (°)	Arc length (mm)	Style
125 mm	BEN IR-002-125-12	2	4	1
	BEN IR-004-125-12	4	10	2
	BEN IR-009-125-12	9	20	2
	BEN IR-015-125-12	15	36	2
	BEN IR-030-125-12	30	72	3
	BEN IR-045-125-12	45	108	3
	BEN IR-060-125-12	60	144	3
	BEN IR-075-125-12	75	180	3
	BEN IR-090-125-12	90	216	3
	BEN IR-105-125-12	105	252	3
	BEN IR-120-125-12	120	288	3
160 mm	BEN IR-001-160-12	1	4	1
	BEN IR-003-160-12	3	10	2
	BEN IR-007-160-12	7	20	2
	BEN IR-015-160-12	15	45	2
	BEN IR-030-160-12	30	90	2
	BEN IR-045-160-12	45	135	3
	BEN IR-060-160-12	60	181	3
	BEN IR-075-160-12	75	226	3
	BEN IR-090-160-12	90	271	3
	BEN IR-105-160-12	105	316	3
	BEN IR-120-160-12	120	361	3
250 mm	BEN IR-001-250-12	1	4	2
	BEN IR-002-250-12	2	10	2
	BEN IR-004-250-12	4	20	3
	BEN IR-015-250-12	15	69	3
	BEN IR-030-250-12	30	137	3
	BEN IR-045-250-12	45	206	3
	BEN IR-060-250-12	60	275	3
	BEN IR-075-250-12	75	343	3
	BEN IR-090-250-12	90	412	3
	BEN IR-105-250-12	105	481	3
	BEN IR-120-250-12	120	549	3

Ordering example:

BNL IR-_ _ _-_ _ _-12

- Radial T-slot inductive cams
- Swept angle
- Cam Radius
- For 12 mm plunger spacing, slot width 6mm, inductive, non-contact

Robot Zone Limit

Segmented cam kits are designed to be used in a complementary, redundant zone limit system. The kit includes one 180° cam segment, one 90° cam segment, one 45° degree cam segment, and three 15° cam segments. By attaching different combinations of cam segments together, two complementary cam sets can be created. The arc lengths of the two cam sets cam be varied in increments of 15°. Below are the complementary cam sets that can be created.

Complementary Angles	Cam Set One	Cam Set Two
180°/180°	180°	90°, 45°, 15°, 15°, 15°
195°/165°	180°, 15°	90°, 45°, 15°, 15°
210°/150°	180°, 15°, 15°	90°, 45°, 15°
225°/135°	180°, 45°	90°, 15°, 15°, 15°
240°/120°	180°, 45°, 15°	90°, 15°, 15°
255°/105°	180°, 45°, 15°, 15°	90°, 15°
270°/90°	180°, 90°	45°, 15°, 15°, 15°
285°/75°	180°, 90°, 15°	45°, 15°, 15°
300°/60°	180°, 90°, 15°, 15°	45°, 15°
315°/45°	180°, 90°, 45°	15°, 15°, 15°
330°/30°	180°, 90°, 45°, 15°	15°, 15°
345°/15°	180°, 90°, 45°, 15°, 15°	15°

Segmented Mechanical Cam Kit Package Contents

Description	Quantity
Cam segment, 180°	1 (not sold separately)
Cam segment, 90°	1 (not sold separately)
Cam segment, 45°	1 (not sold separately)
Cam segment, 15°	3 (not sold separately)
End ramp assembly	4
Connector	5
M3x8 socket head screw	10
M4x20 self-tapping screw	2
1.5 mm hex wrench	1
2.5 mm hex wrench	1
3.0 mm hex wrench	1

Note:

Due to manufacturing processes, cam sets with radii larger than 450 mm will have three 90° segments

Replacement Parts:

Connector – Z/Connector-segmented cam (312735)
T-slot end ramp – BNN TRE-250-12
U-slot end ramp – BNN URE-250-12
M3x8 screw – Z/SCREW-M3x8-w/loctite (312736)
M4x20 screw – SCHNEIDSHR.D7513-M4x20ST.BE (718329)

Segmented Mechanical Cam Kits			
Part Number	**Inside Radius**	**Mounting Style**	**Cam Drum**
BNN 520-R250-360-T-SEG-KIT-C	250	T-Slot	
BNN 520-R260-360-U-SEG-KIT-C	250	U-Slot	
BNN 520-R350-360-U-SEG-KIT-C	342	U-Slot	BNL M710I-CAM-DRUM
BNN 520-R373-360-U-SEG-KIT-C	395	U-Slot	BNL 5304-120-06-R373-2000
BNN 520-R545-360-T-SEG-KIT-C	545	T-Slot	BNL LAH-12_ _-545-B-01
BNN 520-R545-360-U-SEG-KIT-C	545	U-Slot	BNL M410IB-CAM-DRUM-01
BNN 550-R379-S01-K01	250	T-Slot	BNL LAH-12_ _-250-B
BNN 550-R380-S00-K01	125	T-Slot	BNL LAH-12_ _-125-B
BNN 550-R381-S00-K01	395	T-Slot	BNL LAH-12_ _-395-B-01
BNN 550-R383-S03-K02	600	T-Slot	BNL LAH-12_ _-600-B-01
BNN 550-R385-S00-K01	280	T-Slot	
BNN 550-R390-S00-K01	450	T-Slot	BNL LAH-12_ _-450-B-01
BNN 550-R392-S00-K01	200	T-Slot	BNL LAH-12_ _-200-B-01
BNN 551-R391-S04-K03	160	U-Slot	BNL LAH-12_ _-160-B

SO_

Quantity of Segments In Set							
Set Number	**180° Segments**	**137.5° Segments**	**90° Segments**	**45° Segments**	**30° Segments**	**15° Segments**	**End Ramps**
S00	1		1	1		3	4
S01			3	1	1	1	6
S02	1		1	1		3	0
S03			3	1		3	4
S04		2					4

KO_

Components Included In Kit							
	Z/ALLEN-WRENCH-1.5MM	**HEX-WRENCH-2.0MM**	**HEX-WRENCH-2.5MM**	**HEX-WRENCH-3MM**	**Z/CONNEC-TOR-SEG-MENTED-CAM**	**Z/SCREW-M3-X-8-W/ LOCTITE**	**SCHNEIDSHR. D7513-M4X20 ST-BE**
Kit Number	**327086**	**326788**	**326783**	**311107**	**312735**	**312736**	**718329**
01		1	1	1	5	10	2
02	1	1	1	1	6	12	2
03					1	2	2

Robot Zone Limit
Segmented cam kits are designed to be used in a complementary, redundant zone limit system. The kit includes one 180° cam segment, one 90° cam segment, one 45° degree cam segment, and three 15° cam segments. By attaching different combinations of cam segments together, two complementary cam sets can be created. The arc lengths of the two cam sets can be varied in increments of 15°. Below are the complementary cam sets that can be created.

Complementary Angles	Cam Set One	Cam Set Two
180°/180°	180°	90°, 45°, 15°, 15°, 15°
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210°/150°	180°, 15°, 15°	90°, 45°, 15°
225°/135°	180°, 45°	90°, 15°, 15°, 15°
240°/120°	180°, 45°, 15°	90°, 15°, 15°
255°/105°	180°, 45°, 15°, 15°	90°, 15°
270°/90°	180°, 90°	45°, 15°, 15°, 15°
285°/75°	180°, 90°, 15°	45°, 15°, 15°
300°/60°	180°, 90°, 15°, 15°	45°, 15°
315°/45°	180°, 90°, 45°	15°, 15°, 15°
330°/30°	180°, 90°, 45°, 15°	15°, 15°
345°/15°	180°, 90°, 45°, 15°, 15°	15°

Segmented Non-Contact Cam Kit Package Contents

Description	Quantity
Cam segment, 180°	1 (not sold separately)
Cam segment, 90°	1 (not sold separately)
Cam segment, 45°	1 (not sold separately)
Cam segment, 15°	3 (not sold separately)
M4x20 screws	14
Special M4 nut	14
2.5 mm hex wrench	1

Note:
BEN style cams are intended for non-contact operations of inductive sensors only. Mis-applications for use as trip cams for mechanical limit switches will result in extremely rapid wear and failure.

Replacement Parts:
M4x20 screw – Z/SCREW-SHCS-M4-X-20-FH (317248)
M4 T-nut – NOCKENKOERPER-ROHTEIL 516-17 (149398)
Tamper proof label – Label Tamper Proof (167282)
Spanner screwdriver bit – Spanner BIT 1/4 Hex (167279)
Tamper proof spanner screw – SCREW Spanner M4X25 DIN 7167 (167208)

Segmented Inductive Cam Kit

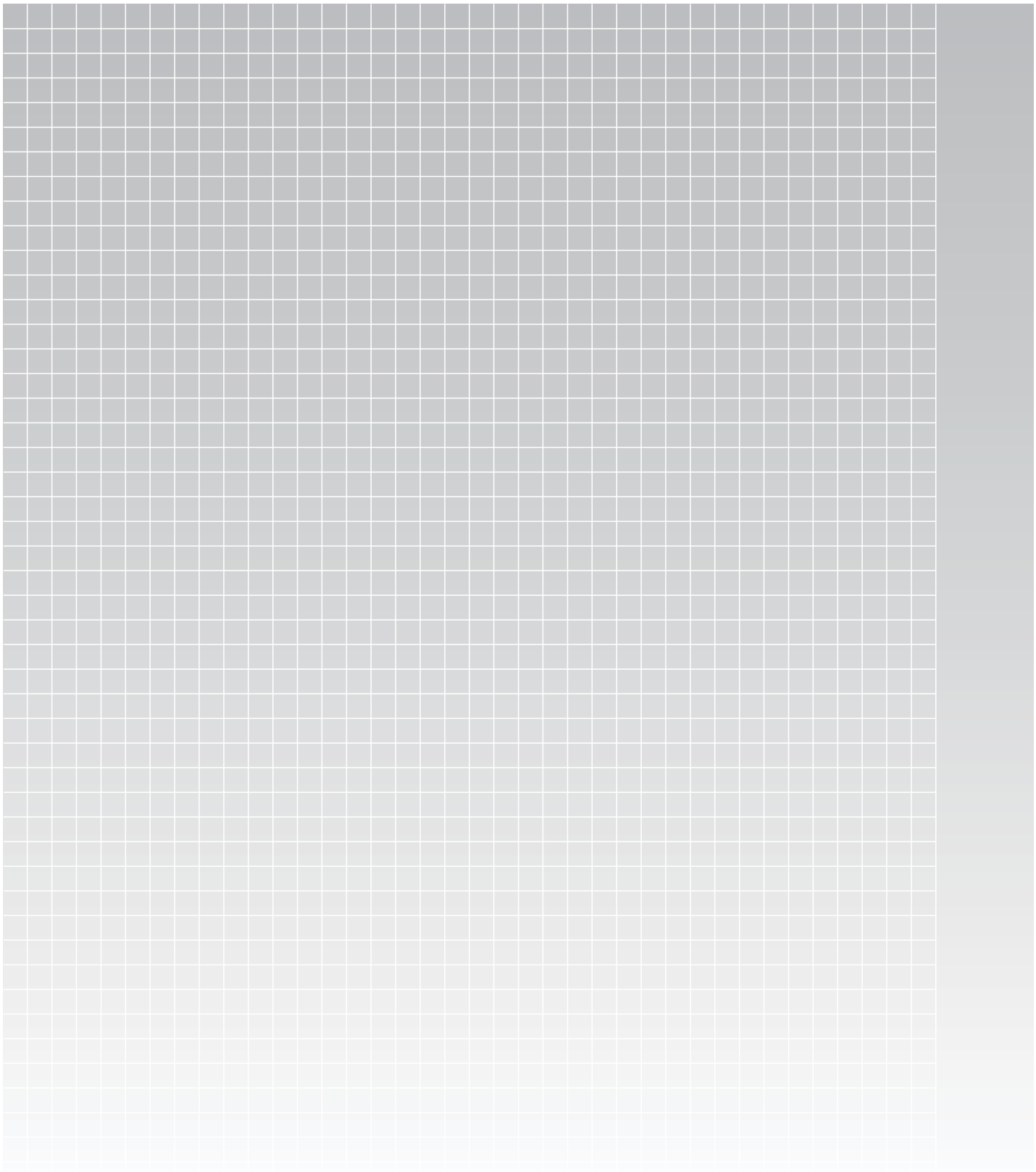
Segmented Non-Contact Cam Kits			
Part Number	**Inside Radius**	**Mounting Style**	**Cam Drum**
BEN 516-17-R210,0-S00-K01	200	T-Slot	BNL LAH-12_ _-200-B-01
BEN 516-17-R260,0-S00-K01	250	T-Slot	BNL LAH-12_ _-250-B
BEN 516-17-R290,0-S00-K01	280	T-Slot	
BEN 516-17-R405,0-S00-K01	395	T-Slot	BNL LAH-12_ _-395-B-01
BEN 516-17-R460,0-S00-K01	450	T-Slot	BNL LAH-12_ _-450-B-01
BEN 516-17-R555,0-S00-K01	545	T-Slot	BNL LAH-12_ _-545-B-01

SO_

Quantity of Segments In Set				
Set Number	**180° Segments**	**90° Segments**	**45° Segments**	**15° Segments**
S00	1	1	1	3

KO_

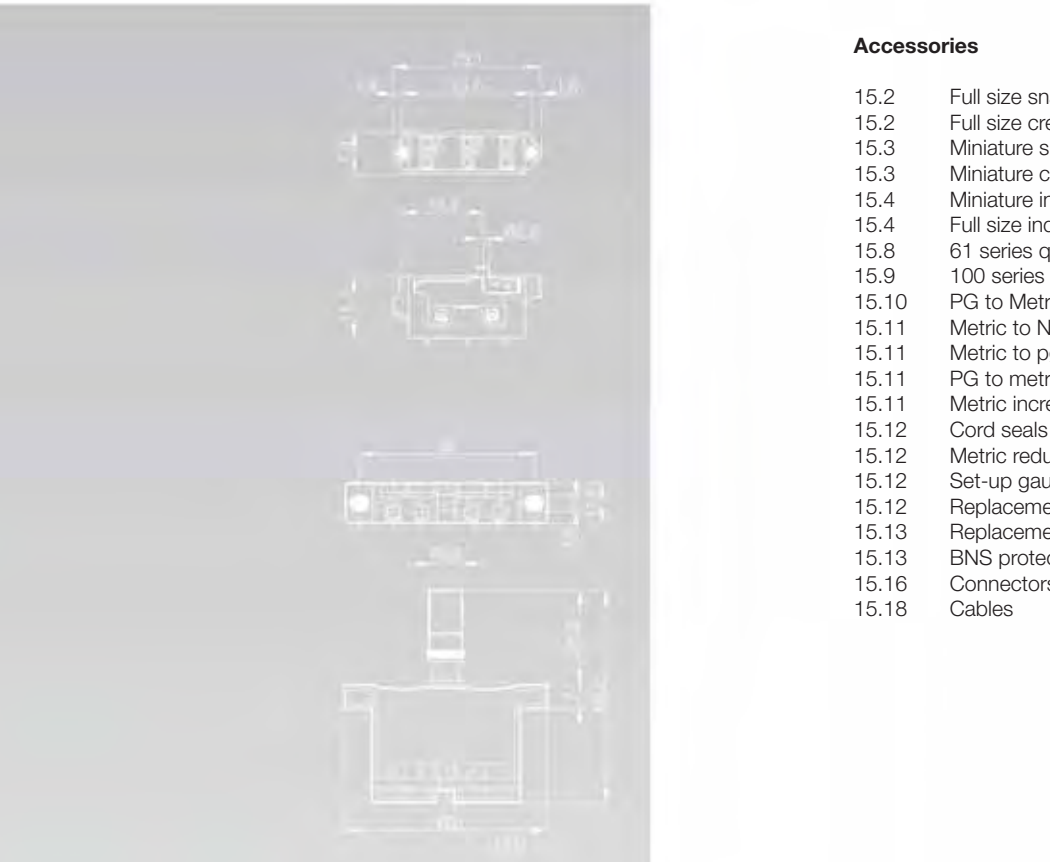
Components Included In Kit			
	HEX-WRENCH-2.5MM	**M4 T-Nut**	**Z/SCREW-SHCS-M4-X-20-FH**
Kit Number	**326783**	**149398**	**317248**
01	1	14	14
02			1
03			



Mechanical Switches
Contents

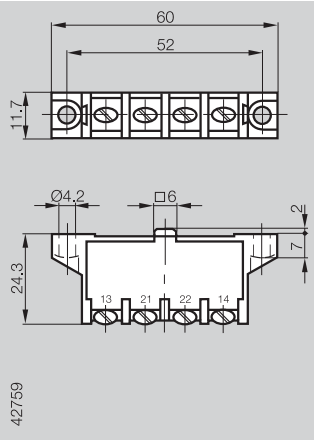
Accessories

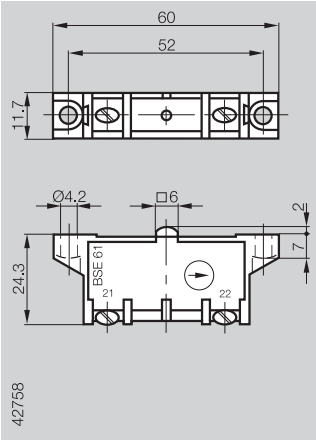
15.2	Full size snap switch elements
15.2	Full size creep switch elements
15.3	Miniature snap switch elements
15.3	Miniature creep switch elements
15.4	Miniature inductive switch elements
15.4	Full size inductive switch elements
15.8	61 series quick-change plunger blocks
15.9	100 series quick-change plunger blocks
15.10	PG to Metric cross reference
15.11	Metric to NPT adapter
15.11	Metric to pg adapters
15.11	PG to metric adapters
15.11	Metric increasers
15.12	Cord seals
15.12	Metric reducers
15.12	Set-up gauges
15.12	Replacement plungers
15.13	Replacement wiper plates
15.13	BNS protective cover
15.16	Connectors
15.18	Cables

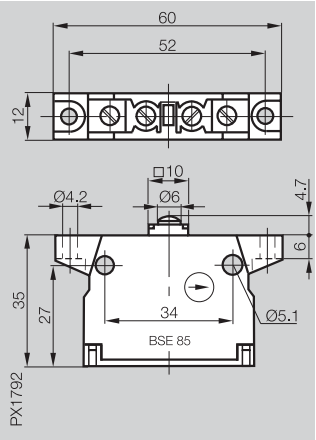


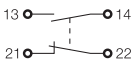
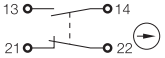
Type	Snap switch element BSE 30.0	Creep switch element BSE 61 to DIN EN 60204-1	Snap switch element BSE 85 to DIN EN 60204-1
for multiple position switches series	100, 62, 61, 72	100, 62, 61, 72	100, 62, 61, 72
for single position switches series	F 60	F 60	F 60

CE

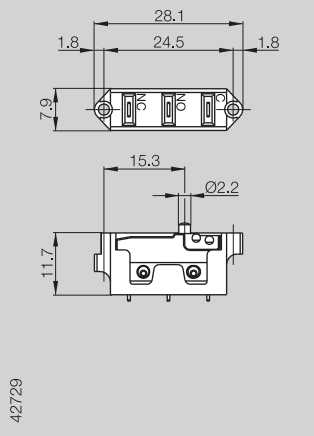
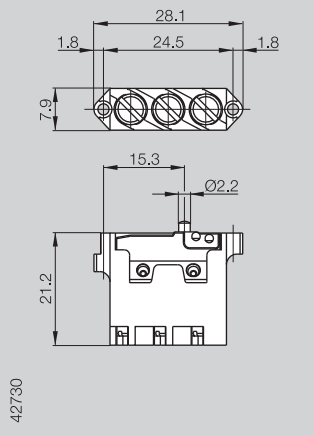
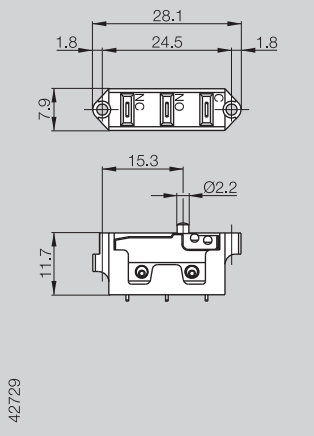
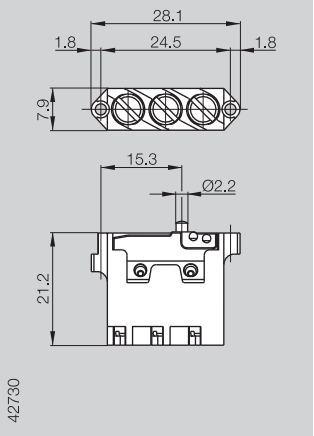
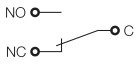
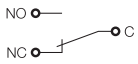
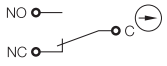
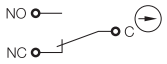




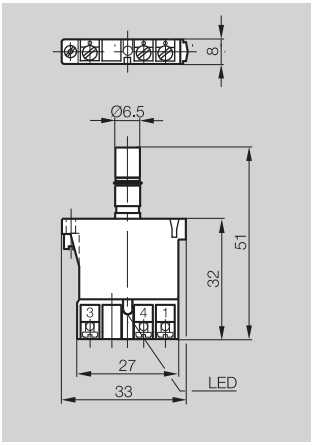


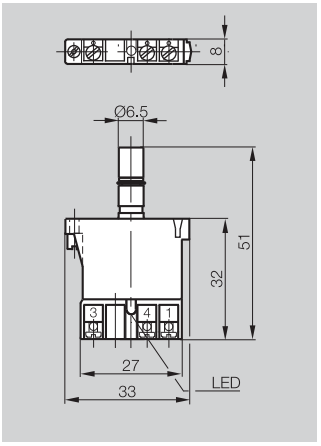
Part number	BSE 30.0-RK	BSE 61-RK	BSE 85-RK
Construction			
Contact material	**Silver, gold plated**	**Silver**	**Silver**
Switching principle	Snap switch	Creep switch, positive-opening	Snap switch, positive opening (normally-closed)
Contact system	Dual changeover, one normally open and one normally closed, galvanically isolated	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 AWG	2 x 16 AWG	2 x 16 AWG	2 x 16 AWG
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	Group C (VDE 0110)	Group C (VDE 0110)	Group C (VDE 0110)
Isolation	240 V AC	250 V AC	250 V AC
Nominal voltage	6 A	6 A	6 A
Constant current	≥ 20 mA	≥ 20 mA	≥ 20 mA
Minimum load at 24 V DC	< 40 mΩ	< 40 mΩ	< 40 mΩ
Contact resistance	6 A, cos φ = 1		
Switching capacity AC 250 V 40...60 Hz	2 A, cos φ = 0.8	Depends on traverse speed and switching frequency	2 A, cos φ = 0.8
220 V	1 A, cos φ = 0.4		
DC 24 V	0.5 A, L/R = 200 ms		
	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	CSA	cULus, CSA

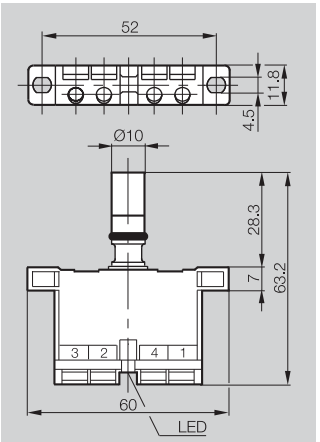
Note: Positive opening contact for safety applications. May only be operated with a rigid plunger.

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
			
BSE 69.1-RK BSE 73.1-RK	BSE 70.1-RK BSE 74.1-RK	BSE 63-RK	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 
18	18	18	18
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
		5 A, cos φ = 0.75	5 A, cos φ = 0.75
2 A, cos φ = 0.8	2 A, cos φ = 0.8		
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	UL, CSA	cULus, CSA	cULus, CSA

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



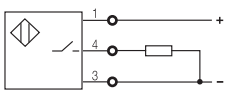




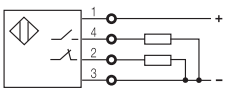
Part number			
PNP/NO	BES 517-312-Y-RK		
PNP/Complementary			BES 517-110-RK
NPN/NO		BES 517-311-Y-RK	
NPN/Complementary			
Rated operational voltage U_e	24 V DC	24 V DC	24 V DC
Supply voltage U_B	10...30 V DC	10...30 V DC	10...60 V DC
Voltage drop U_d at I_e static	≤ 3.5 V	≤ 3.5 V	≤ 1.5 V
Rated insulation 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
Wire AWG	18	18	16

Wiring diagrams

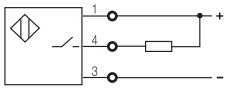
PNP, normally open



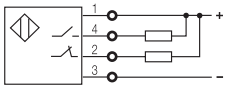
PNP, complementary

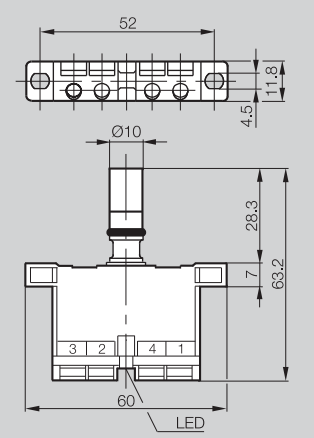
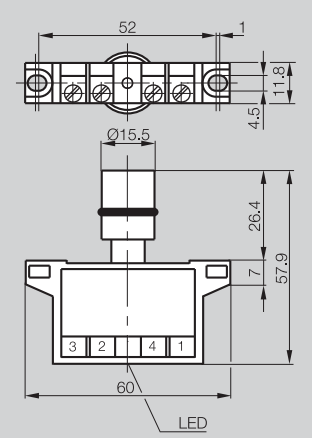
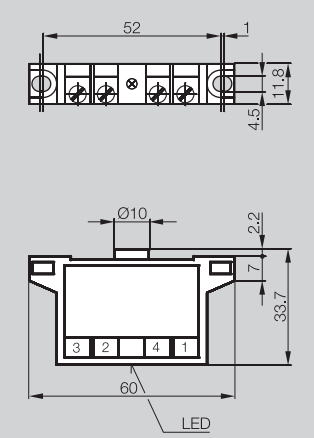


NPN, normally closed

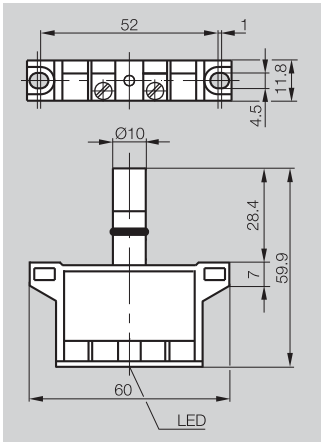


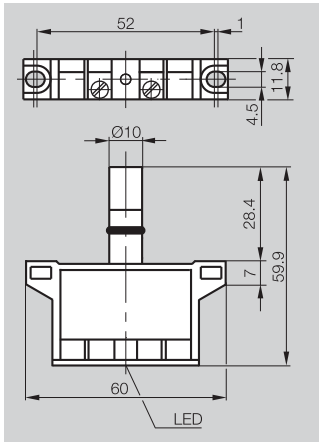
NPN, complementary

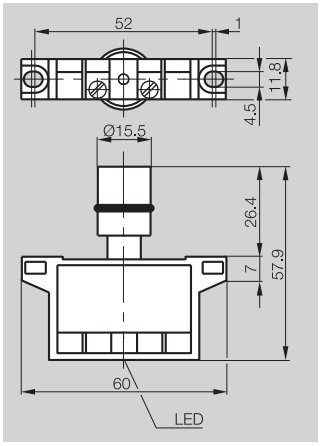


NA	THA	DH
2 mm	**5 mm**	**2, 2 mm**
0...1.6 mm	0...4 mm	0...1.8 mm
602, 610...613, 60	602, 611, 613, 605	100, 62, 72, 61
		
BES 517-108-RK	BES 517-142-Y-RK	BES 516-110-D-RK
24 V DC	24 V DC	24 V DC
10...60 V DC	10...30 V DC	10...30 V DC
≤ 1.5 V	≤ 3.5 V	≤ 1.2 V
75 V DC	75 V DC	75 V DC
200 mA	130 mA	400 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
16	14	14

Code for inductive switch elements	**WS**	**WO**	**EJA**
Rated operating distance sn	**2 mm**	**2 mm**	**5 mm**
Assured operating distance sa	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



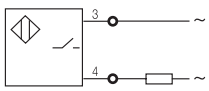




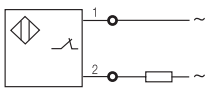
for replacement switch elements			
AC/NO	BES 517-410-RK		BES 517-463-RK
AC/NC		BES 517-421-RK	
DC/NO			
DC/NC			
NAMUR			
Rated operational voltage U_e	110 V AC	110 V AC	220 V AC
Supply voltage U_B	35...250 V AC	35...250 V AC	90...250 V AC
Voltage drop Ud at Ie static	≤ 8.5 V	≤ 8.5 V	≤ 8.5 V
Rated insulation 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
Wire AWG	14	14	14
Approval	cULus	cULus	cULus

Wiring diagrams

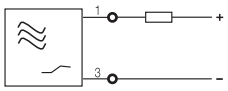
AC, NO



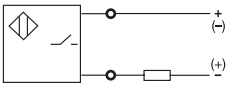
AC, NC



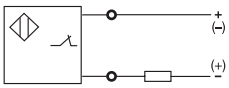
NAMUR

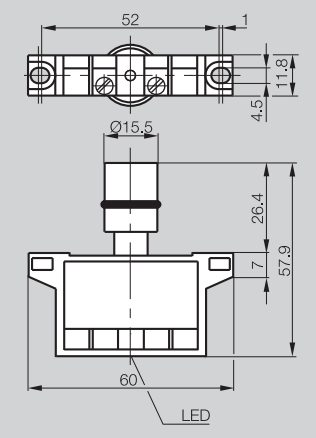
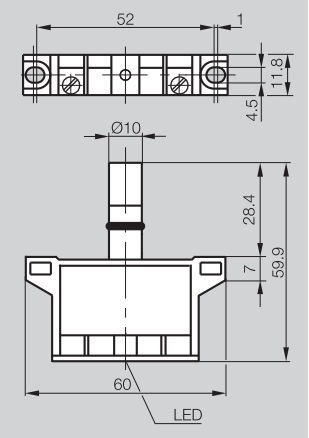
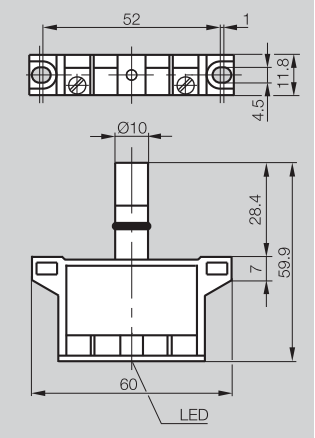
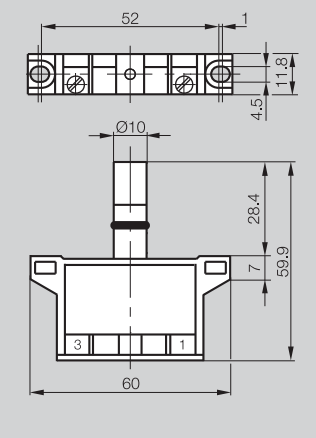


DC, NO



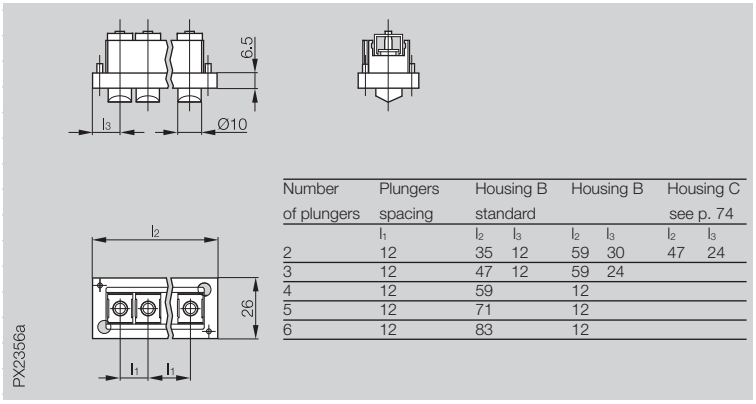
DC, NC



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
			
BES 517-464-RK	BES 517-560-H-RK	BES 517-561-H-RK	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
14	14	14	14
cULus			

*Output signal:	Current change (no trigger response)
Fully undamped	≥ 4 mA
Fully damped	≤ 1 mA
Permissible series resistance R_V	550...1100 Ohm

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



Number of plungers	Plungers spacing	Housing B standard		Housing B		Housing C see p. 74	
	l_1	l_2	l_3	l_2	l_3	l_2	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			

Part Number	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

Note!

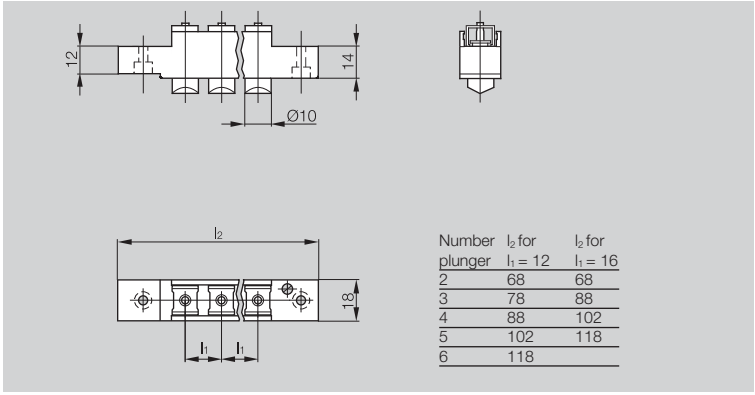
Safety switch positions to DIN EN 60204-1/VDE 0113 may only be operated with a rigid plunger.

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	

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	

Part Number	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		

Note!

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

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			

Mechanical Multiple Positon Switches						
Switch housing		**Threaded Opening**		**Adapters**	**Ordering Code**	
		Old	New	Old (Female PG) to New (Male Metric)	Old	New
40		PG9	M16	BKV-819-M16/P09	BNS 519-B_ _ - _ 08-40-_ _	BNS 819-B_ _ - _ 08-40-_ _
46		PG11	M16	BKV-819-M16/P11	BNS 519-B_ _ - _ _ _-46-_ _	BNS 819-B_ _ - _ _ _-46-_ _
61		PG13.5	M20	BKV-819-M20/P13	BNS 543-B_ _ - _ _ _-61-_ _	BNS 819-B_ _ - _ _ _-61-_ _
62		PG16	M20	BKV-819-M20/P16	BNS 519-B_ _ - _ _ _-62-_ _	BNS 819-B_ _ - _ _ _-62-_ _
72	2 plungers	PG16	M25	BKV-819-M25/P16	BNS 542-B_ _ - _ _ _-72-_ _	BNS 819-B_ _ - _ _ _-72-_ _
72	3 or more plungers	PG21	M25	BKV-819-M25/P21	BNS 542-B_ _ - _ _ _-72-_ _	BNS 819-B_ _ - _ _ _-72-_ _
100	2 - 5 plungers	PG16	M25	BKV-819-M25/P16	BNS 519-B_ _ - _ _ _-100-_ _	BNS 819-B_ _ - _ _ _-100-_ _
100	6 or more plungers	PG21	M25	BKV-819-M25/P21	BNS 519-B_ _ - _ _ _-100-_ _	BNS 819-B_ _ - _ _ _-100-_ _

Inductive Multiple Positon Switches						
Switch housing		**Threaded Opening**		**Adapters**	**Ordering Code**	
		Old	New	Old (Female PG) to New (Male Metric)	Old	New
602-11	2 - 5 plungers	PG16	M25	BKV-819-M25/P16	BNS 516-B_ _ - _ _ _-12-602-11	BNS 816-B_ _ - _ _ _-12-602-11
602-11	6 or more plungers	PG21	M25	BKV-819-M25/P21	BNS 516-B_ _ - _ _ _-12-602-11	BNS 816-B_ _ - _ _ _-12-602-11
603-11		PG11	M16	BKV-819-M16/P11	BNS 516-B_ _ - _ _ _-12-603-11	BNS 816-B_ _ - _ _ _-12-603-11
605-11	2 plungers	PG16	M25	BKV-819-M25/P16	BNS 516-B_ _ - _ _ _-12-605-11	BNS 816-B_ _ - _ _ _-12-605-11
605-11	3 or more plungers	PG21	M25	BKV-819-M25/P21	BNS 516-B_ _ - _ _ _-12-605-11	BNS 816-B_ _ - _ _ _-12-605-11
610-11		PG13.5	M20	BKV-819-M20/P13	BNS 516-B_ _ - _ _ _-12-610-11	BNS 816-B_ _ - _ _ _-12-610-11
611-11		PG13.5	M20	BKV-819-M20/P13	BNS 516-B_ _ - _ _ _-12-611-11	BNS 816-B_ _ - _ _ _-12-611-11
612-11		PG13.5	M20	BKV-819-M20/P13	BNS 516-B_ _ - _ _ _-12-612-11	BNS 816-B_ _ - _ _ _-12-612-11
613-11		PG13.5	M20	BKV-819-M20/P13	BNS 516-B_ _ - _ _ _-12-613-11	BNS 816-B_ _ - _ _ _-12-613-11
650-11		PG9	M16	BKV-819-M16/P09	BNS 516-B_ _ - _ 08-650-11	BNS 816-B_ _ - _ 08-650-11

Mechanical Single Positon Switches					
Switch housing	**Threaded Opening**		**Adapters**	**Ordering Code**	
	Old	New	Old (Female PG) to New (Male Metric)	Old	New
99	PG7	M12	BKV-819-M12/P07	BNS 519-99-_ _-_ _	BNS 819-99-_ _-_ _
100	PG9	M16	BKV-819-M16/P09	BNS 519-100-_ _-_ _	BNS 819-100-_ _-_ _
F 60	PG9	M16	BKV-819-M16/P09	BNS 519-F _-60-_ _ _	BNS 819-F _-60-_ _ _

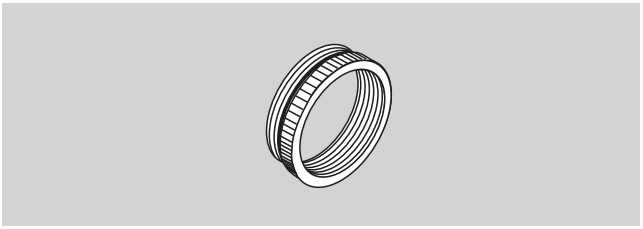
Accessory Type	Metric to NPT Adapter Converts metric threaded opening in BNS switch to NPT threaded conduit fiiting
Male M16 to Female 1/2"NPT	Z/M16-M-TO-1/2"-F-NPT
Male M20 to Female 1/2"NPT	Z/M20-M-TO-1/2"-F-NPT
Male M25 to Female 3/4"NPT	Z/M25-M-TO-3/4"-F-NPT
Material	Nickel-Plated Brass

Accessory Type	Metric to PG Adapter Converts metric threaded opening in BNS switch to PG threaded conduit fiiting
Male M12 to Female PG 07	BKV 819-M12/P07
Male M16 to Female PG 09	BKV 819-M16/P09
Male M16 to Female PG 11	BKV 819-M16/P11
Male M20 to Female PG 13	BKV 819-M20/P13
Male M20 to Female PG 16	BKV 819-M20/P16
Male M25 to Female PG 16	BKV 819-M25/P16
Male M25 to Female PG 21	BKV 819-M25/P21
Material	Nickel-Plated Brass O-Ring Included

Accessory Type	PG to Metric Adapter Converts PG threaded opening to metric conduit fittings
Male PG 07 to Female M12	BKV 819-P07/M12
Male PG 09 to Female M16	BKV 819-P09/M16
Male PG 11 to Female M16	BKV 819-P11/M16
Male PG 13 to Female M20	BKV 819-P13/M20
Male PG 16 to Female M20	BKV 819-P16/M20
Male PG 16 to Female M25	BKV 819-P16/M25
Male PG 21 to Female M25	BKV 819-P21/M25
Material	Nickel-Plated Brass O-Ring Included

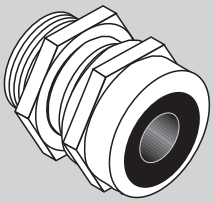
Accessory Type	Metric Increasers Increases the metric opening in the BNS switch
Male M12 to Female M16	BKV 819-M12/M16
Male M16 to Female M20	BKV 819-M16/M20
Male M20 to Female M25	BKV 819-M20/M25
Material	Nickel-Plated Brass O-Ring Included

Accessory Type	Metric Reducers Decreases the metric opening in the BNS switch



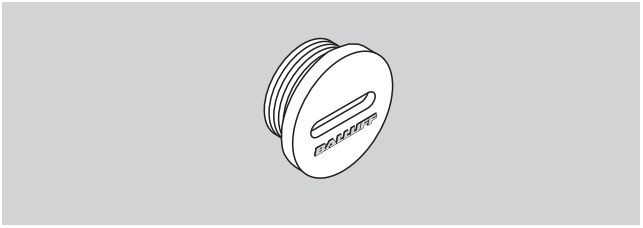
Male M16 to Female M12	BKV 819-M16/M12
Male M20 to Female M12	BKV 819-M20/M12
Male M20 to Female M16	BKV 819-M20/M16
Male M25 to Female M16	BKV 819-M25/M16
Male M25 to Female M20	BKV 819-M25/M20
Material	Nickel-Plated Brass O-Ring Included

Accessory Type	Cord Seal Metric threads Viton form seal and O-ring 150 PSI



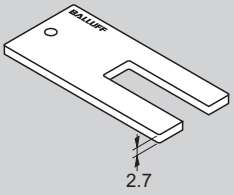
M12 Cable Range 2 - 5 mm	BKV 820-M12/2-5-01-M
M16 Cable Range 4 - 8 mm	BKV 820-M16/4-8-01-M
M16 Cable Range 5-10 mm	BKV 820-M16/5-10-03-M
M20 Cable Range 7 - 12 mm	BKV 820-M20/7-12-01-M
M20 Cable Range 10 - 14 mm	BKV 820-M20/10-14-01-M
M25 Cable Range 9 - 16 mm	BKV 820-M25/9-16-01-M
M25 Cable Range 13 - 18 mm	BKV 820-M25/13-18-01-M
M32 Cable Range 13 - 20 mm	BKV 820-M32/13-20-01-M
Material	Nickel-Plated Brass PVDF Spline Bushing

Accessory Type	Sealing Cap Plastic metric threaded sealing cap Supplied with O-Ring



M16 Plastic Cap	VERSCHLUSSSCHR. KPL. M16X1,5
M20 Plastic Cap	VERSCHLUSSSCHR. KPL. M20X1,5
M25 Plastic Cap	VERSCHLUSSSCHR. KPL. M25X1,5
Material	Plastic O-Ring Included

Accessory Type	BNS Set Up Gauge Used to set distance between BNS switch face and cams

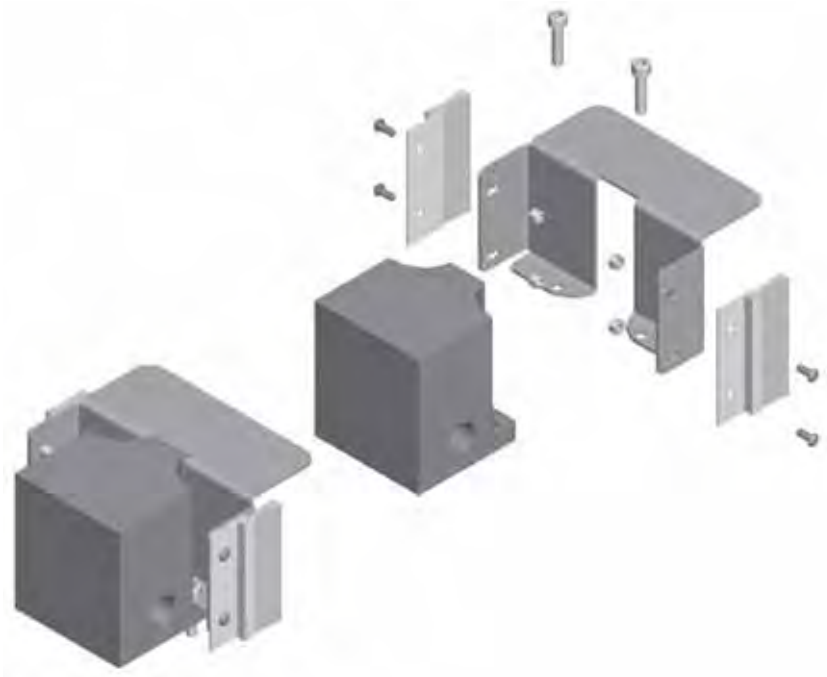


BSE-85 Elements	BNL Z/GAUGE-X508
BSE-30 & BSE 61 Elements	BNL GAUGE-100-3MM
Inductive Switches with 3.2 mm assured sensing distance	GAGE BAM-AC-NS 127. x25.4x1.60 ALU
Material	Steel Aluminum

Accessory Type	Replacement Plungers Stainless steel plungers Telescoping style for standard switches Rigid style for safety switches

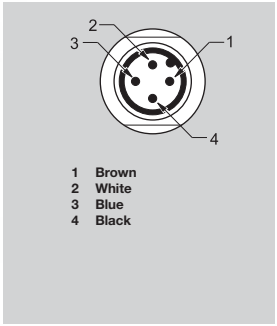
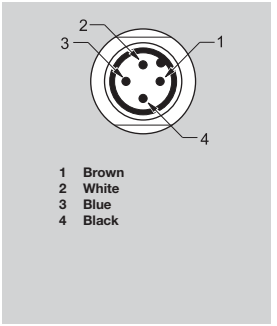
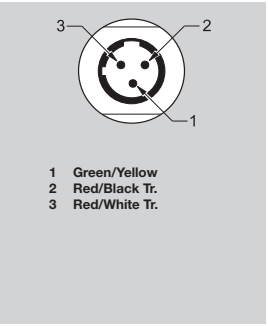
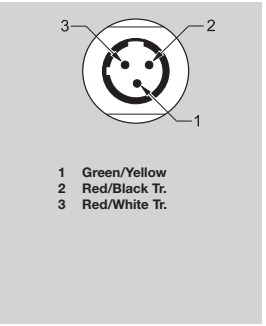
D - Rigid Chisel Plunger (813 or 823) - Safety	STOESSELEINHEIT KPL. D10 813
D - Telescoping Chisel Plunger (819 or 829) - Standard	STOESSELEINHEIT KPL. D10 819
K - Rigid Ball Plunger (813 or 823) - Safety	STOESSELEINHEIT KPL. K10 813
K - Telescoping Ball Plunger (819 or 829) - Standard	STOESSELEINHEIT KPL. K10 819
L - Rigid Roller Bearing Plunger (813 or 823) - Safety	STOESSELEINHEIT KPL. L10 813
L - Telescoping Roller Bearing Plunger (819 or 829) - Standard	STOESSELEINHEIT KPL. L10 819
R - Rigid Roller Plunger (813 or 823) - Safety	STOESSELEINHEIT KPL. R10 813
R - Telescoping Roller Plunger (819 or 829) - Standard	STOESSELEINHEIT KPL. R10 819

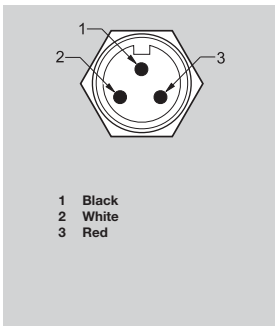
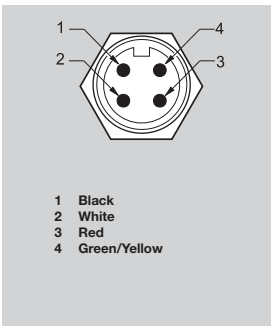
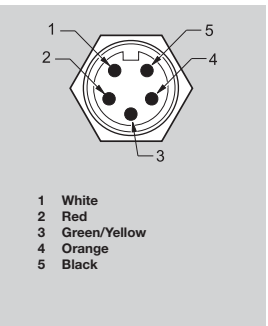
Accessory Type	Replacement Wiper Plate includes plate and mounting screws
	
Wiper Plate	
10 mm plunger	ABSTREIFPLATTE KPL. F. STOESSEL E10 NEU
8 mm plunger	ABSTREIFPLATTE KPL. F. STOESSEL E6 NEU

Accessory Type	BNS Protection Cover for 4 and 6 Position 61 and 100 Series Provide additional protection for mechanical and inductive switches in harsh environments. Brass brushes rub against cams to help remove foreign debris.
	
4 position 61 series	BAM SH-NS-61-V1-04
6 position 61 series	BAM SH-NS-61-V1-06
4 position 100 series	BAM SH-NS-100-V1-04
6 position 100 series	BAM SH-NS-100-V1-06
Brush Replacement Kits	
4 position brush	BAM SH-NS-V1-RK2-48mm
6 position brush	BAM SH-NS-V1-RK2-72mm
Brush Holder and Brush Replacement Kits	
4 position	BAM SH-NS-V1-RK1-48mm
6 position	BAM SH-NS-V1-RK1-72mm

BNS Switches With Number of Pre-Wired Connectors										
	X#### Unique Part Number Assigned By Factory		Number of Connectors Required							
Switch Housing Series	Connector Suffix	Connector Description	Number of Switch Positions							
			2	3	4	5	6	8	10	12
40 / 650-11 Series	S80	5 Pole Dual Keyway Connector without LED	1	1	2	2	2			
	S80	5 Pole Dual Keyway Connector with LED	1	2	2					
	S72	5 Pole Center Pin Ground Connector without LED	1	1	2	2	2			
	S72	5 Pole Center Pin Ground Connector with LED	1	2	2					
	X ####	8 Pole Connector without LED	1	1	1	1	1			
	X ####	8 Pole Connector with LED	1	1	1	1	2			
	X ####	9 Pole Connector without LED	1	1	1	1	1			
	X ####	9 Pole Connector with LED	1	1	1	1	2			
	S90	12 Pole Connector without LED	1	1	1	1	1			
	S90	12 Pole Connector with LED	1	1	1	1	1			
46 / 603-11 Series	S80	5 Pole Dual Keyway Connector without LED	1	1	2	2	2			
	S80	5 Pole Dual Keyway Connector with LED	1	2	2					
	S72	5 Pole Center Pin Ground Connector without LED	1	1	2	2	2			
	S72	5 Pole Center Pin Ground Connector with LED	1	2	2					
	X ####	8 Pole Connector without LED	1	1	1	1	1	2	2	
	X ####	8 Pole Connector with LED	1	1	1	1	2	2	2	
	X ####	9 Pole Connector without LED	1	1	1	1	1	2	2	
	X ####	9 Pole Connector with LED	1	1	1	1	2	2	2	
	S90	12 Pole Connector without LED	1	1	1	1	1	1	1	
	S90	12 Pole Connector with LED	1	1	1	1	1	2	2	
61 / 610-11 / 611-11 / 612-11 / 613-11 Series	S80	5 Pole Dual Keyway Connector without LED	1	1	2	2	2			
	S80	5 Pole Dual Keyway Connector with LED	1	2	2					
	S72	5 Pole Center Pin Ground Connector without LED	1	1	2	2	2			
	S72	5 Pole Center Pin Ground Connector with LED	1	2	2					
	X ####	8 Pole Connector without LED	1	1	1	1	1			
	X ####	8 Pole Connector with LED	1	1	1	1	2			
	X ####	9 Pole Connector without LED	1	1	1	1	1			
	X ####	9 Pole Connector with LED	1	1	1	1	2			
	S90	12 Pole Connector without LED	1	1	1	1	1			
	S90	12 Pole Connector with LED	1	1	1	1	1			
	X ####	19 Pole Connector without LED	1	1	1	1	1			
	X ####	19 Pole Connector with LED	1	1	1	1	1			
	X####	24 Pin Harting DD Connector with LED	1	1	1	1	1			
	X####	24 Pin Harting DD Connector without LED	1	1	1	1	1			
	X####	32 Pin Harting EE Connector with LED	1	1	1	1	1			
	X####	32 Pin Harting EE Connector without LED	1	1	1	1	1			

BNS Switches With Number of Pre-Wired Connectors										
	X#### Unique Part Number Assigned By Factory		Number of Connectors Required							
Switch Housing Series	Connector Suffix	Connector Description	Number of Switch Positions							
			2	3	4	5	6	8	10	12
62 / 72 / 605-11 Series	S80	5 Pole Dual Keyway Connector without LED	1	1	2	2	2			
	S80	5 Pole Dual Keyway Connector with LED	1	2	2					
	S72	5 Pole Center Pin Ground Connector without LED	1	1	2	2	2			
	S72	5 Pole Center Pin Ground Connector with LED	1	2	2					
	X ####	8 Pole Connector without LED	1	1	1	1	1	2	2	
	X ####	8 Pole Connector with LED	1	1	1	1	2	2	2	
	X ####	9 Pole Connector without LED	1	1	1	1	1	2	2	
	X ####	9 Pole Connector with LED	1	1	1	1	2	2	2	
	S90	12 Pole Connector without LED	1	1	1	1	1	1	1	
	S90	12 Pole Connector with LED	1	1	1	1	1	2	2	
	X ####	19 Pole Connector without LED	1	1	1	1	1	1	1	
	X ####	19 Pole Connector with LED	1	1	1	1	1	1	1	
	X####	24 Pin Harting DD Connector with LED	1	1	1	1	1	1	1	
	X####	24 Pin Harting DD Connector without LED	1	1	1	1	1	1	1	
	X####	32 Pin Harting EE Connector with LED	1	1	1	1	1	1	1	
	X####	32 Pin Harting EE Connector without LED	1	1	1	1	1	1	1	
100 / 602-11 Series	S80	5 Pole Dual Keyway Connector without LED	1	1	2	2	2			
	S80	5 Pole Dual Keyway Connector with LED	1	2	2					
	S72	5 Pole Center Pin Ground Connector without LED	1	1	2	2	2			
	S72	5 Pole Center Pin Ground Connector with LED	1	2	2					
	X ####	8 Pole Connector without LED	1	1	1	1	1	2	2	2
	X ####	8 Pole Connector with LED	1	1	1	1	2	2	2	
	X ####	9 Pole Connector without LED	1	1	1	1	1	2	2	2
	X ####	9 Pole Connector with LED	1	1	1	1	2	2	2	
	S90	12 Pole Connector without LED	1	1	1	1	1	1	1	2
	S90	12 Pole Connector with LED	1	1	1	1	1	1	2	2
	X ####	19 Pole Connector without LED	1	1	1	1	1	1	1	1
	X ####	19 Pole Connector with LED	1	1	1	1	1	1	1	1
	X####	24 Pin Harting DD Connector with LED	1	1	1	1	1	1	1	1
	X####	24 Pin Harting DD Connector without LED	1	1	1	1	1	1	1	1
	X####	32 Pin Harting EE Connector with LED	1	1	1	1	1	1	1	1
	X####	32 Pin Harting EE Connector without LED	1	1	1	1	1	1	1	1
	S80L	5 Pin Connector Left Side of Switch								
	S80R	5 Pin Connector Right Side of Switch								
	S80S	5 Pin Connector Both Sides of Switch								

Connector	Micro DC	Micro DC	Micro AC 1/2"x20 UNF	Micro AC 1/2"x20 UNF
Style	M12 - 4 pole	M12 - 4 pole	Micro AC - 3 pole	Micro AC - 3 pole
Configuration	Straight Male	Straight Male	Straight Male	Straight Male
					
M16 x 1.5 Fig. 1	R04 CA-04-K-22A-010F		R21 CA-03-K-22B-010F	
M20 x 1.5 Fig. 2		R04 CA-04-L-22A-010F		R21 CA-03-L-22B-010F
Voltage Rating	300 Vac/Vdc	300 Vac/Vdc	300 Vac/Vdc	300 Vac/Vdc
Amperage	4 Amps	4 Amps	4 Amps	4 Amps
Wire Gauge	22 AWG	22 AWG	22 AWG	22 AWG
Jacket	PVC	PVC	PVC	PVC
Shell	nickel plated brass	nickel plated brass	anodized aluminum	anodized aluminum
O-ring	viton	viton	viton	viton
Protection	IP 67	IP 67	IP 67	IP 67
Ambient Operating Temp.	-40 to 221°F	-40 to 221°F	-4 to 221°F	-4 to 221°F
cULus Recognized	yes	yes	yes	yes

Connector	Mini Size A	Mini Size A	Mini Size A
Style	3 pole	4 pole	5 pole
Configuration	Straight Male	Straight Male	Straight Male
				
M20 x 1.5 Fig. 3	R05 CA-03-L-18C-010F	R05 CA-04-L-18C-010F	R0A CA-05-L-18C-010F
Voltage Rating	300 Vac/Vdc	300 Vac/Vdc	300 Vac/Vdc
Amperage	8 Amps	5 Amps	5 Amps
Wire Gauge	18 AWG	18 AWG	18 AWG
Jacket	PVC	PVC	PVC
Shell	anodized aluminum	anodized aluminum	anodized aluminum
O-ring	viton	viton	viton
Protection	IP 67	IP 67	IP 67
Ambient Operating Temp.	-40 to 194°F	-40 to 194°F	-40 to 194°F
cULus Recognized	yes	yes	yes

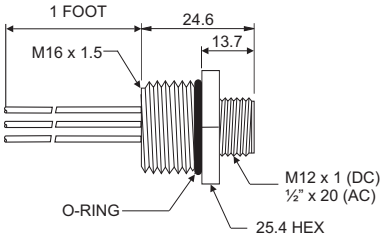


Fig. 1 (Male)

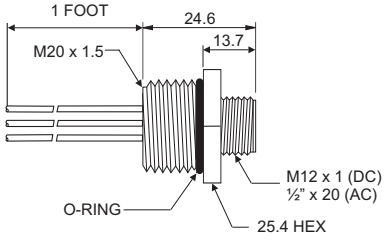


Fig. 2 (Male)

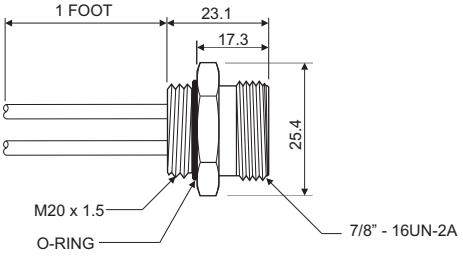
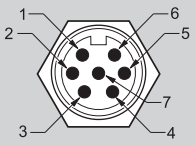
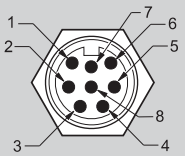
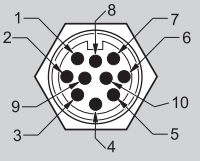
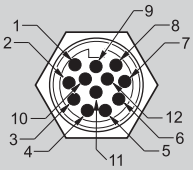
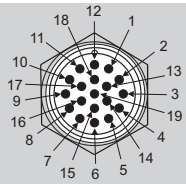


Fig. 3 (Male)

Connector	Mini Size B	Mini Size B	Mini Size B
Style	6 pole	7 pole	8 pole
Configuration	Straight Male	Straight Male	Straight Male
				
M20 x 1.5 Fig. 4	R0B CA-06-L-18C-010F	R0B CA-07-L-18C-010F	R0B CA-08-L-18C-010F
Voltage Rating	300 Vac/Vdc	300 Vac/Vdc	300 Vac/Vdc
Amperage	5 Amps	5 Amps	5 Amps
Wire Gauge	18 AWG	18 AWG	18 AWG
Jacket	PVC	PVC	PVC
Shell	anodized aluminum	anodized aluminum	anodized aluminum
O-Ring	viton	viton	viton
Protection	IP 67	IP 67	IP 67
Ambient Operating Temp.	-40 to 221°F	-40 to 221°F	-40 to 221°F
cULus Recognized	yes	yes	yes

Connector	Mini Size C	Mini Size C	Mini Size C	Mini Size C
Style	9 pole	10 pole	12 pole	19 Pole
Configuration	Straight Male	Straight Male	Straight Male	Straight Male
				
M20 x 1.5 Fig. 5	BCC A559-0000-20-RM041-003	BCC A55A-0000-20-RM043-003	BCC A55C-0000-20-RM044-003	BCC A55L-0000-20-RM046-003
Voltage Rating	300 Vac/Vdc	300 Vac/Vdc	300 Vac/Vdc	300 V
Amperage	4 Amps	4 Amps	4 Amps	4 Amps
Wire Gauge	18 AWG	18 AWG	18 AWG	3/18 & 16/22 AWG
Jacket	PVC	PVC	PVC	PVC
Shell	anodized aluminum	anodized aluminum	anodized aluminum	clear anodized aluminum
O-ring	viton	viton	viton	viton
Protection	IP 67	IP 67	IP 67	IP 67
Ambient Operating Temp.	-4 to 221°F	-4 to 221°F	-4 to 221°F	-4 to 221°F
cULus Recognized	yes	yes	yes	yes

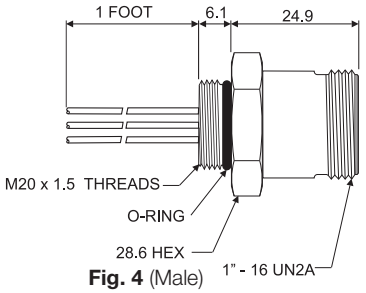


Fig. 4 (Male)

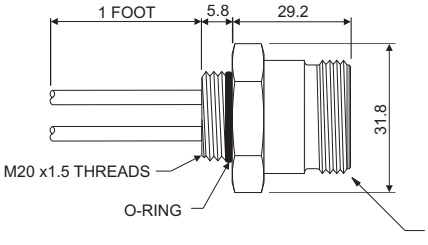


Fig. 5 (Male)

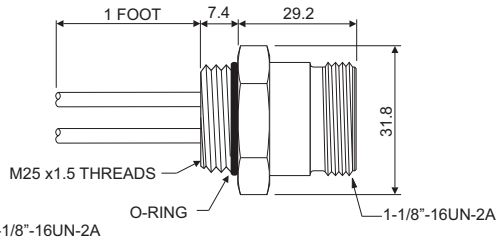
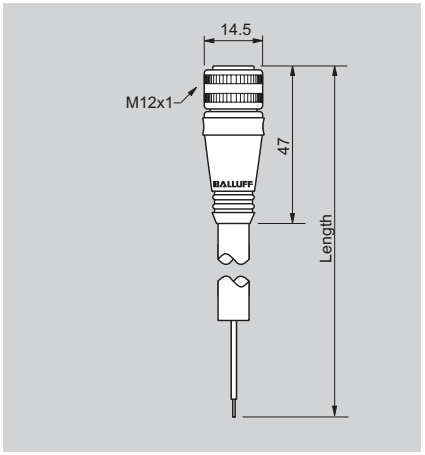
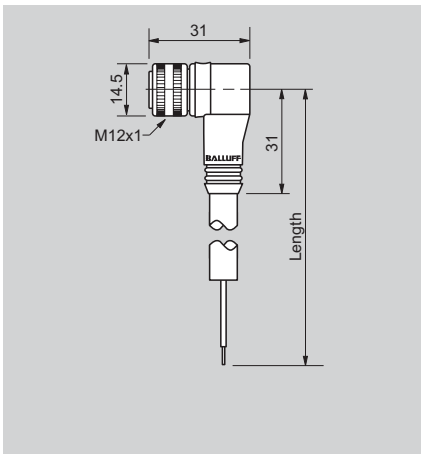
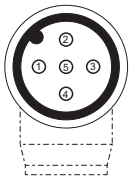


***Fig. 5** (Male)

Connector	Micro	Micro
Style	M12 DC Single Keyway	M12 DC Single Keyway
Configuration	Straight Female	Right Angle Female
		
3 Wire PVC	BCC M415-0000-1A-001-VX43T2-XXX	BCC M425-0000-1A-001-VX43T2-XXX
3 Wire TPE	BCC M415-0000-1A-001-EX43T2-XXX	BCC M425-0000-1A-001-EX432T2-XXX
4 Wire PVC	BCC M415-0000-1A-003-VX44T2-XXX	BCC M425-0000-1A-003-VX44T2-XXX
4 Wire TPE	BCC M415-0000-1A-003-EX44T2-XXX	BCC M425-0000-1A-003-EX44T2-XXX
5 Wire, non-LED	C04 AEQ-00-VY-050M	C04 BEQ-00-VY-050M
Voltage Rating (non-LED)	250 Vac/Vdc (36 Vdc-8 wire)	250 Vac/Vdc (36 Vdc–8 wire)
Amperage	4 Amps	4 Amps
Wire Gauge	22 AWG (24 AWG-8 wire)	22 AWG (24 AWG– 8 wire)
Jacket	Yellow PVC, TPE (PUR-8 wire)	Yellow PVC, TPE (PUR–8 wire)
Coupling Nut *8-pole Nickel Plated Brass	Black Epoxy Coated Zinc	Black Epoxy Coated Zinc
Protection	IP 67	IP 67
Ambient Operating Temperature	-5° C to 105° C	-5° C to 105° C
UL Listed	yes	yes
CSA Certified	yes	yes

Notes:
1. 5 meter cable length is standard (other lengths available - consult factory)
2. Additional cable options are available from the part matrix. Consult factory for availability. Minimum order quantities and lead times may apply.

Female 2-5 pin face view



3-wire

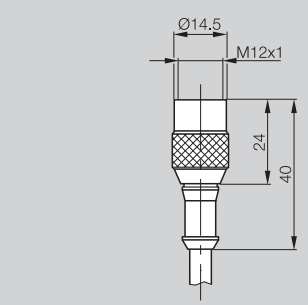
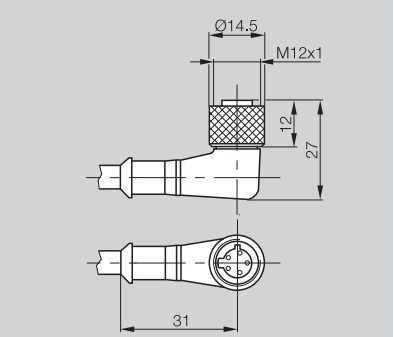
Pin #	Color
1	Brown
2	
3	Blue
4	Black
5	

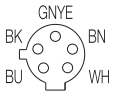
4-wire

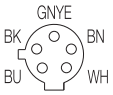
Pin #	Color
1	Brown
2	White
3	Blue
4	Black
5	

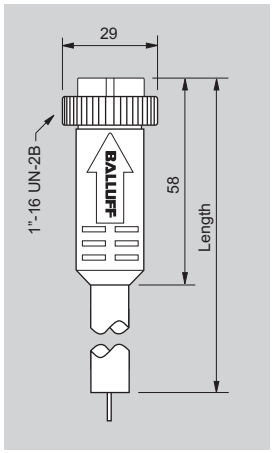
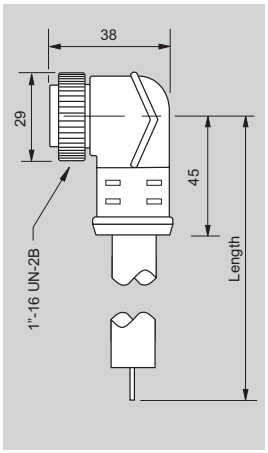
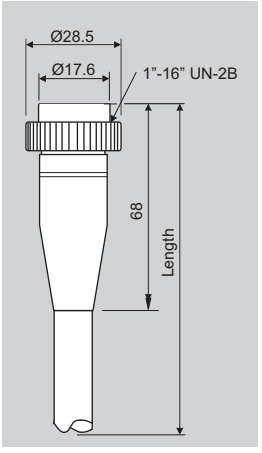
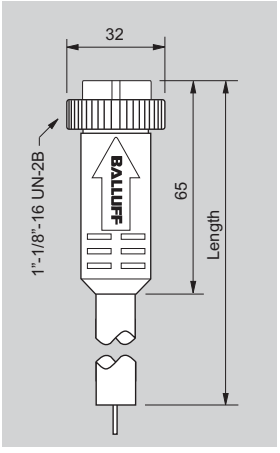
5-wire

Pin #	Color
1	Brown
2	White
3	Blue
4	Black
5	Grey

Connector	BKS-S 80	BKS-S 80
Version	Straight female	Right angle female
Use	BNS ...-S80	BNS ...-S80
		
12-pin		
5-pin	BKS-S 80-G-PU-05	BKS-S 80-W-PU-05
4-pin		
3-pin		
Supply voltage U_B		
Cable	300 V AC/10...60 V DC	300 V AC/10...60 V DC
No. of wires × AWG	5 m molded-on PUR	5 m molded-on PUR
Degree of protection per IEC 60529	5×20	5×20
Ambient temperature range T_a	IP 67	IP 68 per BWN Pr. 20
View of female side	–25...+90 °C	–25...+90 °C

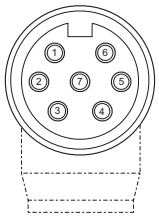




Connector	7-8 Pole Mini	7-8 Pole Mini	8-9 Pole Mini	12 Pole
Style	Mini Size B	Mini Size B	Mini Size B	Mini Size C
Configuration	Straight Female	Right Angle Female	Straight Female	Straight Female
				
Mini Connectors				
7 Pole	BCC A417-0000-10-086-VX47W8-_ _ _	BCC A427-0000-10-086-VX47W8-_ _ _	CB 08-AA-16-VY-200FH	
8 Pole	BCC A418-0000-10-087-VX48W8-_ _ _	BCC A428-0000-10-087-VX48W8-_ _ _	CC 09-AA-16-VY-200FH	
9 Pole				
12 Pole				BCC A51C-0000-10-090-VX4CW8-_ _ _
Voltage Rating	300 Vac/Vdc	300 Vac/Vdc	600 Vac/Vdc	300 Vac/Vdc
Amperage	5A (7 pole) / 5A (8 pole)	5A (7 pole) / 5A (8 pole)	7A (8/9 pole)	4A
Wire Gauge	18 AWG	18 AWG	16 AWG	18 AWG
Jacket	PVC	PVC	PVC	PVC
Coupling Nut	Anodized Aluminum	Anodized Aluminum	Black Epoxy Coated Zinc	Anodized Aluminum
Protection	IP 67	IP 67	IP 68 / NEMA 6P	IP 67
Ambient Operating Temp.	-40 to 221°F	-40 to 221°F	-4 to 194°F	-40 to 221°F
UL Recognized	yes	yes		yes
C-UL Recognized	yes	yes		yes

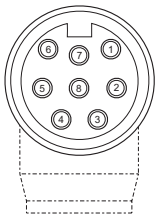
Note: Additional variations/lengths available - consult factory.

Female 7-pin face view



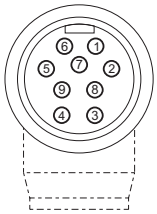
Pin #	Color
1	White/Black
2	Black
3	White
4	Red
5	Orange
6	Blue
7	Green/Yellow

Female 8-pin face view



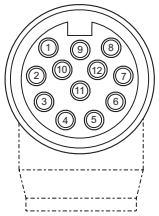
Pin #	Color
1	Orange
2	Blue
3	White/Black
4	Black
5	White
6	Red
7	Green/Yellow
8	Red/Black

Female 9-pin face view



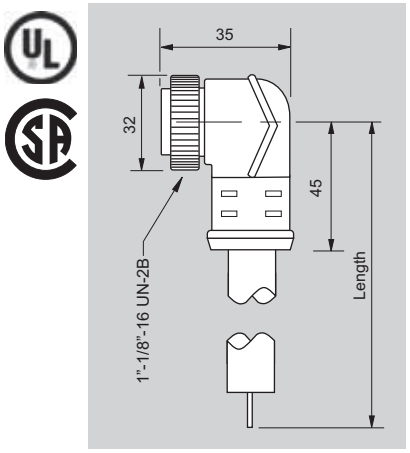
Pin #	Color
1	Orange
2	Blue
3	Red/Black
4	Green/Black
5	White
6	Red
7	Green/Yellow
8	White/Black
9	Black

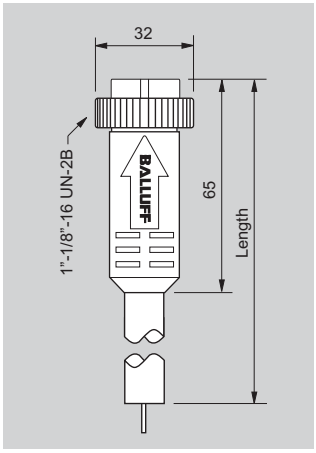
Female 12-pin face view



Pin #	Color
1	Orange
2	Blue
3	White/Black
4	Red/Black
5	Green/Black
6	Orange/Black
7	Blue/Black
8	Black/White
9	Green/Yellow
10	Red
11	White
12	Black

Connector	12 Pole	19 Pole
Style	Mini Size C	Mini Size C
Configuration	Right Angle Female	Straight Female



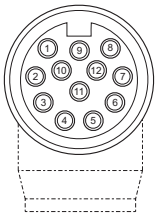


Mini Connectors		
12 Pole	BCC A52C-0000-10-090-VX4CW8-_ _ _	
19 Pole		BCC A51L-0000-10-091-PX0LW8-_ _ _
19 Pole (High Flex)		

Voltage Rating	300 Vac/Vdc	300 Vac/Vdc
Amperage	4A	8 A LG Pins / 3 A Small Pins
Wire Gauge	18 AWG	18/3 AWG / 22/16 AWG
Jacket	PVC	PVC
Coupling Nut	Anodized Aluminum	Anodized Aluminum
Protection	IP 67	IP 67
Ambient Operating Temp.	-40 to 221°F	-40 to 221°F
UL Recognized	yes	yes
C-UL Recognized	yes	yes

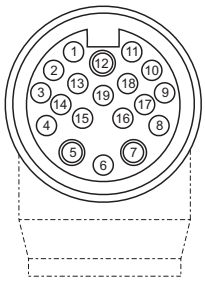
Note: Additional variations/lengths available - consult factory.

Female 12-pin face view



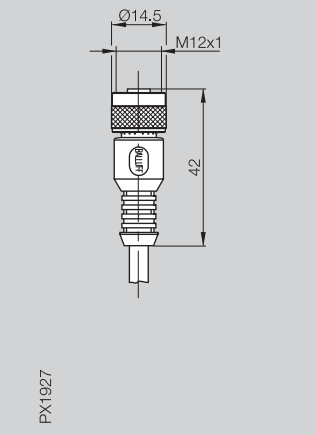
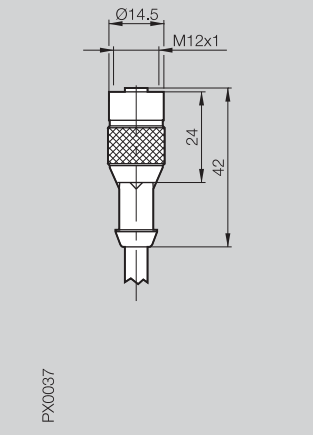
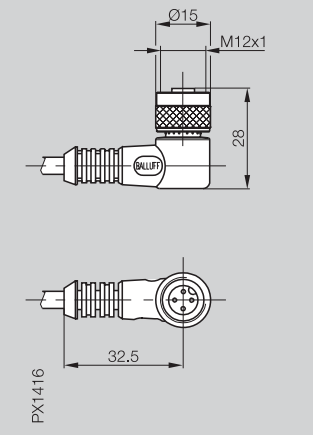
Pin #	Color
1	Orange
2	Blue
3	White/Black
4	Red/Black
5	Green/Black
6	Orange/Black
7	Blue/Black
8	Black/White
9	Green/Yellow
10	Red
11	White
12	Black

Female 19-pin face view

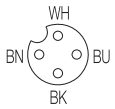


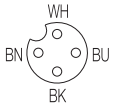
Pin #	Color
1	Violet
2	Red
3	Grey
4	Red/Blue
5	Blue
6	Green
7	Brown
8	White/Green
9	White/Yellow
10	White/Grey

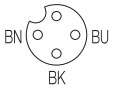
Pin #	Color
11	Black
12	Green/Yellow
13	Yellow/Brown
14	Brown/Green
15	White
16	Yellow
17	Pink
18	Grey/Brown
19	Grey/Pink

Connector	BKS-B 19	BKS-S 19	BKS-B 20
Version	Straight female	Straight female	Right angle female
Use	BNS ...-S4_-I (IO-Link)	BNS ...-S4_-I (IO-Link)	BNS ...-S4_-I (IO-Link)
			
4-pin	BCC M415-0000-1A-003-VX8434-_ _ _	BCC M415-0000-1A-003-PX0434-_ _ _	
3-pin	BCC M415-0000-1A-001-VX8334-_ _ _	BCC M415-0000-1A-001-PX0334-_ _ _	BCC M425-0000-1A-001-VX8334-_ _ _
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Cable	3 m/5 m molded-on PVC	3 m molded PUR	3 m molded PVC
No. of wires × cross-section	3×0.34 mm²/4×0.34 mm²	3×0.34 mm²/4×0.34 mm²	3×0.34 mm²
Degree of protection per IEC 60529	IP 67	IP 68 per BWN Pr. 20	IP 67
Ambient temperature range T_a	–25...+85 °C	–25...+70 °C	–25...+85 °C

Other cable lengths on request.





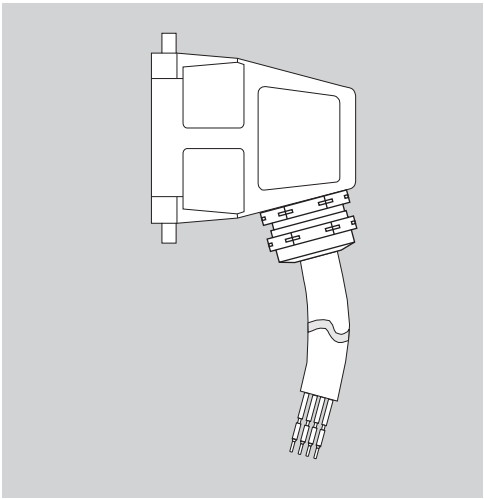
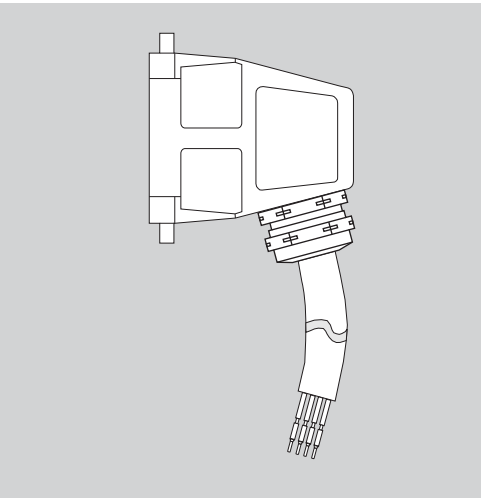


Note!

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

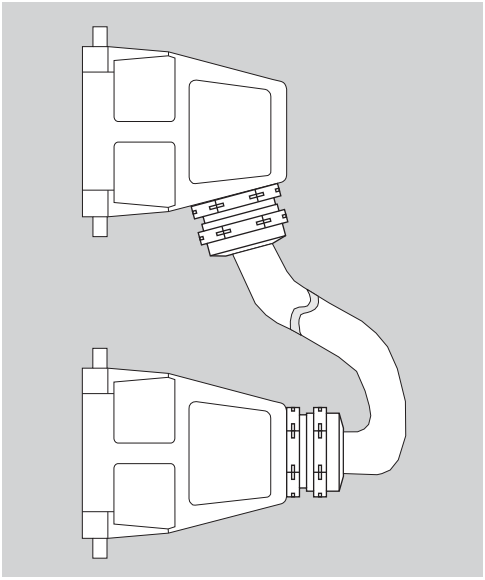
If there are multiple switch positions, multiple connectors or larger connectors with a larger number of pins are used.

IO-Link

Connector	Harting 24-pin DD	Harting 24-pin DD
Version	Right angle with flying leads	Right angle with flying leads hi-flex
Use	BNS with 24-pin connector	BNS with 24-pin connector
		
Part number	BKS-X518-CABLE-10FT	BKS-X518-CABLE-HI-FLEX-15FT
	BKS-X518-CABLE-20FT	BKS-X518-CABLE-HI-FLEX-20FT
	BKS-X518-CABLE-25FT	BKS-X518-CABLE-HI-FLEX-30FT
	BKS-X518-CABLE-30FT	BKS-X518-CABLE-HI-FLEX-40FT
	BKS-X518-CABLE-40FT	BKS-X518-CABLE-HI-FLEX-60FT
	BKS-X518-CABLE-50FT	BKS-X518-CABLE-HI-FLEX-100FT
	BKS-X518-CABLE-65FT	BKS-X518-CABLE-HI-FLEX-120FT
	BKS-X518-CABLE-75FT	
	BKS-X518-CABLE-85FT	
	BKS-X518-CABLE-100FT	
Housing	24 DD right angle	24 DD right angle
Insert	24 DD female	24 DD female
Contacts	Silver plated female sockets	Silver plated female sockets
Wire size	18 AWG	16 AWG
Jacket	PVC, Gray	TPE, Yellow
Voltage rating	600 VAC/VDC	600 VAC/VDC
Number of conductors	25	31
Temperature	-5°...90°C	-5°...90°C

Notes:
- Pin 1 bottom left when facing connector
- Wired straight through (wire 1 on PIN 1)

Connector	Harting 24-pin DD
Version	Right angle/straight double ended
Use	BNS with 24-pin connector

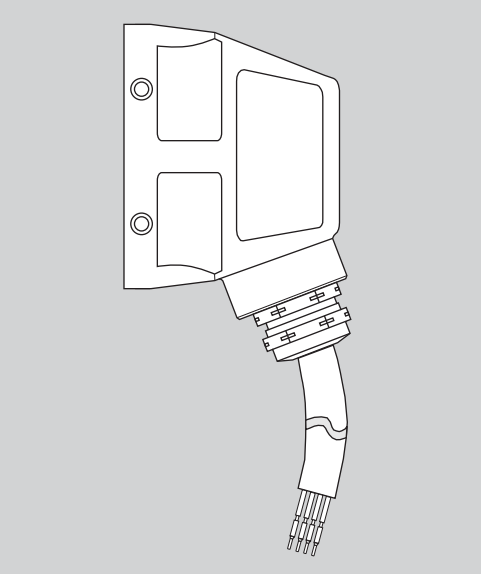


Part number	BKS-X518-CABLE-EXTENSION-020FT
	BKS-X518-CABLE-EXTENSION-040FT
	BKS-X518-CABLE-EXTENSION-050FT
	BKS-X518-CABLE-EXTENSION-060FT
	BKS-X518-CABLE-EXTENSION-080FT
	BKS-X518-CABLE-EXTENSION-095FT

Housing	Right angle female/straight male
Insert	24 DD female/24 DD male
Contacts	Silver plated female sockets/male pins
Wire size	18 AWG
Jacket	PVC, Gray
Voltage rating	600 VAC/VDC
Number of conductors	25
Temperature	-5°...90°C

Notes:
- Pin 1 bottom left when facing connector
- Wired straight through (wire 1 on PIN 1)

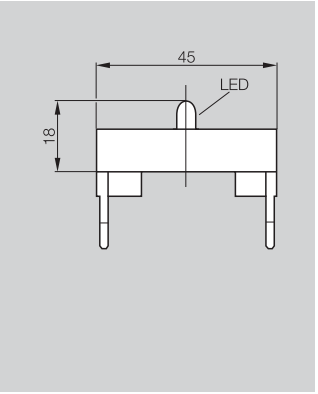
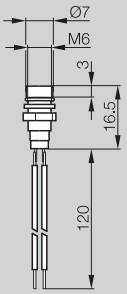
Connector	Harting 32-pin EE
Version	Right angle with flying leads
Use	BNS with 32-pin connector



Part number	BKS-X524-CABLE-40FT

Housing	32 EE right angle
Insert	32 EE female
Contacts	Silver plated female sockets
Wire size	18 AWG
Jacket	PVC, Gray
Voltage rating	600 VAC/VDC
Number of conductors	25
Temperature	-5°...90°C

Notes:
- Pin 1 bottom left when facing connector
- Wired straight through (wire 1 on PIN 1)

Type	FD/FE	FC
		 **Dimensions not applicable for miniature series**
Application with		
Multiple position switches **FD** 6...60 V DC/AC	510870	
Multiple position switches **FE** 90...250 V DC/AC	510880	
Multiple position switches **FD** 24...28 V DC/AC		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.

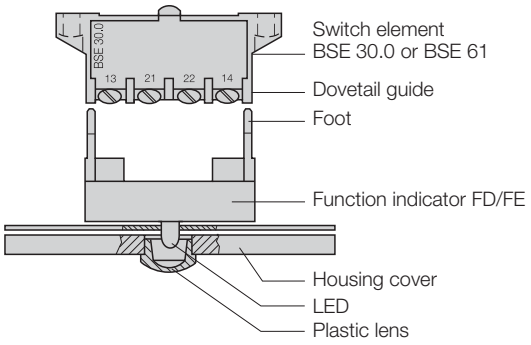
Three voltage ranges are available for multiple position switches with quick-change unit:
6...60 V AC/DC (FD)
90...250 V AC/DC (FE)
24...28 V DC (FC)

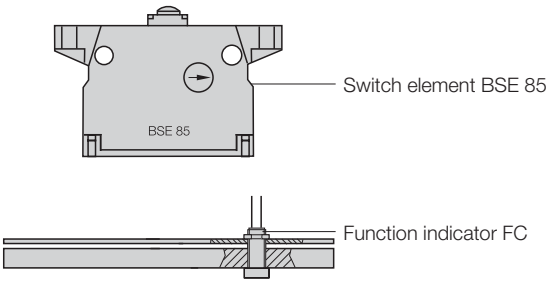
Installation for FD/FE

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.





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BNN 520-UB-40 ... **N/A** ... 13.3
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BNN 520-UB-63 ... **N/A** ... 13.3
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BNN TR-030-050-12C ... **N/A** ... 14.4
BNN TR-030-075-12C ... **BNN00H9** ... 14.4
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BNN TR-045-100-12C ... **N/A** ... 14.4
BNN TR-045-125-12 ... **BNN00HL** ... 14.4
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BNN TR-045-160-12C ... **N/A** ... 14.5
BNN TR-045-250-12C ... **BNN00EN** ... 14.4
BNN TR-050/310-280-12C ... **BNN00HR** ... 14.4
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BNN TR-060-050-12C ... **N/A** ... 14.4
BNN TR-060-075-12C ... **N/A** ... 14.4
BNN TR-060-100-12C ... **BNN00HU** ... 14.4
BNN TR-060-125-12C ... **N/A** ... 14.5
BNN TR-060-160-12C ... **N/A** ... 14.5
BNN TR-060-250-12C ... **N/A** ... 14.5
BNN TR-060-280-12C ... **BNN00HW** ... 14.4
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BNN TR-075-050-12C ... **N/A** ... 14.4
BNN TR-075-075-12C ... **N/A** ... 14.4
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BNN TR-075-125-12C ... **N/A** ... 14.5
BNN TR-075-160-12C ... **N/A** ... 14.5
BNN TR-075-250-12C ... **N/A** ... 14.5
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BNN TR-090-050-12C ... **BNN00J0** ... 14.4
BNN TR-090-075-12C ... **N/A** ... 14.4
BNN TR-090-100-12C ... **BNN00NT** ... 14.4
BNN TR-090-125-12C ... **N/A** ... 14.5
BNN TR-090-160-12C ... **N/A** ... 14.5
BNN TR-090-250-12C ... **BNN00ER** ... 14.4
BNN TR-090-270-12C ... **BNN00FT** ... 14.4
BNN TR-090-280-12C ... **BNN00J1** ... 14.4
BNN TR-090-75-12C ... **BNN00J2** ... 14.4
BNN TR-100-280-12C ... **BNN00J4** ... 14.4
BNN TR-105-100-12C ... **N/A** ... 14.4
BNN TR-105-125-12C ... **N/A** ... 14.5
BNN TR-105-160-12C ... **N/A** ... 14.5
BNN TR-105-250-12C ... **N/A** ... 14.5
BNN TR-110-280-12C ... **BNN00J5** ... 14.4
BNN TR-115-280-12C ... **BNN00EU** ... 14.4
BNN TR-120/240-250-12C ... **BNN00J8** ... 14.4
BNN TR-120/240-280-12C ... **BNN00FJ** ... 14.4
BNN TR-120-100-12C ... **N/A** ... 14.4
BNN TR-120-125-12C ... **BNN00EW** ... 14.4

BNN TR-120-160-12C ... **N/A** ... 14.5
BNN TR-120-250-12C ... **N/A** ... 14.5
BNN TR-120-280-12C ... **BNN00E8** ... 14.4
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BNN TR-180-250-12C ... **BNN00F0** ... 14.4
BNN TR-180-280-12C ... **BNN00F1** ... 14.4
BNN TR-180-395-12C ... **BNN00JE** ... 14.4
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BNN TR-195-280-12C ... **BNN00JJ** ... 14.4
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BNN TR-240-250-12C ... **N/A** ... 14.5
BNN TR-240-280-12C ... **BNN00E7** ... 14.4
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BNN TR-250-280-12C ... **BNN00JM** ... 14.4
BNN TR-255-250-12C ... **BNN00F5** ... 14.4
BNN TR-260-280-12C ... **BNN00JN** ... 14.4
BNN TR-270-250-12C ... **BNN00F6** ... 14.4
BNN TR-270-280-12C ... **BNN00JP** ... 14.4
BNN TR-280-280-12C ... **BNN00JR** ... 14.4
BNN TR-290-280-12C ... **BNN00E5** ... 14.4
BNN TR-300-280-12C ... **BNN00JT** ... 14.4
BNN TR-315-250-12C ... **BNN00F7** ... 14.4
BNN TR-330-280-12C ... **BNN00JY** ... 14.4
BNN TR-340-280-12C ... **BNN00F8** ... 14.4
BNN TR-345-125-12C ... **BNN00F9** ... 14.4
BNN TR-345-250-12C ... **BNN00FA** ... 14.4
BNN TR-90-250-12C ... **N/A** ... 14.5
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BNN UR-001-250-12 ... **BNN00KU** ... 14.2
BNN UR-001-250-12C ... **N/A** ... 14.3
BNN UR-002-125-12C ... **BNN004K** ... 14.2
BNN UR-002-250-12C ... **N/A** ... 14.3
BNN UR-003-075-12C ... **N/A** ... 14.2
BNN UR-003-100-12C ... **BNN00KZ** ... 14.2
BNN UR-003-160-12C ... **N/A** ... 14.3
BNN UR-004-040-12C ... **BNN00JZ** ... 14.2
BNN UR-004-050-12C ... **N/A** ... 14.2
BNN UR-004-125-12C ... **N/A** ... 14.3
BNN UR-004-250-12 ... **BNN00L0** ... 14.2
BNN UR-004-250-12C ... **N/A** ... 14.3
BNN UR-005-100-12C ... **N/A** ... 14.2
BNN UR-007-075-12C ... **BNN00L2** ... 14.2
BNN UR-007-160-12C ... **BNN00L3** ... 14.2
BNN UR-009-050-12C ... **BNN00L4** ... 14.2
BNN UR-009-125-12C ... **N/A** ... 14.3
BNN UR-010-040-12C ... **BNN00K0** ... 14.2
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BNN UR-015-050-12C ... **BNN00K2** ... 14.2
BNN UR-015-075-12C ... **BNN00K3** ... 14.2
BNN UR-015-100-12C ... **N/A** ... 14.2
BNN UR-015-125-12C ... **BNN00L7** ... 14.2
BNN UR-015-160-12C ... **BNN00MJ** ... 14.2
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BNN UR-030-250-12C ... **N/A** ... 14.3
BNN UR-030-395-12C ... **BNN00FC** ... 14.2
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BNN UR-045-040-12C ... **BNN00MK** ... 14.2
BNN UR-045-050-12C ... **N/A** ... 14.2
BNN UR-045-075-12C ... **N/A** ... 14.2
BNN UR-045-100-12C ... **BNN00ML** ... 14.2
BNN UR-045-125-12C ... **BNN00FE** ... 14.2
BNN UR-045-160-12C ... **BNN00KA** ... 14.2
BNN UR-045-250-12C ... **N/A** ... 14.3
BNN UR-045-260-12C ... **BNN00FK** ... 14.2
BNN UR-045-395-12C ... **BNN00FF** ... 14.2
BNN UR-050-075-12C ... **BNN00P2** ... 14.2
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BNN UR-060-050-12C ... **N/A** ... 14.2
BNN UR-060-075-12C ... **N/A** ... 14.2
BNN UR-060-100-12C ... **BNN00M2** ... 14.2
BNN UR-060-125-12C ... **BNN00L9** ... 14.2
BNN UR-060-160-12C ... **N/A** ... 14.3
BNN UR-060-250-12C ... **N/A** ... 14.3
BNN UR-075/285-125-12C ... **BNN00M6** ... 14.2
BNN UR-075-040-12C ... **N/A** ... 14.2
BNN UR-075-050-12C ... **N/A** ... 14.2
BNN UR-075-075-12C ... **N/A** ... 14.2
BNN UR-075-100-12C ... **N/A** ... 14.2
BNN UR-075-125-12C ... **BNN00LA** ... 14.2
BNN UR-075-160-12C ... **N/A** ... 14.3
BNN UR-075-250-12C ... **N/A** ... 14.3
BNN UR-090-040-12C ... **BNN00KC** ... 14.2
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BNN UR-090-075-12C ... **N/A** ... 14.2
BNN UR-090-100-12C ... **N/A** ... 14.2
BNN UR-090-125-12C ... **BNN00LC** ... 14.2
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BNN UR-105-100-12C ... **N/A** ... 14.2
BNN UR-105-125-12C ... **BNN00LE** ... 14.2
BNN UR-105-160-12C ... **N/A** ... 14.3
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BNN UR-120-125-12C ... **BNN00LF** ... 14.2
BNN UR-120-160-12C ... **N/A** ... 14.3
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BNN UR-180-050-12C ... **N/A** ... 14.2
BNN UR-180-075-12C ... **BNN00FN** ... 14.2
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BNN UR-260-125-12C ... **N/A** ... 14.3
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BNN UR-320-125-12C ... **N/A** ... 14.3
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BNS 813-B02-L12-61-A-12-02-D057 ... **BNS02RE** ... 3.4
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BNS 813-B02-L12-61-A-22-02 ... **BNS02FJ** ... 3.4
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BNS 813-B03-L12-61-A-20-02 ... **BNS02JN** ... 3.4
BNS 813-B03-L12-61-A-22-03 ... **BNS02JP** ... 3.4
BNS 813-B03-L12-61-A-22-03-F022 ... **BNS02RL** ... 3.4
BNS 813-B03-L12-61-A-55-0908 ... **BNS02JR** ... 10.2
BNS 813-B03-L12-72-10-01 ... **BNS022H** ... 4.4
BNS 813-B03-R12-61-A-10-02 ... **BNS02K1** ... 3.4
BNS 813-B03-R12-61-A-10-0461 ... **BNS02K3** ... 3.4
BNS 813-B03-R12-61-A-12-03 ... **BNS02K4** ... 3.4
BNS 813-B03-R12-61-A-12-0365 ... **BNS02K5** ... 3.4
BNS 813-B03-R12-61-A-20-01 ... **BNS02K6** ... 3.4
BNS 813-B03-R12-61-A-22-03 ... **BNS02K9** ... 3.4
BNS 813-B03-R12-61-C-12-03 ... **BNS02KN** ... 3.4
BNS 813-B03-R12-72-10-01 ... **BNS022L** ... 4.4
BNS 813-B04-D12-61-A-10-01 ... **BNS02KT** ... 3.4
BNS 813-B04-D12-61-A-10-02 ... **BNS02KW** ... 3.4
BNS 813-B04-D12-61-A-10-03 ... **BNS02KZ** ... 3.4
BNS 813-B04-D12-61-A-10-SP01 ... **BNS02RN** ... 3.4
BNS 813-B04-D12-61-A-12-04 ... **BNS02L0** ... 3.4
BNS 813-B04-D12-61-A-20-01 ... **BNS02L2** ... 3.4
BNS 813-B04-D12-61-A-20-02-C064 ... **BNS02RP** ... 3.4
BNS 813-B04-D12-61-A-20-02-C065 ... **BNS02RR** ... 3.4
BNS 813-B04-D12-61-A-22-04 ... **BNS02L4** ... 3.4
BNS 813-B04-D12-61-A-55-0540 ... **BNS02L7** ... 10.2
BNS 813-B04-D12-72-10-01 ... **BNS022T** ... 4.4
BNS 813-B04-D16-61-B-12-04 ... **BNS03WM** ... 3.4
BNS 813-B04-D16-61-B-22-04 ... **BNS02LF** ... 3.4
BNS 813-B04-E16-61-B-12-04 ... **BNS02LL** ... 3.4
BNS 813-B04-E16-61-B-22-04 ... **BNS02LM** ... 3.4
BNS 813-B04-L12-61-A-10-01 ... **BNS02LU** ... 3.4
BNS 813-B04-L12-61-A-12-04 ... **BNS02LW** ... 3.4
BNS 813-B04-L12-61-A-12-04-D027 ... **BNS02RT** ... 3.4
BNS 813-B04-L12-61-A-22-04 ... **BNS02M0** ... 3.4
BNS 813-B04-L12-61-A-22-04-F032 ... **BNS02RU** ... 3.4
BNS 813-B04-L12-72-22-04 ... **BNS0230** ... 4.4
BNS 813-B04-L16-72-10-01-FD ... **BNS0231** ... 4.4
BNS 813-B04-R12-61-A-10-01 ... **BNS02M9** ... 3.4
BNS 813-B04-R12-61-A-10-02 ... **BNS02ME** ... 3.4
BNS 813-B04-R12-61-A-10-03 ... **BNS02MF** ... 3.4
BNS 813-B04-R12-61-A-20-01 ... **BNS02MJ** ... 3.4
BNS 813-B04-R12-61-A-22-04 ... **BNS02MM** ... 3.4
BNS 813-B04-R12-72-10-01-FD ... **BNS0233** ... 4.4
BNS 813-B04-R12-72-12-04 ... **BNS0235** ... 4.4
BNS 813-B04-R12-72-22-04 ... **BNS0238** ... 4.4
BNS 813-B04-R12-72-55-0913 ... **BNS0239** ... 10.2
BNS 813-B04-R12-72-55-1187 ... **BNS02RA** ... 10.2
BNS 813-B05-D12-61-A-10-02 ... **BNS02N0** ... 3.4
BNS 813-B05-D12-61-A-20-02 ... **BNS02N4** ... 3.4
BNS 813-B05-L12-61-A-22-05 ... **BNS02NJ** ... 3.4
BNS 813-B05-R12-61-A-10-02 ... **BNS02NN** ... 3.4
BNS 813-B05-R12-61-A-22-05 ... **BNS02NT** ... 3.4
BNS 813-B05-R12-72-22-05 ... **BNS023F** ... 4.4
BNS 813-B06-D12-61-A-10-01 ... **BNS02NW** ... 3.4
BNS 813-B06-D12-61-A-22-06 ... **BNS02P0** ... 3.4
BNS 813-B06-L12-61-A-12-06 ... **BNS02P6** ... 3.4
BNS 813-B06-L12-61-A-22-06 ... **BNS02P7** ... 3.4
BNS 813-B06-L12-61-A-22-06-F082 ... **BNS02RW** ... 3.4
BNS 813-B06-L12-72-12-06 ... **BNS023K** ... 4.4
BNS 813-B06-R12-61-A-22-06 ... **BNS02PH** ... 3.4
BNS 813-B06-R12-72-20-04 ... **BNS023M** ... 4.4
BNS 813-B06-R12-72-55-0734 ... **BNS023N** ... 10.2
BNS 813-B06-R12-72-55-0838 ... **BNS023P** ... 10.2
BNS 813-B06-R12-72-55-1154 ... **BNS023R** ... 10.2
BNS 813-C02-X12-61-C-12-X001 ... **BNS02RY** ... 3.4
BNS 813-D02-D12-100-10-01 ... **BNS00PP** ... 1.4
BNS 813-D02-D12-100-10-01-FD ... **BNS00PR** ... 1.4
BNS 813-D02-D12-100-12-02 ... **BNS00PT** ... 1.4
BNS 813-D02-D12-100-12-02-FD ... **BNS00PU** ... 1.4
BNS 813-D02-D12-100-20-01-FD ... **BNS00PY** ... 1.4
BNS 813-D02-D12-100-22-02 ... **BNS00PZ** ... 1.4
BNS 813-D02-D12-100-55-0747 ... **BNS00R2** ... 10.2
BNS 813-D02-D12-100-55-FD-0219 ... **BNS00R3** ... 10.2
BNS 813-D02-D12-62-10-01 ... **BNS01A5** ... 2.4
BNS 813-D02-D12-62-12-02 ... **BNS01A6** ... 2.4
BNS 813-D02-E12-100-10-01-FD ... **BNS00RA** ... 1.4
BNS 813-D02-L12-100-10-01 ... **BNS00RJ** ... 1.4
BNS 813-D02-L12-100-22-02 ... **BNS00RM** ... 1.4
BNS 813-D02-L12-100-22-02-C040 ... **BNS02RZ** ... 1.4
BNS 813-D02-L12-100-55-FD-0802 ... **BNS00RP** ... 10.2
BNS 813-D02-L16-100-22-02 ... **BNS00RR** ... 1.4
BNS 813-D02-L16-100-22-02-FC ... **BNS03W7** ... 1.4
BNS 813-D02-R12-100-12-02 ... **BNS00RW** ... 1.4
BNS 813-D02-R12-100-22-02 ... **BNS00T1** ... 1.4
BNS 813-D02-R12-100-55-0577 ... **BNS00T3** ... 10.2
BNS 813-D02-R12-62-10-01 ... **BNS01AN** ... 2.4
BNS 813-D02-R12-62-12-02 ... **BNS01AR** ... 2.4
BNS 813-D02-R12-62-12-02-FD ... **BNS01AT** ... 2.4
BNS 813-D02-R16-100-22-02 ... **BNS00T7** ... 1.4
BNS 813-D02-R16-62-12-02 ... **BNS01AW** ... 2.4
BNS 813-D03-D12-100-10-01-FD ... **BNS00TC** ... 1.4
BNS 813-D03-D12-100-10-02 ... **BNS00TE** ... 1.4
BNS 813-D03-D12-100-10-02-FD ... **BNS00TF** ... 1.4
BNS 813-D03-D12-100-10-02-FE ... **BNS03ZJ** ... 1.4
BNS 813-D03-D12-100-20-01 ... **BNS00TJ** ... 1.4
BNS 813-D03-D12-100-20-02-FD ... **BNS00TM** ... 1.4
BNS 813-D03-D12-100-22-03 ... **BNS00TN** ... 1.4
BNS 813-D03-D12-100-55-0763 ... **BNS00TT** ... 10.2
BNS 813-D03-D12-100-55-0768 ... **BNS00TU** ... 10.2
BNS 813-D03-D12-100-55-1065 ... **BNS02R1** ... 10.2
BNS 813-D03-D12-100-55-FD-0708 ... **BNS00U2** ... 10.2
BNS 813-D03-D12-100-55-FE-0230 ... **BNS02R2** ... 10.2
BNS 813-D03-D12-62-10-01 ... **BNS01AY** ... 2.4
BNS 813-D03-D12-62-10-02 ... **BNS01C0** ... 2.4
BNS 813-D03-D12-62-12-03 ... **BNS01C2** ... 2.4
BNS 813-D03-E12-100-22-03 ... **BNS00UC** ... 1.4
BNS 813-D03-L12-100-10-02-FD-A031 ... **BNS02T0** ... 1.4
BNS 813-D03-L12-100-10-02-FD-D076 ... **BNS02T1** ... 1.4
BNS 813-D03-L12-100-22-03 ... **BNS00UN** ... 1.4
BNS 813-D03-R12-100-10-01 ... **BNS00UZ** ... 1.4
BNS 813-D03-R12-100-10-02 ... **BNS00W1** ... 1.4
BNS 813-D03-R12-100-20-02-FD ... **BNS00W7** ... 1.4
BNS 813-D03-R12-100-20-02-FD-SP55 ... **BNS02T2** ... 1.4
BNS 813-D03-R12-100-20-02-FD-SP56 ... **BNS02T3** ... 1.4
BNS 813-D03-R12-100-22-03 ... **BNS00W9** ... 1.4
BNS 813-D03-R12-100-55-FD-0480 ... **BNS00WJ** ... 10.2
BNS 813-D03-R12-62-55-0724 ... **BNS01CK** ... 10.2
BNS 813-D03-R16-100-22-03 ... **BNS00WM** ... 1.4
BNS 813-D03-R16-62-12-03 ... **BNS01CM** ... 2.4
BNS 813-D04-D12-100-10-02-FE ... **BNS00WY** ... 1.4
BNS 813-D04-D12-100-20-01 ... **BNS00Y2** ... 1.4
BNS 813-D04-D12-100-20-02 ... **BNS00Y5** ... 1.4
BNS 813-D04-D12-100-20-02-FD ... **BNS00Y6** ... 1.4
BNS 813-D04-D12-100-20-02-SP01 ... **BNS02T4** ... 1.4
BNS 813-D04-D12-100-22-04 ... **BNS00Y7** ... 1.4
BNS 813-D04-D12-100-55-0622 ... **BNS02R3** ... 10.2
BNS 813-D04-D12-100-55-0670 ... **BNS00YE** ... 10.2
BNS 813-D04-D12-100-55-FD-0107 ... **BNS00YL** ... 10.2
BNS 813-D04-D12-100-55-FD-0745 ... **BNS00YN** ... 10.2
BNS 813-D04-D12-62-10-01 ... **BNS01CN** ... 2.4
BNS 813-D04-E12-100-12-04 ... **BNS00Z4** ... 1.4
BNS 813-D04-E12-100-55-1023 ... **BNS03P8** ... 10.2
BNS 813-D04-K12-100-22-04-FC ... **BNS037Z** ... 1.4
BNS 813-D04-L12-100-12-04 ... **BNS00ZJ** ... 1.4
BNS 813-D04-L12-100-20-02 ... **BNS00ZM** ... 1.4

BNS 813-D04-L12-100-20-02-SP01 ... **BNS02T5** ... 1.4
BNS 813-D04-L12-100-22-04 ... **BNS00ZR** ... 1.4
BNS 813-D04-L12-100-55-FC-1075 ... **BNS02R4** ... 10.2
BNS 813-D04-L12-62-10-02 ... **BNS03Y2** ... 2.4
BNS 813-D04-R12-100-10-02-F047 ... **BNS02T6** ... 1.4
BNS 813-D04-R12-100-12-04 ... **BNS010E** ... 1.4
BNS 813-D04-R12-100-20-01-FE ... **BNS010K** ... 1.4
BNS 813-D04-R12-100-20-02-FD ... **BNS010M** ... 1.4
BNS 813-D04-R12-100-20-03-FD ... **BNS010P** ... 1.4
BNS 813-D04-R12-100-22-04 ... **BNS010R** ... 1.4
BNS 813-D04-R12-100-55-FD-0118 ... **BNS0111** ... 10.2
BNS 813-D04-R12-100-55-FD-0573 ... **BNS0113** ... 10.2
BNS 813-D04-R12-62-12-04 ... **BNS01EE** ... 2.4
BNS 813-D04-R12-62-55-0669 ... **BNS01EK** ... 10.2
BNS 813-D04-R16-100-22-04 ... **BNS0117** ... 1.4
BNS 813-D05-D12-100-10-02-FD ... **BNS011C** ... 1.4
BNS 813-D05-D12-100-13-FD-0476 ... **BNS02R5** ... 1.4
BNS 813-D05-D12-100-22-05 ... **BNS011N** ... 1.4
BNS 813-D05-D12-100-55-FD-0364 ... **BNS011R** ... 10.2
BNS 813-D05-D12-62-12-05 ... **BNS01EY** ... 2.4
BNS 813-D05-D12-62-12-05-FD ... **BNS01EZ** ... 2.4
BNS 813-D05-D16-100-12-05-B050 ... **BNS02T7** ... 1.4
BNS 813-D05-D16-100-12-05-B051 ... **BNS02T8** ... 1.4
BNS 813-D05-D16-100-55-01-SP10 ... **BNS02T9** ... 10.2
BNS 813-D05-D16-100-55-01-SP11 ... **BNS02TA** ... 10.2
BNS 813-D05-D16-100-55-1080 ... **BNS011Y** ... 10.2
BNS 813-D05-E12-100-20-03 ... **BNS0121** ... 1.4
BNS 813-D05-E12-100-22-05 ... **BNS0122** ... 1.4
BNS 813-D05-L12-100-12-05 ... **BNS0125** ... 1.4
BNS 813-D05-L12-100-20-02 ... **BNS0127** ... 1.4
BNS 813-D05-L12-100-22-05 ... **BNS0129** ... 1.4
BNS 813-D05-L12-62-12-05 ... **BNS01F5** ... 2.4
BNS 813-D05-R12-100-22-05 ... **BNS012L** ... 1.4
BNS 813-D05-R12-100-55-FD-0364 ... **BNS012P** ... 10.2
BNS 813-D05-R12-62-12-05 ... **BNS01F7** ... 2.4
BNS 813-D05-R12-62-22-05 ... **BNS01F8** ... 2.4
BNS 813-D05-R16-100-10-01 ... **BNS012R** ... 1.4
BNS 813-D05-R16-100-22-05 ... **BNS012U** ... 1.4
BNS 813-D06-D12-100-20-04 ... **BNS0137** ... 1.4
BNS 813-D06-D12-100-55-FD-0199 ... **BNS02R6** ... 10.2
BNS 813-D06-D16-100-10-01 ... **BNS013H** ... 1.4
BNS 813-D06-D16-100-55-1113 ... **BNS013T** ... 10.2
BNS 813-D06-D16-100-55-SP10 ... **BNS02TC** ... 10.2
BNS 813-D06-D16-100-55-SP11 ... **BNS02TE** ... 10.2
BNS 813-D06-L12-100-20-02-SP02 ... **BNS02TH** ... 1.4
BNS 813-D06-L12-100-20-04 ... **BNS0146** ... 1.4
BNS 813-D06-L12-100-22-06 ... **BNS0147** ... 1.4
BNS 813-D06-L12-100-22-06-FC ... **BNS0148** ... 1.4
BNS 813-D06-L12-100-55-0624 ... **BNS0149** ... 10.2
BNS 813-D06-L12-100-55-1057 ... **BNS014J** ... 10.2
BNS 813-D06-L12-100-55-1072 ... **BNS02R7** ... 10.2
BNS 813-D06-L12-100-55-FD-0372 ... **BNS014M** ... 10.2
BNS 813-D06-R12-100-12-06-FD ... **BNS0150** ... 1.4
BNS 813-D06-R12-100-22-06 ... **BNS0154** ... 1.4
BNS 813-D06-R12-100-55-1118 ... **BNS0157** ... 10.2
BNS 813-D08-D12-100-13-SP01 ... **BNS02TJ** ... 1.4
BNS 813-D08-D12-100-13-SP02 ... **BNS02TK** ... 1.4
BNS 813-D08-L12-100-10-01-FD ... **BNS0166** ... 1.4
BNS 813-D08-L12-100-10-02-FD ... **BNS0168** ... 1.4
BNS 813-D08-L12-100-10-02-FE ... **BNS03WY** ... 1.4
BNS 813-D08-L12-100-22-08 ... **BNS016H** ... 1.4
BNS 813-D08-L12-100-55-1004 ... **BNS016K** ... 10.2
BNS 813-D08-L12-62-12-08 ... **BNS01FU** ... 2.4
BNS 813-D08-L12-62-12-08-FE ... **BNS01FW** ... 2.4
BNS 813-D08-R12-100-10-02 ... **BNS016Y** ... 1.4
BNS 813-D08-R12-100-12-08 ... **BNS0170** ... 1.4
BNS 813-D08-R12-100-22-08 ... **BNS0173** ... 1.4
BNS 813-FD-60-183 ... **BNS001J** ... 7.4
BNS 813-FD-60-183-S4R ... **BNS0380** ... 7.4
BNS 813-FD-60-185-FD ... **BNS001N** ... 7.4
BNS 813-FD-60-185-S80R ... **BNS001P** ... 7.4
BNS 813-FD-60-186 ... **BNS001R** ... 7.4
BNS 813-FD-60-186-FC ... **BNS001T** ... 7.4
BNS 813-FD-60-187 ... **BNS001Y** ... 7.4
BNS 813-FD-60-187-FC ... **BNS001Z** ... 7.4
BNS 813-FK-60-183 ... **BNS0026** ... 7.4
BNS 813-FK-60-185 ... **BNS0029** ... 7.4
BNS 813-FK-60-186 ... **BNS002A** ... 7.4
BNS 813-FK-60-186-FC ... **BNS002C** ... 7.4
BNS 813-FK-60-187 ... **BNS002E** ... 7.4
BNS 813-FL-60-183 ... **BNS002F** ... 7.4
BNS 813-FL-60-185 ... **BNS002J** ... 7.4
BNS 813-FL-60-185-FD ... **BNS002K** ... 7.4
BNS 813-FL-60-186 ... **BNS002M** ... 7.4
BNS 813-FL-60-186-FC ... **BNS002N** ... 7.4
BNS 813-FL-60-187 ... **BNS002P** ... 7.4
BNS 813-FL-60-187-FC ... **BNS03WA** ... 7.4
BNS 813-FR-60-183 ... **BNS002R** ... 7.4
BNS 813-FR-60-183-FD-S80R ... **BNS002U** ... 7.4
BNS 813-FR-60-185 ... **BNS002Y** ... 7.4
BNS 813-FR-60-185-FD ... **BNS002Z** ... 7.4
BNS 813-FR-60-186 ... **BNS0030** ... 7.4
BNS 813-FR-60-186-FC ... **BNS0031** ... 7.4
BNS 813-FR-60-187 ... **BNS0034** ... 7.4
BNS 813-X503-FE-60-186 ... **BNS0081** ... 7.4
BNS 813-X508-D06-L12-100-22-06 ... **BNS02TL** ... 1.4
BNS 813-X512-B02-L12-61-A-22-02 ... **BNS02PW** ... 3.4
BNS 813-X512-B03-E12-61-A-55-FD-0686 ... **BNS02PY** ... 10.2
BNS 813-X512-C02-E16-61-D-22-02 ... **BNS02PZ** ... 3.4
BNS 813-X518-B06-L12-61-A-22-06 ... **BNS02TM** ... 3.4
BNS 813-X518-D04-L12-100-22-04 ... **BNS02TN** ... 1.4
BNS 813-X518-D06-L12-100-22-06 ... **BNS02TR** ... 1.4
BNS 813-X518-D06-L16-100-22-06 ... **BNS02TT** ... 1.4
BNS 813-X524-D06-L12-100-22-06 ... **BNS02TW** ... 1.4
BNS 813-X524-D08-L12-100-22-08 ... **BNS02TY** ... 1.4
BNS 813-X540-D08-L12-100-22-08 ... **BNS02TZ** ... 1.4
BNS 813-X572-D04-E12-100-22-04 ... **BNS02U5** ... 1.4
BNS 813-X572-D04-L12-100-22-04 ... **BNS02U6** ... 1.4
BNS 813-X572-D04-R12-100-22-04 ... **BNS02U7** ... 1.4
BNS 813-X573-D02-E12-100-22-02 ... **BNS02U8** ... 1.4
BNS 813-X573-D02-L12-100-22-02 ... **BNS02U9** ... 1.4
BNS 813-X574-B02-L12-61-A-22-02 ... **BNS02UA** ... 3.4
BNS 813-X574-D02-L12-100-22-02 ... **BNS02UC** ... 1.4
BNS 813-X597-B02-L12-61-A-22-02 ... **BNS02UF** ... 3.4
BNS 813-X598-B02-L12-61-A-22-02 ... **BNS02UH** ... 3.4
BNS 813-X599-B04-L12-61-A-22-04 ... **BNS02UJ** ... 3.4
BNS 813-X600-B04-L12-61-A-22-04 ... **BNS02UK** ... 3.4
BNS 813-X606-B06-L12-61-A-22-06 ... **BNS02UL** ... 3.4
BNS 813-X607-B06-L12-61-A-22-06 ... **BNS02UM** ... 3.4
BNS 813-X632-B03-L12-61-A-22-03 ... **BNS02UR** ... 3.4
BNS 813-X635-D04-L12-100-20-02 ... **BNS02UT** ... 1.4
BNS 813-X636-D04-L12-100-20-02 ... **BNS02UU** ... 1.4
BNS 813-X640-B02-L12-61-A-22-02 ... **BNS02UW** ... 3.4
BNS 813-X651-B02-L12-61-A-22-02 ... **BNS02UY** ... 3.4
BNS 813-X651-D02-L12-100-22-02 ... **BNS02UZ** ... 1.4
BNS 813-X654-B02-L12-61-A-22-02 ... **BNS02W0** ... 3.4
BNS 813-X654-B06-L12-61-A-22-06 ... **BNS02W1** ... 3.4
BNS 813-X655-B06-L12-61-A-22-06 ... **BNS02W2** ... 3.4
BNS 813-X694-B06-L12-61-A-22-06 ... **BNS02W5** ... 3.4
BNS 813-X695-B02-L12-61-A-22-02 ... **BNS02W6** ... 3.4
BNS 813-X710-FD-60-186-S4R ... **BNS0037** ... 7.4
BNS 813-X710-FD-60-187-S4R ... **BNS0038** ... 7.4
BNS 813-X710-FK-60-186-S4R ... **BNS0039** ... 7.4
BNS 813-X710-FR-60-186-S4R ... **BNS003A** ... 7.4
BNS 813-X710-FR-60-187-S4R ... **BNS003C** ... 7.4
BNS 813-X712-D04-D12-100-20-02-FD-S90L ... **BNS02W7** ... 1.4
BNS 813-X712-D04-D12-100-20-02-FD-S90R ... **BNS02W8** ... 1.4
BNS 813-X717-B06-L12-61-A-22-06 ... **BNS02WC** ... 3.4
BNS 813-X718-B06-L12-61-A-22-06 ... **BNS02WE** ... 3.4
BNS 813-X726-D06-L12-100-20-02-S90L ... **BNS02WF** ... 1.4
BNS 813-X726-D06-L12-100-20-02-S90R ... **BNS02WH** ... 1.4
BNS 813-X755-FK-60-186 ... **BNS0085** ... 7.4
BNS 813-X782-D03-L16-100-10-02 ... **BNS02WJ** ... 1.4
BNS 813-X783-D03-L16-100-10-02 ... **BNS02WK** ... 1.4
BNS 813-X793-B02-L12-61-A-22-02 ... **BNS02WM** ... 3.4
BNS 813-X794-B02-L12-61-A-22-02 ... **BNS02WN** ... 3.4
BNS 813-X805-B06-L12-61-A-22-06 ... **BNS02WR** ... 3.4
BNS 813-X806-B02-L12-61-A-22-02 ... **BNS02WT** ... 3.4
BNS 813-X817-B04-L12-61-A-22-04 ... **BNS02WU** ... 3.4
BNS 813-X818-B04-L12-61-A-22-04 ... **BNS02WW** ... 3.4
BNS 813-X819-B02-L12-61-A-22-02 ... **BNS02WY** ... 3.4
BNS 813-X820-B02-L12-61-A-22-02 ... **BNS02WZ** ... 3.4
BNS 813-X821-B06-L12-61-A-22-06 ... **BNS02Y0** ... 3.4
BNS 813-X824-B06-L12-61-A-22-06 ... **BNS02Y1** ... 3.4
BNS 813-X879-B06-R12-72-10 ... **BNS03NY** ... 4.4
BNS 813-X886-B02-L12-61-A-22-02 ... **BNS03RA** ... 3.4
BNS 813-X888-D03-R12-100-20-02 ... **BNS03RL** ... 1.4
BNS 813-X922-FL-60-183 ... **BNS03W4** ... 7.4
BNS 816-B02-KHG-12-602-11 ... **BNS0386** ... 1.10
BNS 816-B02-KHG-12-602-11-S80L ... **BNS03W1** ... 1.10
BNS 816-B02-KHG-12-602-11-SP02 ... **BNS03K3** ... 1.10
BNS 816-B02-KHG-12-602-11-SP03 ... **BNS03K4** ... 1.10
BNS 816-B02-KHG-12-610-11 ... **BNS03E0** ... 3.1
BNS 816-B02-KHG-12-610-SP02 ... **BNS03K5** ... 3.1
BNS 816-B02-KHG-12-610-SP03 ... **BNS03K6** ... 3.1
BNS 816-B02-KHG-16-602-11 ... **BNS0387** ... 1.10
BNS 816-B02-NA-12-602-11 ... **BNS0389** ... 1.10
BNS 816-B02-PA-12-602-11 ... **BNS038F** ... 1.10
BNS 816-B02-PA-12-610-11 ... **BNS03EA** ... 3.1
BNS 816-B02-WS-12-602-11 ... **BNS038L** ... 1.10
BNS 816-B03-00-12-602-11-1069 ... **BNS03CT** ... 1.10
BNS 816-B03-EJA-16-611-11 ... **BNS03EY** ... 3.1

BNS 816-B03-KHG-12-602-11 ... **BNS038P** ... 1.10
BNS 816-B03-KHG-12-602-11-SP02 ... **BNS03K7** ... 1.10
BNS 816-B03-KHG-12-602-11-SP03 ... **BNS03K8** ... 1.10
BNS 816-B03-KHG-12-610-11-S80R ... **BNS03F0** ... 3.1
BNS 816-B03-KHG-12-610-SP02 ... **BNS03K9** ... 3.1
BNS 816-B03-NA-12-602-11 ... **BNS038T** ... 1.10
BNS 816-B03-NG-12-602-11 ... **BNS038Y** ... 1.10
BNS 816-B03-PA-12-602-11 ... **BNS038Z** ... 1.10
BNS 816-B03-PA-12-602-11-SP02 ... **BNS03KC** ... 1.10
BNS 816-B03-PA-12-602-11-SP03 ... **BNS03KE** ... 1.10
BNS 816-B03-THA-16-602-11 ... **BNS0395** ... 1.10
BNS 816-B03-WS-12-602-11 ... **BNS0398** ... 1.10
BNS 816-B04-KHG-12-602-11 ... **BNS039E** ... 1.10
BNS 816-B04-KHG-12-602-11-SP02 ... **BNS03KF** ... 1.10
BNS 816-B04-KHG-12-602-11-SP03 ... **BNS03KH** ... 1.10
BNS 816-B04-KHH-12-602-11 ... **BNS03FZ** ... 1.10
BNS 816-B04-KHH-12-610-11 ... **BNS03H0** ... 3.1
BNS 816-B04-NA-12-602-11 ... **BNS039F** ... 1.10
BNS 816-B04-PA-12-602-11 ... **BNS039K** ... 1.10
BNS 816-B04-PA-12-602-11-S90L ... **BNS039L** ... 1.10
BNS 816-B04-PA-12-602-11-SP02 ... **BNS03KK** ... 1.10
BNS 816-B04-PA-12-602-11-SP03 ... **BNS03KL** ... 1.10
BNS 816-B04-PA-12-602-11-SP10 ... **BNS03KM** ... 1.10
BNS 816-B04-PA-12-610-11 ... **BNS03H5** ... 3.1
BNS 816-B04-PA-16-605-11 ... **BNS03H6** ... 4.6
BNS 816-B04-PA-16-611-11 ... **BNS03H7** ... 3.1
BNS 816-B04-WO-12-610-11 ... **BNS03HM** ... 3.1
BNS 816-B05-EJA-16-602-11 ... **BNS039W** ... 1.10
BNS 816-B05-KHG-16-602-11 ... **BNS039Z** ... 1.10
BNS 816-B05-KHG-16-602-11-SP03 ... **BNS03KN** ... 1.10
BNS 816-B05-PA-12-602-11 ... **BNS03A3** ... 1.10
BNS 816-B05-PA-12-602-11-SP08 ... **BNS03KP** ... 1.10
BNS 816-B05-PA-12-602-11-SP09 ... **BNS03KR** ... 1.10
BNS 816-B06-KHG-12-602-11 ... **BNS03AA** ... 1.10
BNS 816-B06-NA-12-602-11 ... **BNS03AE** ... 1.10
BNS 816-B06-NA-12-602-11-S90R ... **BNS03AF** ... 1.10
BNS 816-B06-PA-12-602-11 ... **BNS03AJ** ... 1.10
BNS 816-B06-PA-12-602-11-S90L ... **BNS03AK** ... 1.10
BNS 816-B06-PA-16-602-11-S90L ... **BNS03AP** ... 1.10
BNS 816-B06-THA-16-602-11 ... **BNS03AR** ... 1.10
BNS 816-B06-WS-12-602-11 ... **BNS03AU** ... 1.10
BNS 816-B08-NA-12-602-11 ... **BNS03C0** ... 1.10
BNS 816-B08-PA-12-602-11 ... **BNS03C1** ... 1.10
BNS 816-B08-PA-12-605-11 ... **BNS03JL** ... 4.6
BNS 816-B08-THA-16-605-11 ... **BNS03JN** ... 4.6
BNS 816-B10-PA-12-602-11 ... **BNS03C9** ... 1.10
BNS 816-X546-B06-00-12-610-12 ... **BNS03KZ** ... 3.13
BNS 816-X547-B04-00-12-610-12 ... **BNS03L0** ... 3.13
BNS 816-X548-B02-00-12-610-12 ... **BNS03L1** ... 3.13
BNS 816-X569-B04-00-12-602-11 ... **BNS03L4** ... 1.13
BNS 816-X569-B06-00-12-602-11 ... **BNS03L5** ... 1.13
BNS 816-X569-B08-00-12-602-11 ... **BNS03L6** ... 1.13
BNS 816-X579-B02-00-12-610-11 ... **BNS03L7** ... 3.13
BNS 816-X580-B02-00-12-602-11 ... **BNS03L8** ... 1.13
BNS 816-X580-B02-00-12-610-11 ... **BNS03L9** ... 3.13
BNS 816-X582-B02-00-12-610-11 ... **BNS03LA** ... 3.13
BNS 816-X584-B06-PA-12-602-11 ... **BNS03LC** ... 1.10
BNS 816-X585-B06-PA-12-602-11 ... **BNS03LE** ... 1.10
BNS 816-X594-B04-00-12-610-11 ... **BNS03LF** ... 3.13
BNS 816-X595-B04-00-12-602-11 ... **BNS03LH** ... 1.13
BNS 816-X595-B04-00-12-610-11 ... **BNS03LJ** ... 3.13
BNS 816-X596-B04-00-12-602-11 ... **BNS03LK** ... 1.13
BNS 816-X596-B04-00-12-610-11 ... **BNS03LL** ... 3.13
BNS 816-X601-B08-00-12-602-11 ... **BNS03LM** ... 1.13
BNS 816-X602-B08-00-12-602-11 ... **BNS03LN** ... 1.13
BNS 816-X603-B03-00-12-602-11 ... **BNS03LT** ... 1.13
BNS 816-X603-B04-00-12-602-11 ... **BNS03LU** ... 1.13
BNS 816-X603-B06-00-12-602-11 ... **BNS03LY** ... 1.13
BNS 816-X603-B06-00-12-610-11 ... **BNS03LZ** ... 3.13
BNS 816-X604-B06-00-12-602-11 ... **BNS03M0** ... 1.13
BNS 816-X615-B02-PA-12-602-11 ... **BNS03M2** ... 1.10
BNS 816-X616-B02-PA-12-602-11 ... **BNS03M3** ... 1.10
BNS 816-X617-B04-PA-12-602-11 ... **BNS03M4** ... 1.10
BNS 816-X618-B04-PA-12-602-11 ... **BNS03M5** ... 1.10
BNS 816-X630-B06-00-12-610-11 ... **BNS03M7** ... 3.13
BNS 816-X631-B06-00-12-602-11 ... **BNS03M8** ... 1.13
BNS 816-X652-B06-PA-12-602-11 ... **BNS03M9** ... 1.10
BNS 816-X697-B04-KHH-12-602-11 ... **BNS03MA** ... 1.10
BNS 816-X709-B03-00-12-610-11 ... **BNS03MC** ... 3.13
BNS 816-X725-B02-PA-12-602-11-S90L ... **BNS03MF** ... 1.10
BNS 816-X741-B02-00-12-602-11 ... **BNS02Y3** ... 1.13
BNS 816-X741-B02-00-12-610-11 ... **BNS03MK** ... 3.13
BNS 816-X742-B02-00-12-602-11 ... **BNS03ML** ... 1.13
BNS 816-X742-B02-00-12-610-11 ... **BNS03MM** ... 3.13
BNS 816-X760-B02-PA-12-610-11 ... **BNS03MN** ... 3.1
BNS 816-X762-B06-00-12-610-11 ... **BNS03MW** ... 3.13
BNS 816-X786-B06-00-12-602-11 ... **BNS03MZ** ... 1.13
BNS 816-X786-B06-00-12-610-11 ... **BNS03N0** ... 3.13
BNS 816-X790-B06-00-12-610-11 ... **BNS02Y4** ... 3.13
BNS 816-X791-B02-00-12-610-11 ... **BNS03N1** ... 3.13
BNS 816-X792-B02-00-12-610-11 ... **BNS03N2** ... 3.13
BNS 816-X816-B04-00-12-610-11 ... **BNS03N3** ... 3.13
BNS 816-X826-B06-PA-12-610-11 ... **BNS03N4** ... 3.1
BNS 816-X835-B04-00-12-610-11 ... **BNS03N6** ... 3.13
BNS 816-X844-B06-00-12-610-11 ... **BNS03N7** ... 3.13
BNS 816-X846-B02-00-12-610-11 ... **BNS03N8** ... 3.13
BNS 816-X849-B06-00-12-610-11 ... **BNS03N9** ... 3.13
BNS 816-X850-B06-00-12-610-11 ... **BNS03NA** ... 3.13
BNS 816-X851-B06-00-12-610-11 ... **BNS03NC** ... 3.13
BNS 816-X876-B03-PA-12-602-11 ... **BNS03NH** ... 1.10
BNS 816-X885-B02-PA-12-610-11 ... **BNS03RC** ... 3.1
BNS 816-X889-B04-00-12-602-11 ... **BNS03RP** ... 1.13
BNS 816-X889-B04-00-12-610-11 ... **BNS03RR** ... 3.13
BNS 819-100-D-10 ... **BNS005A** ... 8.2
BNS 819-100-D-10-S80 ... **BNS005E** ... 8.2
BNS 819-100-D-11 ... **BNS005F** ... 8.2
BNS 819-100-D-11-S80 ... **BNS005J** ... 8.2
BNS 819-100-D-12 ... **BNS005K** ... 8.2
BNS 819-100-D-12-S80 ... **BNS005L** ... 8.2
BNS 819-100-D-13 ... **BNS005M** ... 8.2
BNS 819-100-D-13-S21 ... **BNS005N** ... 8.2
BNS 819-100-D-13-S4 ... **BNS005P** ... 8.2
BNS 819-100-E-11 ... **BNS005U** ... 8.2
BNS 819-100-E-12 ... **BNS005Y** ... 8.2
BNS 819-100-E-13 ... **BNS005Z** ... 8.2
BNS 819-100-K-10 ... **BNS0060** ... 8.2
BNS 819-100-K-10-S21 ... **BNS0061** ... 8.2
BNS 819-100-K-11 ... **BNS0063** ... 8.2
BNS 819-100-K-11-S4 ... **BNS0064** ... 8.2
BNS 819-100-K-12 ... **BNS0065** ... 8.2
BNS 819-100-K-12-S80 ... **BNS0066** ... 8.2
BNS 819-100-K-13 ... **BNS0067** ... 8.2
BNS 819-100-K-13-S4 ... **BNS009H** ... 8.2
BNS 819-100-K-13-SP01 ... **BNS0069** ... 8.2
BNS 819-100-R-10 ... **BNS006A** ... 8.2
BNS 819-100-R-11 ... **BNS006E** ... 8.2
BNS 819-100-R-11-S21 ... **BNS006F** ... 8.2
BNS 819-100-R-11-S4 ... **BNS006H** ... 8.2
BNS 819-100-R-11-S80 ... **BNS006J** ... 8.2
BNS 819-100-R-12 ... **BNS006K** ... 8.2
BNS 819-100-R-12-S80 ... **BNS006L** ... 8.2
BNS 819-100-R-13 ... **BNS006M** ... 8.2
BNS 819-100-R-13-S21 ... **BNS006N** ... 8.2
BNS 819-100-R-13-S4 ... **BNS006P** ... 8.2
BNS 819-100-R-13-S80 ... **BNS006R** ... 8.2
BNS 819-99-D-10 ... **BNS003U** ... 8.2
BNS 819-99-D-10-S80 ... **BNS003Y** ... 8.2
BNS 819-99-D-11 ... **BNS003Z** ... 8.2
BNS 819-99-D-11-S80 ... **BNS0040** ... 8.2
BNS 819-99-D-11-SP011 ... **BNS03CY** ... 8.2
BNS 819-99-D-13 ... **BNS0043** ... 8.2
BNS 819-99-E-12 ... **BNS0049** ... 8.2
BNS 819-99-E-13 ... **BNS004C** ... 8.2
BNS 819-99-K-10 ... **BNS004E** ... 8.2
BNS 819-99-K-10-S80 ... **BNS004H** ... 8.2
BNS 819-99-K-11 ... **BNS004J** ... 8.2
BNS 819-99-K-13 ... **BNS004M** ... 8.2
BNS 819-99-R-10 ... **BNS004P** ... 8.2
BNS 819-99-R-10-S80 ... **BNS004T** ... 8.2
BNS 819-99-R-11 ... **BNS004U** ... 8.2
BNS 819-99-R-11-S80 ... **BNS004W** ... 8.2
BNS 819-99-R-12 ... **BNS004Y** ... 8.2
BNS 819-99-R-12-S4 ... **BNS004Z** ... 8.2
BNS 819-99-R-12-S80 ... **BNS0050** ... 8.2
BNS 819-99-R-13 ... **BNS0051** ... 8.2
BNS 819-99-R-13-S4 ... **BNS009J** ... 8.2
BNS 819-B02-D08-40-10 ... **BNS01NL** ... 6.2
BNS 819-B02-D08-40-11 ... **BNS01NN** ... 6.2
BNS 819-B02-D08-40-11-FC ... **BNS03NL** ... 6.2
BNS 819-B02-D08-40-11-S80R ... **BNS03ZR** ... 6.2
BNS 819-B02-D08-40-12 ... **BNS01NP** ... 6.2
BNS 819-B02-D08-40-13 ... **BNS01NT** ... 6.2
BNS 819-B02-D08-40-13-S80R ... **BNS01NW** ... 6.2
BNS 819-B02-D08-46-11 ... **BNS01P3** ... 5.2
BNS 819-B02-D12-61-12-10 ... **BNS026R** ... 3.2
BNS 819-B02-D12-61-12-10-FD ... **BNS026T** ... 3.2
BNS 819-B02-D12-61-12-10-S80L ... **BNS03YA** ... 3.2
BNS 819-B02-D12-61-12-10-S80R ... **BNS026Z** ... 3.2
BNS 819-B02-D12-61-12-3B ... **BNS0271** ... 3.2
BNS 819-B02-D12-61-24-10 ... **BNS0274** ... 3.2
BNS 819-B02-D12-61-24-10-FC ... **BNS0275** ... 3.2
BNS 819-B02-D12-61-30-10 ... **BNS0276** ... 3.2

BNS 819-B02-D12-72-10-FD ... **BNS0248** ... 4.2
BNS 819-B02-D12-72-10-FD-R2 ... **BNS02Y5** ... 4.2
BNS 819-B02-D16-61-16-10 ... **BNS0277** ... 3.2
BNS 819-B02-D16-61-30-10 ... **BNS027A** ... 3.2
BNS 819-B02-D16-72-10 ... **BNS0249** ... 4.2
BNS 819-B02-E08-46-13 ... **BNS01PN** ... 5.2
BNS 819-B02-K08-40-11 ... **BNS01PU** ... 6.2
BNS 819-B02-K08-40-13 ... **BNS01PZ** ... 6.2
BNS 819-B02-K08-40-13-C075 ... **BNS02Y6** ... 6.2
BNS 819-B02-K08-46-11 ... **BNS01R1** ... 5.2
BNS 819-B02-K12-61-12-10 ... **BNS027J** ... 3.2
BNS 819-B02-K16-61-16-10 ... **BNS027L** ... 3.2
BNS 819-B02-L12-61-12-10 ... **BNS027M** ... 3.2
BNS 819-B02-L12-61-12-3B ... **BNS027P** ... 3.2
BNS 819-B02-L12-72-10-FD ... **BNS03Z5** ... 4.2
BNS 819-B02-L16-61-16-10 ... **BNS027R** ... 3.2
BNS 819-B02-L16-61-16-10-FD ... **BNS03NM** ... 3.2
BNS 819-B02-R08-40-10 ... **BNS01R3** ... 6.2
BNS 819-B02-R08-40-10-S80R ... **BNS01R4** ... 6.2
BNS 819-B02-R08-40-11 ... **BNS01R5** ... 6.2
BNS 819-B02-R08-40-11-S80R ... **BNS03PC** ... 6.2
BNS 819-B02-R08-40-13 ... **BNS01R9** ... 6.2
BNS 819-B02-R10-46-11 ... **BNS01RL** ... 5.2
BNS 819-B02-R12-61-12-10 ... **BNS027T** ... 3.2
BNS 819-B02-R12-61-12-10-FD ... **BNS027W** ... 3.2
BNS 819-B02-R12-61-12-10-S80R ... **BNS027Y** ... 3.2
BNS 819-B02-R12-61-12-55-FD-1009 ... **BNS027Z** ... 10.2
BNS 819-B02-R12-72-10 ... **BNS024F** ... 4.2
BNS 819-B02-R16-61-16-10 ... **BNS0283** ... 3.2
BNS 819-B02-R16-61-30-10 ... **BNS0286** ... 3.2
BNS 819-B03-D08-40-10 ... **BNS01RN** ... 6.2
BNS 819-B03-D08-40-11 ... **BNS01RP** ... 6.2
BNS 819-B03-D08-40-11-S80R ... **BNS01RT** ... 6.2
BNS 819-B03-D08-40-12 ... **BNS01RU** ... 6.2
BNS 819-B03-D08-40-13 ... **BNS01RW** ... 6.2
BNS 819-B03-D08-40-13-S80R ... **BNS01RZ** ... 6.2
BNS 819-B03-D08-40-SP01 ... **BNS02Y8** ... 6.2
BNS 819-B03-D08-46-10 ... **BNS01T1** ... 5.2
BNS 819-B03-D08-46-13 ... **BNS01T6** ... 5.2
BNS 819-B03-D10-46-13 ... **BNS01TJ** ... 5.2
BNS 819-B03-D12-61-12-10 ... **BNS0287** ... 3.2
BNS 819-B03-D12-61-12-10-FD ... **BNS0288** ... 3.2
BNS 819-B03-D12-61-12-10-FE ... **BNS028A** ... 3.2
BNS 819-B03-D12-61-12-10-S72L ... **BNS028E** ... 4.2
BNS 819-B03-D12-61-12-10-S80L ... **BNS028F** ... 3.2
BNS 819-B03-D12-61-12-10-S80R ... **BNS028H** ... 3.2
BNS 819-B03-D12-61-12-3B ... **BNS028J** ... 3.2
BNS 819-B03-D12-61-12-55-0929 ... **BNS028K** ... 10.2
BNS 819-B03-D12-61-24-10 ... **BNS028N** ... 3.2
BNS 819-B03-D12-61-24-10-FC ... **BNS028P** ... 3.2
BNS 819-B03-D12-72-10 ... **BNS024H** ... 4.2
BNS 819-B03-D12-72-10-FD ... **BNS024J** ... 4.2
BNS 819-B03-D12-72-10-FD-L3 ... **BNS02Y9** ... 4.2
BNS 819-B03-D12-72-10-FD-R3 ... **BNS02YA** ... 4.2
BNS 819-B03-D16-61-16-10-S80R ... **BNS028U** ... 3.2
BNS 819-B03-D16-72-10 ... **BNS024K** ... 4.2
BNS 819-B03-E08-40-13 ... **BNS01TL** ... 6.2
BNS 819-B03-E12-61-12-10-FD ... **BNS03T8** ... 3.2
BNS 819-B03-K08-40-12-S80L ... **BNS03W8** ... 6.2
BNS 819-B03-K10-46-11 ... **BNS01U0** ... 5.2
BNS 819-B03-K12-61-12-10 ... **BNS028Z** ... 3.2
BNS 819-B03-K16-72-10 ... **BNS024N** ... 4.2
BNS 819-B03-L12-61-12-10 ... **BNS0292** ... 3.2
BNS 819-B03-L12-61-12-3B ... **BNS0294** ... 3.2
BNS 819-B03-L12-72-10 ... **BNS024P** ... 4.2
BNS 819-B03-R08-40-10 ... **BNS01U1** ... 6.2
BNS 819-B03-R08-40-11 ... **BNS01U2** ... 6.2
BNS 819-B03-R08-40-12-S80L ... **BNS03YH** ... 6.2
BNS 819-B03-R08-40-13 ... **BNS01U4** ... 6.2
BNS 819-B03-R08-40-13-S80R ... **BNS01U5** ... 6.2
BNS 819-B03-R08-46-11 ... **BNS01U9** ... 5.2
BNS 819-B03-R08-46-11-S80R ... **BNS03TA** ... 5.2
BNS 819-B03-R12-61-12-10 ... **BNS0298** ... 3.2
BNS 819-B03-R12-61-12-10-FD ... **BNS029A** ... 3.2
BNS 819-B03-R12-61-12-10-S80R ... **BNS029E** ... 3.2
BNS 819-B03-R12-61-12-10-SP01 ... **BNS02YC** ... 3.2
BNS 819-B03-R12-61-12-10-SP02 ... **BNS02YE** ... 3.2
BNS 819-B03-R12-61-24-10 ... **BNS029J** ... 3.2
BNS 819-B03-R12-72-10 ... **BNS024T** ... 4.2
BNS 819-B03-R12-72-10-FD ... **BNS024U** ... 4.2
BNS 819-B03-R16-61-16-10 ... **BNS029K** ... 3.2
BNS 819-B03-R16-72-10 ... **BNS024W** ... 4.2
BNS 819-B04-D08-40-11 ... **BNS01UK** ... 6.2
BNS 819-B04-D08-40-13 ... **BNS01UP** ... 6.2
BNS 819-B04-D08-46-11-S80S ... **BNS01UU** ... 5.2
BNS 819-B04-D08-46-13 ... **BNS01UY** ... 5.2
BNS 819-B04-D10-46-11 ... **BNS01W3** ... 5.2
BNS 819-B04-D12-61-12-10 ... **BNS029M** ... 3.2
BNS 819-B04-D12-61-12-10-FD ... **BNS029N** ... 3.2
BNS 819-B04-D12-61-12-10-S80S ... **BNS029T** ... 3.2
BNS 819-B04-D12-61-12-55-1138 ... **BNS029Y** ... 10.2
BNS 819-B04-D12-61-12-55-FD-1119 ... **BNS029Z** ... 10.2
BNS 819-B04-D12-72-10 ... **BNS024Z** ... 4.2
BNS 819-B04-D12-72-10-FD ... **BNS0250** ... 4.2
BNS 819-B04-D12-72-10-FD-L4 ... **BNS02YF** ... 4.2
BNS 819-B04-D12-72-10-FE ... **BNS0251** ... 4.2
BNS 819-B04-D16-61-16-10 ... **BNS02A0** ... 3.2
BNS 819-B04-D16-72-10 ... **BNS0252** ... 4.2
BNS 819-B04-E08-46-11 ... **BNS01WC** ... 5.2
BNS 819-B04-E12-61-12-10 ... **BNS02A2** ... 3.2
BNS 819-B04-K12-61-12-10 ... **BNS02A3** ... 3.2
BNS 819-B04-K12-61-12-10-S90L ... **BNS03R7** ... 3.2
BNS 819-B04-K16-72-10 ... **BNS0258** ... 4.2
BNS 819-B04-L12-61-12-10 ... **BNS02A7** ... 3.2
BNS 819-B04-L12-61-12-10-FE ... **BNS02A9** ... 3.2
BNS 819-B04-R08-40-10 ... **BNS01WU** ... 6.2
BNS 819-B04-R08-40-11 ... **BNS01WW** ... 6.2
BNS 819-B04-R08-46-11 ... **BNS01Y1** ... 5.2
BNS 819-B04-R08-46-12 ... **BNS01Y2** ... 5.2
BNS 819-B04-R08-46-13 ... **BNS01Y3** ... 5.2
BNS 819-B04-R12-61-12-10 ... **BNS02AH** ... 3.2
BNS 819-B04-R12-61-12-10-FD ... **BNS02AJ** ... 3.2
BNS 819-B04-R12-72-10 ... **BNS025E** ... 4.2
BNS 819-B04-R12-72-10-FD ... **BNS03U7** ... 4.2
BNS 819-B04-R16-61-16-10 ... **BNS02AL** ... 3.2
BNS 819-B04-R16-72-10 ... **BNS025F** ... 4.2
BNS 819-B04-R16-72-10-FE ... **BNS025J** ... 4.2
BNS 819-B05-D08-46-13 ... **BNS01YM** ... 5.2
BNS 819-B05-D08-46-13-FC ... **BNS01YN** ... 5.2
BNS 819-B05-D12-61-12-10 ... **BNS02AM** ... 3.2
BNS 819-B05-D12-72-10 ... **BNS025K** ... 4.2
BNS 819-B05-E08-46-11 ... **BNS03WC** ... 5.2
BNS 819-B05-L12-61-12-10 ... **BNS02AT** ... 3.2
BNS 819-B05-L12-72-10 ... **BNS025L** ... 4.2
BNS 819-B05-R08-40-11 ... **BNS01Z4** ... 6.2
BNS 819-B05-R08-46-11 ... **BNS01Z9** ... 5.2
BNS 819-B05-R08-46-13 ... **BNS01ZC** ... 5.2
BNS 819-B05-R12-61-12-10 ... **BNS02AU** ... 3.2
BNS 819-B05-R12-61-12-10-FD ... **BNS02AW** ... 3.2
BNS 819-B05-R12-72-10 ... **BNS025M** ... 4.2
BNS 819-B06-D08-40-10 ... **BNS01ZL** ... 6.2
BNS 819-B06-D08-46-13 ... **BNS01ZZ** ... 5.2
BNS 819-B06-D12-61-12-10 ... **BNS02AY** ... 3.2
BNS 819-B06-D12-72-10 ... **BNS025P** ... 4.2
BNS 819-B06-K12-61-12-10 ... **BNS02C2** ... 3.2
BNS 819-B06-K12-72-10 ... **BNS025U** ... 4.2
BNS 819-B06-L12-61-12-10 ... **BNS02C4** ... 3.2
BNS 819-B06-R08-40-13 ... **BNS020E** ... 6.2
BNS 819-B06-R12-61-12-10 ... **BNS02C8** ... 3.2
BNS 819-B06-R12-72-10 ... **BNS025Z** ... 4.2
BNS 819-B06-R12-72-10-FD ... **BNS0260** ... 4.2
BNS 819-B06-R16-72-10 ... **BNS0261** ... 4.2
BNS 819-B08-R16-72-10 ... **BNS0269** ... 4.2
BNS 819-B10-D08-46-11 ... **BNS0219** ... 5.2
BNS 819-B10-R12-72-10 ... **BNS026H** ... 4.2
BNS 819-B10-R16-72-10 ... **BNS026K** ... 4.2
BNS 819-D02-D12-100-10 ... **BNS00A1** ... 1.2
BNS 819-D02-D12-100-10-FD ... **BNS00A2** ... 1.2
BNS 819-D02-D12-100-10-FD-L2 ... **BNS02YK** ... 1.2
BNS 819-D02-D12-100-10-FD-R2 ... **BNS02YL** ... 1.2
BNS 819-D02-D12-100-10-FD-S90L ... **BNS00A4** ... 1.2
BNS 819-D02-D12-100-10-FE ... **BNS00A6** ... 1.2
BNS 819-D02-D12-100-10-FE-SP04 ... **BNS02YM** ... 1.2
BNS 819-D02-D12-100-10-SP14 ... **BNS02YN** ... 1.2
BNS 819-D02-D12-100-10-SP15 ... **BNS02YP** ... 1.2
BNS 819-D02-D12-62-10 ... **BNS01H2** ... 2.2
BNS 819-D02-D12-62-10-FD-S80R ... **BNS01H4** ... 2.2
BNS 819-D02-D12-62-10-S80R ... **BNS01H6** ... 2.2
BNS 819-D02-D16-100-10 ... **BNS00AC** ... 1.2
BNS 819-D02-D16-100-10-FD ... **BNS00AE** ... 1.2
BNS 819-D02-D16-100-10-FD-S80R ... **BNS03ZP** ... 1.2
BNS 819-D02-D16-100-10-FE ... **BNS00AH** ... 1.2
BNS 819-D02-D16-62-10 ... **BNS01H7** ... 2.2
BNS 819-D02-E12-100-10 ... **BNS00AK** ... 1.2
BNS 819-D02-E12-100-10-FD ... **BNS00AL** ... 1.2
BNS 819-D02-E12-62-10 ... **BNS01H9** ... 2.2
BNS 819-D02-K12-100-10 ... **BNS00AW** ... 1.2
BNS 819-D02-K12-100-10-A032 ... **BNS02YR** ... 1.2
BNS 819-D02-K12-100-10-A033 ... **BNS02YT** ... 1.2
BNS 819-D02-K12-100-10-FD ... **BNS00AY** ... 1.2
BNS 819-D02-K12-100-10-FD-R2 ... **BNS02YU** ... 1.2
BNS 819-D02-K16-62-10 ... **BNS01HF** ... 2.2

BNS 819-D02-L12-100-10 ... **BNS00C3** ... 1.2
BNS 819-D02-L12-100-10-FD ... **BNS00C4** ... 1.2
BNS 819-D02-L12-100-10-FD-L2 ... **BNS02YW** ... 1.2
BNS 819-D02-L12-100-10-FD-S80L ... **BNS01A3** ... 1.2
BNS 819-D02-L12-100-10-FD-S80R ... **BNS00C5** ... 1.2
BNS 819-D02-L12-100-10-FE ... **BNS00C6** ... 1.2
BNS 819-D02-L12-62-10 ... **BNS01HH** ... 2.2
BNS 819-D02-L16-100-10-FD ... **BNS00C8** ... 1.2
BNS 819-D02-L16-62-10-FD ... **BNS01HK** ... 2.2
BNS 819-D02-R12-100-10 ... **BNS00C9** ... 1.2
BNS 819-D02-R12-100-10-FD ... **BNS00CA** ... 1.2
BNS 819-D02-R12-100-10-FD-S80L ... **BNS01A4** ... 1.2
BNS 819-D02-R12-100-10-FD-S80R ... **BNS00CC** ... 1.2
BNS 819-D02-R12-100-10-FE ... **BNS00CE** ... 1.2
BNS 819-D02-R12-100-10-FE-S80R ... **BNS00CF** ... 1.2
BNS 819-D02-R12-100-10-FE-SP66 ... **BNS02YZ** ... 1.2
BNS 819-D02-R12-100-10-S80L ... **BNS00CH** ... 1.2
BNS 819-D02-R12-100-10-S80R ... **BNS00CJ** ... 1.2
BNS 819-D02-R12-62-10 ... **BNS01HL** ... 2.2
BNS 819-D02-R12-62-10-FD ... **BNS01HM** ... 2.2
BNS 819-D02-R12-62-10-FE ... **BNS01HP** ... 2.2
BNS 819-D02-R16-100-10 ... **BNS00CM** ... 1.2
BNS 819-D02-R16-100-10-FD ... **BNS00CN** ... 1.2
BNS 819-D02-R16-100-10-FE-S80R ... **BNS00CR** ... 1.2
BNS 819-D03-D12-100-10 ... **BNS00CT** ... 1.2
BNS 819-D03-D12-100-10-FD ... **BNS00CU** ... 1.2
BNS 819-D03-D12-100-10-FD-L3 ... **BNS02Z0** ... 1.2
BNS 819-D03-D12-100-10-FD-R3 ... **BNS02Z1** ... 1.2
BNS 819-D03-D12-100-10-FD-S80S ... **BNS03TZ** ... 1.2
BNS 819-D03-D12-100-10-FD-S90L ... **BNS0189** ... 1.2
BNS 819-D03-D12-100-10-FD-S90R ... **BNS00CW** ... 1.2
BNS 819-D03-D12-100-10-FE ... **BNS00CY** ... 1.2
BNS 819-D03-D12-100-10-FE-SP56 ... **BNS02Z2** ... 1.2
BNS 819-D03-D12-100-10-FE-SP66 ... **BNS02Z3** ... 1.2
BNS 819-D03-D12-100-10-SP09 ... **BNS02Z4** ... 1.2
BNS 819-D03-D12-100-10-SP11 ... **BNS02Z5** ... 1.2
BNS 819-D03-D12-100-10-SP22 ... **BNS02Z6** ... 1.2
BNS 819-D03-D12-100-10-SP23 ... **BNS02Z7** ... 1.2
BNS 819-D03-D12-100-10-SP51 ... **BNS02Z8** ... 1.2
BNS 819-D03-D12-62-10-FD ... **BNS01HW** ... 2.2
BNS 819-D03-D12-62-10-FE ... **BNS01J0** ... 2.2
BNS 819-D03-D12-62-10-JT ... **BNS02Z9** ... 2.2
BNS 819-D03-D12-62-10-JT-SP03 ... **BNS02ZA** ... 2.2
BNS 819-D03-D12-62-10-JT-SP04 ... **BNS02ZC** ... 2.2
BNS 819-D03-D12-62-10-SP01 ... **BNS02ZE** ... 2.2
BNS 819-D03-D12-62-10-SP02 ... **BNS02ZF** ... 2.2
BNS 819-D03-D12-62-10-SP18 ... **BNS02ZH** ... 2.2
BNS 819-D03-D12-62-10-SP19 ... **BNS02ZJ** ... 2.2
BNS 819-D03-D16-100-10-FD ... **BNS00E3** ... 1.2
BNS 819-D03-D16-100-10-FE ... **BNS00E4** ... 1.2
BNS 819-D03-K12-100-10 ... **BNS00EF** ... 1.2
BNS 819-D03-K12-100-10-FD ... **BNS00EH** ... 1.2
BNS 819-D03-K12-62-10 ... **BNS01J5** ... 2.2
BNS 819-D03-L12-100-10 ... **BNS00EM** ... 1.2
BNS 819-D03-L12-100-10-FD ... **BNS00EN** ... 1.2
BNS 819-D03-L12-100-10-FD-A004 ... **BNS02ZK** ... 1.2
BNS 819-D03-L12-100-10-FD-A005 ... **BNS02ZL** ... 1.2
BNS 819-D03-L12-100-10-FD-C114 ... **BNS02ZM** ... 1.2
BNS 819-D03-L12-100-10-FD-C115 ... **BNS02ZN** ... 1.2
BNS 819-D03-L12-100-FE-SP56 ... **BNS02ZP** ... 1.2
BNS 819-D03-L12-100-FE-SP66 ... **BNS02ZR** ... 1.2
BNS 819-D03-L12-62-10 ... **BNS01JA** ... 2.2
BNS 819-D03-L16-100-10-FD ... **BNS00ET** ... 1.2
BNS 819-D03-R12-100-10 ... **BNS00EW** ... 1.2
BNS 819-D03-R12-100-10-A036 ... **BNS02ZT** ... 1.2
BNS 819-D03-R12-100-10-A037 ... **BNS02ZU** ... 1.2
BNS 819-D03-R12-100-10-FD ... **BNS00EY** ... 1.2
BNS 819-D03-R12-100-10-FD-S80S ... **BNS00F0** ... 1.2
BNS 819-D03-R12-100-10-FD-SP55 ... **BNS02ZW** ... 1.2
BNS 819-D03-R12-100-10-FD-SP65 ... **BNS02ZY** ... 1.2
BNS 819-D03-R12-100-10-FE ... **BNS00F2** ... 1.2
BNS 819-D03-R12-100-10-FE-SP56 ... **BNS02ZZ** ... 1.2
BNS 819-D03-R12-100-10-FE-SP66 ... **BNS0300** ... 1.2
BNS 819-D03-R12-100-10-S80L ... **BNS00F3** ... 1.2
BNS 819-D03-R12-100-10-S80R ... **BNS00F4** ... 1.2
BNS 819-D03-R12-100-10-SP01 ... **BNS0301** ... 1.2
BNS 819-D03-R12-62-10 ... **BNS01JF** ... 2.2
BNS 819-D03-R12-62-10-FD ... **BNS01JH** ... 2.2
BNS 819-D03-R12-62-10-FE ... **BNS01JJ** ... 2.2
BNS 819-D03-R12-62-10-JT ... **BNS0302** ... 2.2
BNS 819-D03-R12-62-SP08 ... **BNS0303** ... 2.2
BNS 819-D03-R16-100-10 ... **BNS00FC** ... 1.2
BNS 819-D03-R16-100-10-FD ... **BNS00FE** ... 1.2
BNS 819-D03-R16-100-10-FE ... **BNS00FH** ... 1.2
BNS 819-D03-R16-62-10 ... **BNS01JM** ... 2.2
BNS 819-D04-D12-100-10 ... **BNS00FK** ... 1.2
BNS 819-D04-D12-100-10-B066 ... **BNS0304** ... 1.2
BNS 819-D04-D12-100-10-B067 ... **BNS0305** ... 1.2
BNS 819-D04-D12-100-10-C058 ... **BNS0306** ... 1.2
BNS 819-D04-D12-100-10-C059 ... **BNS0307** ... 1.2
BNS 819-D04-D12-100-10-FD ... **BNS00FL** ... 1.2
BNS 819-D04-D12-100-10-FD-L4 ... **BNS0308** ... 1.2
BNS 819-D04-D12-100-10-FD-R4 ... **BNS0309** ... 1.2
BNS 819-D04-D12-100-10-FD-S80S ... **BNS00FM** ... 1.2
BNS 819-D04-D12-100-10-FD-S90R ... **BNS00FP** ... 1.2
BNS 819-D04-D12-100-10-FE ... **BNS00FR** ... 1.2
BNS 819-D04-D12-62-10 ... **BNS01JP** ... 2.2
BNS 819-D04-D12-62-10-FD ... **BNS01JR** ... 2.2
BNS 819-D04-D12-62-10-FD-S90R ... **BNS01JU** ... 2.2
BNS 819-D04-D16-100-10 ... **BNS00H0** ... 1.2
BNS 819-D04-D16-100-10-FD ... **BNS00H1** ... 1.2
BNS 819-D04-D16-100-10-FE ... **BNS00H2** ... 1.2
BNS 819-D04-D16-100-10-FE-S90L ... **BNS00H3** ... 1.2
BNS 819-D04-D16-62-10 ... **BNS01JZ** ... 2.2
BNS 819-D04-E12-100-10-FD ... **BNS00H7** ... 1.2
BNS 819-D04-E12-100-10-FD-L4 ... **BNS030A** ... 1.2
BNS 819-D04-E12-100-10-FD-R4 ... **BNS030C** ... 1.2
BNS 819-D04-E12-100-10-FE ... **BNS00HA** ... 1.2
BNS 819-D04-E12-100-55-FD-1043 ... **BNS00HH** ... 10.2
BNS 819-D04-E12-62-10 ... **BNS01K3** ... 2.2
BNS 819-D04-K12-100-10 ... **BNS00HL** ... 1.2
BNS 819-D04-K12-100-10-FD ... **BNS00HM** ... 1.2
BNS 819-D04-K12-100-10-FD-B121 ... **BNS030E** ... 1.2
BNS 819-D04-K12-100-10-FD-B122 ... **BNS030F** ... 1.2
BNS 819-D04-K12-62-10 ... **BNS01K5** ... 2.2
BNS 819-D04-K16-62-10-FD ... **BNS01K8** ... 2.2
BNS 819-D04-L12-100-10 ... **BNS00HR** ... 1.2
BNS 819-D04-L12-100-10-FD ... **BNS00HT** ... 1.2
BNS 819-D04-L12-100-10-FE ... **BNS00HY** ... 1.2
BNS 819-D04-L12-100-14-DH ... **BNS00J0** ... 1.10
BNS 819-D04-L12-62-10 ... **BNS01K9** ... 2.2
BNS 819-D04-L12-62-10-FD ... **BNS01KA** ... 2.2
BNS 819-D04-L12-62-10-FD-SP18 ... **BNS030H** ... 2.2
BNS 819-D04-L16-100-10 ... **BNS00J1** ... 1.2
BNS 819-D04-R12-100-10 ... **BNS00J4** ... 1.2
BNS 819-D04-R12-100-10-B093 ... **BNS030J** ... 1.2
BNS 819-D04-R12-100-10-B094 ... **BNS030K** ... 1.2
BNS 819-D04-R12-100-10-FD ... **BNS00J5** ... 1.2
BNS 819-D04-R12-100-10-FD-B121 ... **BNS030L** ... 1.2
BNS 819-D04-R12-100-10-FD-B122 ... **BNS030M** ... 1.2
BNS 819-D04-R12-100-10-FD-L4 ... **BNS030N** ... 1.2
BNS 819-D04-R12-100-10-FE ... **BNS00J6** ... 1.2
BNS 819-D04-R12-100-SP14 ... **BNS030P** ... 1.2
BNS 819-D04-R12-62-10 ... **BNS01KF** ... 2.2
BNS 819-D04-R12-62-10-FD ... **BNS01KH** ... 2.2
BNS 819-D04-R12-62-10-FE ... **BNS01KK** ... 2.2
BNS 819-D04-R16-100-10 ... **BNS00J9** ... 1.2
BNS 819-D05-D12-100-10 ... **BNS00JE** ... 1.2
BNS 819-D05-D12-100-10-FD ... **BNS00JF** ... 1.2
BNS 819-D05-D12-100-10-FD-L5 ... **BNS030R** ... 1.2
BNS 819-D05-D12-100-10-FD-R5 ... **BNS030T** ... 1.2
BNS 819-D05-D12-100-10-FD-S90L ... **BNS018A** ... 1.2
BNS 819-D05-D12-100-10-FD-S90R ... **BNS00JH** ... 1.2
BNS 819-D05-D12-100-10-FE ... **BNS00JJ** ... 1.2
BNS 819-D05-D12-100-10-S90L ... **BNS018E** ... 1.2
BNS 819-D05-D12-100-10-S90R ... **BNS018C** ... 1.2
BNS 819-D05-D12-62-10 ... **BNS01KN** ... 2.2
BNS 819-D05-E12-100-10 ... **BNS00JR** ... 1.2
BNS 819-D05-L12-100-10 ... **BNS00K3** ... 1.2
BNS 819-D05-L12-100-10-FD ... **BNS00K4** ... 1.2
BNS 819-D05-R12-100-10 ... **BNS00K6** ... 1.2
BNS 819-D05-R12-100-10-A038 ... **BNS030U** ... 1.2
BNS 819-D05-R12-100-10-A039 ... **BNS030W** ... 1.2
BNS 819-D05-R12-100-10-FD ... **BNS00K7** ... 1.2
BNS 819-D05-R12-100-10-FE-A009 ... **BNS030Y** ... 1.2
BNS 819-D05-R12-62-10 ... **BNS01L5** ... 2.2
BNS 819-D05-R16-100-10 ... **BNS00KE** ... 1.2
BNS 819-D05-R16-100-10-FD ... **BNS00KF** ... 1.2
BNS 819-D05-R16-62-10-FE ... **BNS01LC** ... 2.2
BNS 819-D05-R16-62-10-FE-B034 ... **BNS030Z** ... 2.2
BNS 819-D05-R16-62-10-FE-B035 ... **BNS0310** ... 2.2
BNS 819-D06-D12-100-10 ... **BNS00KJ** ... 1.2
BNS 819-D06-D12-100-10-FD ... **BNS00KK** ... 1.2
BNS 819-D06-D12-100-10-FD-C095 ... **BNS0311** ... 1.2
BNS 819-D06-D12-100-10-FD-C096 ... **BNS0312** ... 1.2
BNS 819-D06-D12-100-10-FD-R6 ... **BNS0313** ... 1.2
BNS 819-D06-D12-100-10-FE ... **BNS00KN** ... 1.2
BNS 819-D06-D12-62-10 ... **BNS01LE** ... 2.2
BNS 819-D06-D12-62-10-FE ... **BNS01LH** ... 2.2
BNS 819-D06-E12-100-10 ... **BNS00L0** ... 1.2
BNS 819-D06-E12-100-10-FD ... **BNS00L1** ... 1.2
BNS 819-D06-E12-100-10-FE ... **BNS00L3** ... 1.2

BNS 819-D06-E12-62-10 ... **BNS01LM** ... 2.2
BNS 819-D06-E12-62-10-FD ... **BNS01LN** ... 2.2
BNS 819-D06-L12-100-10 ... **BNS00LA** ... 1.2
BNS 819-D06-L12-100-10-FD ... **BNS00LC** ... 1.2
BNS 819-D06-L12-100-10-FE ... **BNS00LF** ... 1.2
BNS 819-D06-L12-100-10-S90L ... **BNS03R4** ... 1.2
BNS 819-D06-L12-100-10-S90R ... **BNS03PP** ... 1.2
BNS 819-D06-L16-100-10-FE ... **BNS00LK** ... 1.2
BNS 819-D06-R12-100-10 ... **BNS00LL** ... 1.2
BNS 819-D06-R12-100-10-FD ... **BNS00LM** ... 1.2
BNS 819-D06-R12-100-10-FE ... **BNS00LP** ... 1.2
BNS 819-D06-R12-62-10 ... **BNS01LY** ... 2.2
BNS 819-D06-R16-100-10-FD ... **BNS00LY** ... 1.2
BNS 819-D08-D12-100-10 ... **BNS00M0** ... 1.2
BNS 819-D08-D12-100-10-FD ... **BNS00M1** ... 1.2
BNS 819-D08-D12-100-10-FD-S90R ... **BNS00M2** ... 1.2
BNS 819-D08-D12-100-10-FE ... **BNS00M3** ... 1.2
BNS 819-D08-D12-62-10 ... **BNS01M1** ... 2.2
BNS 819-D08-D12-62-10-FD ... **BNS01M2** ... 2.2
BNS 819-D08-D12-62-10-FD-S90R ... **BNS01M3** ... 2.2
BNS 819-D08-D16-100-10-FD ... **BNS00M5** ... 1.2
BNS 819-D08-D16-62-10-FE-S90L ... **BNS01M5** ... 2.2
BNS 819-D08-E12-100-10 ... **BNS00M7** ... 1.2
BNS 819-D08-E12-100-10-FD ... **BNS00M8** ... 1.2
BNS 819-D08-E12-100-10-FE ... **BNS00M9** ... 1.2
BNS 819-D08-E12-62-10 ... **BNS01M6** ... 2.2
BNS 819-D08-K12-100-10-F085 ... **BNS0314** ... 1.2
BNS 819-D08-L12-100-10 ... **BNS00MK** ... 1.2
BNS 819-D08-L12-100-10-FD ... **BNS00ML** ... 1.2
BNS 819-D08-L12-100-10-FE ... **BNS03T3** ... 1.2
BNS 819-D08-L12-62-10 ... **BNS01M8** ... 2.2
BNS 819-D08-R12-100-10 ... **BNS00MP** ... 1.2
BNS 819-D08-R12-100-10-FD ... **BNS00MR** ... 1.2
BNS 819-D08-R12-100-10-FE ... **BNS00MT** ... 1.2
BNS 819-D08-R12-62-10 ... **BNS01MA** ... 2.2
BNS 819-D08-R12-62-10-FD ... **BNS01MC** ... 2.2
BNS 819-D08-R16-100-10 ... **BNS00MY** ... 1.2
BNS 819-D08-R16-100-10-FD ... **BNS00MZ** ... 1.2
BNS 819-D10-D12-100-10 ... **BNS0001** ... 1.2
BNS 819-D10-D12-100-10-FD ... **BNS00N1** ... 1.2
BNS 819-D10-D12-62-10 ... **BNS01MJ** ... 2.2
BNS 819-D10-L12-100-10-FD ... **BNS00NC** ... 1.2
BNS 819-D10-L12-100-10-FE ... **BNS00NE** ... 1.2
BNS 819-D10-L12-62-10-FE ... **BNS01MR** ... 2.2
BNS 819-D10-R12-100-10 ... **BNS00NH** ... 1.2
BNS 819-D12-D12-100-10 ... **BNS00NL** ... 1.2
BNS 819-D12-D12-62-10 ... **BNS01MY** ... 2.2
BNS 819-D12-R12-100-10 ... **BNS00NY** ... 1.2
BNS 819-D12-R12-100-10-FD-S90S ... **BNS03RM** ... 1.2
BNS 819-D16-R12-100-10-FD-S90S ... **BNS00PA** ... 1.2
BNS 819-FD-60-101 ... **BNS0003** ... 7.2
BNS 819-FD-60-101-FD ... **BNS0004** ... 7.2
BNS 819-FD-60-101-FD-S4R ... **BNS000C** ... 7.2
BNS 819-FD-60-101-FD-SP01 ... **BNS000F** ... 7.2
BNS 819-FD-60-101-FE ... **BNS000H** ... 7.2
BNS 819-FD-60-101-FE-S80R ... **BNS000J** ... 7.2
BNS 819-FD-60-101-S4R ... **BNS000K** ... 7.2
BNS 819-FD-60-101-S80R ... **BNS000L** ... 7.2
BNS 819-FE-60-101 ... **BNS000N** ... 7.2
BNS 819-FE-60-101-FD ... **BNS000P** ... 7.2
BNS 819-FK-60-101 ... **BNS0005** ... 7.2
BNS 819-FK-60-101-FD ... **BNS0006** ... 7.2
BNS 819-FK-60-101-FD-S4R ... **BNS009K** ... 7.2
BNS 819-FK-60-101-FD-S80R ... **BNS000U** ... 7.2
BNS 819-FK-60-101-S21R ... **BNS009L** ... 7.2
BNS 819-FK-60-101-S4R ... **BNS000Y** ... 7.2
BNS 819-FL-60-101 ... **BNS000A** ... 7.2
BNS 819-FL-60-101-FD ... **BNS0002** ... 7.2
BNS 819-FL-60-101-FD-S4R ... **BNS0007** ... 7.2
BNS 819-FL-60-101-FE ... **BNS0009** ... 7.2
BNS 819-FL-60-101-S4-D045 ... **BNS009Y** ... 7.2
BNS 819-FL-60-101-S80R ... **BNS0012** ... 7.2
BNS 819-FR-60-101 ... **BNS0013** ... 7.2
BNS 819-FR-60-101-FD ... **BNS0014** ... 7.2
BNS 819-FR-60-101-FD-S4R ... **BNS009M** ... 7.2
BNS 819-FR-60-101-FE ... **BNS0016** ... 7.2
BNS 819-FR-60-101-S21R ... **BNS009N** ... 7.2
BNS 819-FR-60-101-S4R ... **BNS0018** ... 7.2
BNS 819-X375-D03-R16-100-10 ... **BNS0315** ... 1.2
BNS 819-X481-99-K-10 ... **BNS008C** ... 8.2
BNS 819-X481-99-R-10 ... **BNS008E** ... 8.2
BNS 819-X496-99-P-10 ... **BNS008F** ... 8.2
BNS 819-X496-99-P-11 ... **BNS008H** ... 8.2
BNS 819-X496-99-R-11 ... **BNS008K** ... 8.2
BNS 819-X497-99-D-10 ... **BNS008L** ... 8.2
BNS 819-X497-99-K-10 ... **BNS008M** ... 8.2
BNS 819-X505-99-K-10 ... **BNS0054** ... 8.2
BNS 819-X511-99-D-10-S4 ... **BNS008T** ... 8.2
BNS 819-X512-100-R-12-S4 ... **BNS0072** ... 8.2
BNS 819-X512-B02-K08-40-13 ... **BNS021T** ... 6.2
BNS 819-X512-B02-R08-40-13 ... **BNS021U** ... 6.2
BNS 819-X512-B04-R08-40-13 ... **BNS0220** ... 6.2
BNS 819-X512-D02-D12-100-10 ... **BNS03ZN** ... 1.2
BNS 819-X512-D02-E12-100-10-FD ... **BNS00PF** ... 1.2
BNS 819-X512-D02-L12-100-10-FD-L2 ... **BNS031F** ... 1.2
BNS 819-X512-D03-D12-100-10 ... **BNS00PJ** ... 1.2
BNS 819-X512-D03-E12-62-10 ... **BNS01N6** ... 2.2
BNS 819-X512-D03-E12-62-10-F050 ... **BNS031H** ... 2.2
BNS 819-X512-D03-E12-62-10-F051 ... **BNS031J** ... 2.2
BNS 819-X512-D04-E12-100-10 ... **BNS02R8** ... 1.2
BNS 819-X512-D04-L12-100-10-FD-L4 ... **BNS031K** ... 1.2
BNS 819-X512-D04-L12-100-10-FD-S90L ... **BNS018F** ... 1.2
BNS 819-X512-D04-R12-100-10-FE ... **BNS02R9** ... 1.2
BNS 819-X512-D05-E12-100-10-FD-F077 ... **BNS031L** ... 1.2
BNS 819-X512-D05-E12-100-10-FD-F078 ... **BNS031M** ... 1.2
BNS 819-X512-FD-60-101-S21R ... **BNS009P** ... 7.2
BNS 819-X512-FR-60-101-S21R ... **BNS009R** ... 7.2
BNS 819-X521-FD-60-101 ... **BNS0091** ... 7.2
BNS 819-X570-D08-K12-100-10 ... **BNS032M** ... 1.2
BNS 819-X575-B02-E12-61-24-10 ... **BNS032N** ... 3.2
BNS 819-X576-B04-E12-61-12-10 ... **BNS032P** ... 3.2
BNS 819-X581-B03-D12-61-12-10 ... **BNS032R** ... 3.2
BNS 819-X586-D03-E12-100-10 ... **BNS032T** ... 1.2
BNS 819-X587-D03-E12-100-10 ... **BNS032U** ... 1.2
BNS 819-X588-D10-R12-100-10-FD ... **BNS032W** ... 1.2
BNS 819-X612-B06-L12-61-12-10 ... **BNS0330** ... 3.2
BNS 819-X614-B06-L12-61-12-10 ... **BNS0331** ... 3.2
BNS 819-X619-D04-D12-100-10 ... **BNS0332** ... 2.2
BNS 819-X623-D03-R12-100-10 ... **BNS0334** ... 2.2
BNS 819-X624-D03-R12-100-10 ... **BNS0335** ... 2.2
BNS 819-X633-D02-E12-100-10 ... **BNS0336** ... 1.2
BNS 819-X634-D02-E12-100-10 ... **BNS0337** ... 1.2
BNS 819-X638-D02-D12-62-10 ... **BNS0338** ... 2.2
BNS 819-X639-D02-D12-62-10 ... **BNS0339** ... 2.2
BNS 819-X641-FR-60-101 ... **BNS001H** ... 7.2
BNS 819-X643-D04-E12-100-10 ... **BNS033C** ... 1.2
BNS 819-X644-D04-E12-100-10 ... **BNS033E** ... 1.2
BNS 819-X645-D02-D12-100-10 ... **BNS033F** ... 1.2
BNS 819-X645-D02-R12-100-10 ... **BNS033H** ... 1.2
BNS 819-X646-D02-D12-100-10 ... **BNS033J** ... 1.2
BNS 819-X646-D02-R12-100-10 ... **BNS033K** ... 1.2
BNS 819-X649-D02-D12-100-10 ... **BNS033L** ... 1.2
BNS 819-X659-D05-R12-100-10-FD ... **BNS033R** ... 1.2
BNS 819-X661-D03-E12-100-10-FD ... **BNS033T** ... 1.2
BNS 819-X662-D03-E12-100-10-FD ... **BNS033U** ... 2.2
BNS 819-X666-D03-D12-100-10-FE ... **BNS033W** ... 1.2
BNS 819-X667-D03-D12-100-10-FE ... **BNS033Y** ... 1.2
BNS 819-X669-B06-R12-61-12-10 ... **BNS033Z** ... 3.2
BNS 819-X671-D03-R12-62-10 ... **BNS0340** ... 2.2
BNS 819-X672-D03-R12-62-10 ... **BNS0341** ... 2.2
BNS 819-X676-D02-R12-100-10 ... **BNS0343** ... 1.2
BNS 819-X678-B02-L12-61-12-10-FD ... **BNS0344** ... 3.2
BNS 819-X678-D02-L12-100-10-FD ... **BNS0345** ... 1.2
BNS 819-X679-B02-L12-61-12-10-FD ... **BNS0346** ... 3.2
BNS 819-X679-D02-L12-100-10-FD ... **BNS0347** ... 1.2
BNS 819-X680-FR-60-101-S4R ... **BNS009T** ... 7.2
BNS 819-X681-D02-R12-100-10-FD ... **BNS0348** ... 1.2
BNS 819-X681-D02-R12-100-10-FE ... **BNS0349** ... 1.2
BNS 819-X685-B05-D08-46-13-FC ... **BNS034A** ... 5.2
BNS 819-X689-D02-R12-100-10-FD ... **BNS034C** ... 1.2
BNS 819-X689-D02-R12-100-10-FE ... **BNS034E** ... 1.2
BNS 819-X690-D04-R12-100-10-FD ... **BNS034F** ... 1.2
BNS 819-X690-D04-R12-100-10-FE ... **BNS034H** ... 1.2
BNS 819-X691-D02-R12-100-10 ... **BNS034J** ... 1.2
BNS 819-X692-D04-R12-100-10-FD ... **BNS034K** ... 1.2
BNS 819-X692-D04-R12-100-10-FE ... **BNS034L** ... 1.2
BNS 819-X698-100-D-11-S4 ... **BNS0073** ... 8.2
BNS 819-X698-100-D-12-S4 ... **BNS0074** ... 8.2
BNS 819-X698-100-D-13-S4 ... **BNS0075** ... 8.2
BNS 819-X698-100-E-11-S4 ... **BNS0076** ... 8.2
BNS 819-X698-100-E-12-S4 ... **BNS0077** ... 8.2
BNS 819-X698-100-E-13-S4 ... **BNS0078** ... 8.2
BNS 819-X698-100-K-11-S4 ... **BNS0079** ... 8.2
BNS 819-X698-100-K-12-S4 ... **BNS007A** ... 8.2
BNS 819-X698-100-K-13-S4 ... **BNS007C** ... 8.2
BNS 819-X698-100-R-11-S4 ... **BNS007E** ... 8.2
BNS 819-X698-100-R-12-S4 ... **BNS007F** ... 8.2
BNS 819-X698-100-R-13-S4 ... **BNS007H** ... 8.2
BNS 819-X698-99-D-11-S4 ... **BNS0056** ... 8.2
BNS 819-X698-99-K-13-S4 ... **BNS0098** ... 8.2
BNS 819-X699-B03-R08-40-13-S4R ... **BNS034N** ... 6.2
BNS 819-X700-D04-R12-100-10 ... **BNS034P** ... 1.2

BNS 819-X701-D04-R12-100-10 ... **BNS034R** ... 1.2
BNS 819-X706-D05-R12-100-10-FE ... **BNS034Z** ... 1.2
BNS 819-X707-D05-R12-100-10-FE ... **BNS0350** ... 1.2
BNS 819-X710-FD-60-101-S4R ... **BNS009U** ... 7.2
BNS 819-X710-FR-60-101-S4R ... **BNS009W** ... 7.2
BNS 819-X711-FK-60-101 ... **BNS0099** ... 7.2
BNS 819-X713-D02-E12-100-10-FD ... **BNS0351** ... 1.2
BNS 819-X713-D04-E12-100-10-FE ... **BNS0352** ... 1.2
BNS 819-X714-D02-E12-100-10-FD ... **BNS0353** ... 1.2
BNS 819-X714-D04-E12-100-10-FE ... **BNS0354** ... 1.2
BNS 819-X721-D03-R12-100-10-FD ... **BNS0355** ... 1.2
BNS 819-X722-D03-R12-100-10-FD ... **BNS0356** ... 1.2
BNS 819-X723-D03-R12-100-10-S90L ... **BNS0357** ... 1.2
BNS 819-X723-D03-R12-100-10-S90R ... **BNS0358** ... 1.2
BNS 819-X723-D04-R12-100-10-S90L ... **BNS0359** ... 1.2
BNS 819-X723-D04-R12-100-10-S90R ... **BNS035A** ... 1.2
BNS 819-X724-D02-R12-100-10-FD-S90L ... **BNS035C** ... 1.2
BNS 819-X732-D02-R12-100-10 ... **BNS035L** ... 1.2
BNS 819-X733-D02-R12-100-10 ... **BNS035M** ... 1.2
BNS 819-X734-B02-D08-46-13-S4L ... **BNS035N** ... 5.2
BNS 819-X734-B02-D08-46-13-S4R ... **BNS035P** ... 5.2
BNS 819-X737-B03-D12-61-12-10 ... **BNS035U** ... 3.2
BNS 819-X738-B03-D12-61-12-10 ... **BNS035W** ... 3.2
BNS 819-X743-D05-R12-62-10-FD ... **BNS035Y** ... 2.2
BNS 819-X744-D05-R12-62-10-FD ... **BNS035Z** ... 2.2
BNS 819-X745-D06-R12-100-10-FD ... **BNS0360** ... 1.2
BNS 819-X746-D06-R12-100-10-FD ... **BNS0361** ... 1.2
BNS 819-X749-D05-D12-62-10 ... **BNS0364** ... 2.2
BNS 819-X761-B04-D12-61-12-10 ... **BNS0366** ... 3.2
BNS 819-X767-B04-D12-61-12-10 ... **BNS0367** ... 3.2
BNS 819-X780-B03-D12-61-12-10 ... **BNS036A** ... 3.2
BNS 819-X784-D03-E12-100-10-FD-S90L ... **BNS036C** ... 1.2
BNS 819-X784-D03-E12-100-10-FD-S90R ... **BNS036E** ... 1.2
BNS 819-X797-D03-E12-62-10 ... **BNS036F** ... 2.2
BNS 819-X798-D06-D12-100-10-FD ... **BNS036H** ... 1.2
BNS 819-X799-D06-D12-100-10-FD ... **BNS036J** ... 1.2
BNS 819-X801-D06-L12-100-10-FD ... **BNS036K** ... 1.2
BNS 819-X802-D06-L12-100-10-FD ... **BNS036L** ... 1.2
BNS 819-X807-D03-D12-100-55 ... **BNS036M** ... 1.2
BNS 819-X808-D03-R12-100-55 ... **BNS036N** ... 10.2
BNS 819-X810-FK-60-101-FD-S72R ... **BNS009C** ... 7.2
BNS 819-X811-D04-R12-100-10-FD ... **BNS036P** ... 1.2
BNS 819-X812-D04-R12-100-10-FD ... **BNS036R** ... 1.2
BNS 819-X813-D04-R12-100-10-FD ... **BNS036T** ... 1.2
BNS 819-X814-D04-R12-100-10-FD ... **BNS036U** ... 1.2
BNS 819-X822-D03-R12-100-10-FD ... **BNS036W** ... 1.2
BNS 819-X825-B02-D12-61-12-10 ... **BNS036Y** ... 3.2
BNS 819-X831-D03-R12-100-55 ... **BNS036Z** ... 10.2
BNS 819-X847-D04-L12-100-10-FD ... **BNS0372** ... 1.2
BNS 819-X853-D10-L12-100-10-FD-S90S ... **BNS0373** ... 1.2
BNS 819-X863-B06-K12-72-10 ... **BNS0374** ... 4.2
BNS 819-X867-D03-R12-100-10-S90R ... **BNS0375** ... 1.2
BNS 819-X870-D03-R12-100-10 ... **BNS0376** ... 1.2
BNS 819-X875-B02-R08-46-12 ... **BNS0377** ... 5.2
BNS 819-X878-B03-R08-40-11 ... **BNS03NT** ... 6.2
BNS 819-X880-D05-D12-100-10-FD ... **BNS03RT** ... 1.2
BNS 819-X881-B02-R08-40-11 ... **BNS03PU** ... 6.2
BNS 819-X883-D16-R12-100-10-FD ... **BNS03R5** ... 1.2
BNS 819-X890-B02-R08-40-11 ... **BNS03RU** ... 6.2
BNS 819-X895-D10-K12-100-10 ... **BNS03TK** ... 1.2
BNS 819-X923-B03-R08-40-13-FC-S80L ... **BNS03WN** ... 6.2
BNS 823-B02-L12-61-A-22-02 ... **BNS02CN** ... 3.8
BNS 823-B04-L12-61-A-22-04 ... **BNS02CR** ... 3.8
BNS 823-B06-L12-61-A-22-06 ... **BNS02CT** ... 3.8
BNS 823-X518-B06-L12-61-A-22-06 ... **BNS0378** ... 3.8
BNS 823-X518-D06-L12-100-22-06 ... **BNS0379** ... 1.8
BNS 823-X574-B02-L12-61-A-22-02 ... **BNS037A** ... 3.8
BNS 823-X651-B02-L12-61-A-22-02 ... **BNS037C** ... 3.8
BNS 823-X803-B02-L12-61-A-22-02 ... **BNS037E** ... 3.8
BNS 829-D02-D16-100-10 ... **BNS03RF** ... 1.6
BNS 829-D02-R12-100-10 ... **BNS018Z** ... 1.6
BNS 829-D03-D16-100-10-FD ... **BNS03RE** ... 1.6
BNS 829-D04-D12-100-10-FD ... **BNS019A** ... 1.6
BNS 829-D04-D12-100-10-FD-S90R ... **BNS019F** ... 1.6
BNS 829-D04-R12-100-10-FD ... **BNS019M** ... 1.6
BNS 829-D06-D12-100-10 ... **BNS019U** ... 1.6
BNS 829-D06-R12-100-10 ... **BNS01A0** ... 1.6
BNS 829-X557-D04-L12-100-10-FC ... **BNS037K** ... 1.6
BNS 829-X891-D04-D12-100-10-FD ... **BNS03TR** ... 1.6
BNS 829-X892-D04-D12-100-10-FD ... **BNS03TT** ... 1.6
BNS 829-X933-D03-D12-100-10-FD ... **BNS03Y8** ... 1.6
BSE 30.0-RK ... **BSE0005** ... 15.2
BSE 61-RK ... **BSE0009** ... 15.2
BSE 63-RK ... **N/A** ... 15.3
BSE 64-RK ... **N/A** ... 15.3
BSE 69.1-RK ... **BSE000F** ... 15.3
BSE 70.1-RK ... **BSE000J** ... 15.3
BSE 73.1-RK ... **BSE000K** ... 15.3
BSE 74.1-RK ... **BSE000L** ... 15.3
BSE 85-RK ... **BSE000N** ... 15.2
STOESSELEINHEIT KPL. D10 813 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. D10 819 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. K10 813 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. K10 819 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. L10 813 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. L10 819 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. R10 813 ... **N/A** ... 15.13
STOESSELEINHEIT KPL. R10 819 ... **N/A** ... 15.13
VERSCHLUSSSCHR. KPL. M16X1,5 ... **N/A** ... 15.12
VERSCHLUSSSCHR. KPL. M20X1,5 ... **N/A** ... 15.12
VERSCHLUSSSCHR. KPL. M25X1,5 ... **N/A** ... 15.12
x25.4x1.60 ALU ... **N/A** ... 15.12
Z/M16-M-TO-1/2"-F-NPT ... **N/A** ... 15.11
Z/M20-M-TO-1/2"-F-NPT ... **BAM0134** ... 15.11
Z/M20-M-TO-1/2"-F-NPT ... **N/A** ... 15.11
Z/M25-M-TO-3/4"-F-NPT ... **BAM0135** ... 15.11
Z/M25-M-TO-3/4"-F-NPT ... **N/A** ... 15.11

Rugged Control Components from Network to Sensor

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Our products include a complete line of sensors, transducers, ID systems, and connectivity products. Our sensor lines include photoelectric, inductive, capacitive and magnetic, as well as other more specialized sensor products to fit virtually any sensing application.

Connectivity and Identification

Networking and Connectivity

Industrial Network Block I/O
EtherNet/IP, DeviceNet, Profinet, Profibus, CC-Link
Distributed Modular I/O with IO-Link
Cables, Cordsets & Connectors

Passive Connectivity
Sensor Cables & Cordsets
Junction Blocks & Splitters
Non-Contact Connectors

Industrial Identification

Industrial RFID
Machine Tool ID
Pallet Tracking
Part Tracing
Assembly Track and Trace
Asset Tracking
Logistics Tracking

Machine Vision
1D, 2D Barcodes & OCV
Multi-Tool Inspection
Advanced Inspection

Sensors and Solutions

Object Detection

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Mechanical Single & Multiple Position Switches
Magnetic Field Cylinder Sensors
Photoelectric & Ultrasonic Sensors
Robot Zone Limit Systems

Specialty Lines
GlobalProx
UltraFrame
SmartLevel
EdgeMaster
SmartLevel
SuperShorty
V-Twin
StrokeMaster
SlagMaster
SteelFace
Factor1

Linear Position and Measurement

Micropulse Linear Transducers
Profile-Style Transducers
Rod-Style Transducers
Explosion-Proof Transducers
Network Interfaces
Magnetic Linear Encoders

Analog Distance Sensors
Inductive Sensors
Capacitive Sensors
Magneto-Inductive Sensors
Photoelectric Sensors
Laser Sensors

Fluid Detection

Technologies
Pressure Sensors
Capacitive Sensors
Fluid Level Sensors

Accessories

Mechanical Accessories
Holders, Protection & Fastening Systems

Power Supplies
IP67 Industrial Power Supplies
IP20 DIN Rail Power Supplies

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sensors worldwide

- Systems and Services
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- Industrial Identification
- Object Detection
- Linear Position Sensing and Measurement
- Condition Monitoring and Fluid Sensors
- Accessories

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