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).

Available sizes

<table>
<thead>
<tr>
<th>Dimension l₁ when</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension l₁ = 12 mm</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>140</td>
<td>170</td>
<td>200</td>
</tr>
<tr>
<td>Dimension l₂</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Dimension l₃</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Dimension l₄</td>
<td>70</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>140</td>
<td>170</td>
<td>200</td>
<td>240</td>
</tr>
<tr>
<td>Dimension l₅</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Dimension l₆</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Dimensions in mm

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

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

No. of plungers
02 2×
03 3×
04 4×
...

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

Plunger spacing
12 12 mm
16 16 mm

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

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

See page 15.14 for connector options
### Mechanical Switches

**Series 100 per DIN 43697**

**Type**
- Multiple position switch
- 12 mm or 16 mm 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

**Ambient temperature range**
- \(-5\text{ to }+85 \, ^\circ\text{C}\)

**Degree of protection per IEC 60529**
- IP 67

**Function indicator**
- LED 6...60 V AC/DC (FD) or 90...250 V AC/DC (FE)

**Mechanical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plunger point to reference surface</td>
<td>8 mm</td>
</tr>
<tr>
<td>Switchpoint to reference surface</td>
<td>6 mm</td>
</tr>
<tr>
<td>Maximum plunger travel D, K, R, L</td>
<td>5.5 mm</td>
</tr>
<tr>
<td>Maximum plunger travel E</td>
<td>4 mm</td>
</tr>
<tr>
<td>Switching actuating force on plunger</td>
<td>min. 20 N</td>
</tr>
<tr>
<td>Switching frequency</td>
<td>max. 300/min</td>
</tr>
<tr>
<td>Approach speed</td>
<td></td>
</tr>
<tr>
<td>Plunger D</td>
<td>40 m/min</td>
</tr>
<tr>
<td>Plunger E</td>
<td>30 m/min</td>
</tr>
<tr>
<td>Plunger K</td>
<td>10 m/min</td>
</tr>
<tr>
<td>Plunger R</td>
<td>60 m/min</td>
</tr>
<tr>
<td>Plunger L</td>
<td>120 m/min</td>
</tr>
<tr>
<td>Repeatability</td>
<td></td>
</tr>
<tr>
<td>Plunger D, E, K</td>
<td>± 0.002 mm</td>
</tr>
<tr>
<td>Plunger R, L</td>
<td>± 0.01 mm</td>
</tr>
</tbody>
</table>

**IO-Link**

To ensure switching function, the dimension \(s_{CS}\) is especially critical to front edge of mounting base. Dimension is \(3 \cdot 0.05\) to the face of the switch housing (area around the plungers).

**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

**Connection type**
- M25×1.5 for connector or cable gland

**Part number**
- BNS 819-D...100-10...

**Wiring diagram**

**Notes**
- For more details, refer to page 15.2

**Installation**

- Cam and Cam tray
- Note: Dimensions and tolerances are subject to manufacturer's specifications.
Mechanical Switches
Series 100 per DIN 43697

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

Available sizes

<table>
<thead>
<tr>
<th>Number of plungers</th>
<th>Dimension l1 = 12 mm</th>
<th>Dimension l2</th>
<th>Dimension l3</th>
<th>Dimension l4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>70 80 90 105 120 140 170 200</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
<tr>
<td>3</td>
<td>88 88 88 88 88 80 80 80</td>
<td>90 105 120 140 170 200 200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>14 14 14 14 14 20 20 20</td>
</tr>
<tr>
<td>4</td>
<td>90 105 120 140 170 200 200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
<tr>
<td>5</td>
<td>105 120 140 170 200 200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
<tr>
<td>6</td>
<td>120 140 170 200 200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
<tr>
<td>8</td>
<td>140 170 200 200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
<tr>
<td>10</td>
<td>170 200 200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
<tr>
<td>12</td>
<td>200 240</td>
<td>14 14 14 14 14 20 20 20</td>
<td>88 88 88 88 88 80 80 80</td>
<td>88 88 88 88 88 80 80 80</td>
</tr>
</tbody>
</table>

Dimensions in mm

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

BNS 813-X####-D _ _-_ _ _-100-_ _-_ _-_ _ _

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

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 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

Optional connector
See page 15.14 for connector options

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)

Unusual switch configurations, such as custom pre-wired connector (blank = standard assembly)
Hardened aluminum bushings

Available sizes

<table>
<thead>
<tr>
<th>Number of plungers</th>
<th>Plunger style</th>
<th>Plunger spacing</th>
<th>Switch elements</th>
<th>Safety switch elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>D Chisel</td>
<td>12 mm</td>
<td>BSE 61 Remaining switch positions BSE 30.0</td>
<td>No. from flange</td>
</tr>
<tr>
<td>3</td>
<td>K Ball</td>
<td>16 mm</td>
<td>BSE 85 Only BSE 61</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>R Roller</td>
<td>16 mm</td>
<td>BSE 85 Remaining switch positions BSE 30.0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>L Roller</td>
<td>16 mm</td>
<td>Only BSE 85</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>E Chisel with wiper plate</td>
<td>16 mm</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

Optional Connector
S8OR 5-pin, dual keyway right
S8OL 5-pin, dual keyway left
S8OS 5-pin, dual keyway right and left
S9OR 12-pin, right
S9OL 12-pin, left
S9OS 12-pin, right and left
### Mechanical Switches
#### Series 100 per DIN 43697

<table>
<thead>
<tr>
<th>Type</th>
<th>Multiple position switch with positive-opening contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plunger spacing</td>
<td>12 mm or 16 mm</td>
</tr>
<tr>
<td>Mounting and function dimensions</td>
<td>per DIN 43697</td>
</tr>
</tbody>
</table>

#### Safety Multiple Position

**Series 100**

![Diagram of Safety Multiple Position Switch]

<table>
<thead>
<tr>
<th>Specification</th>
<th>BSE 61 per</th>
<th>BSE 85 per</th>
<th>BSE 30.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
</tr>
<tr>
<td><strong>Part number</strong></td>
<td>BNS 813-D-100-1</td>
<td>BNS 813-D-100-2</td>
<td>BNS 813-D-100-0</td>
</tr>
<tr>
<td><strong>Wiring diagram</strong></td>
<td><img src="" alt="Wiring Diagram BSE 61" /></td>
<td><img src="" alt="Wiring Diagram BSE 85" /></td>
<td><img src="" alt="Wiring Diagram BSE 30.0" /></td>
</tr>
</tbody>
</table>

#### Switch element

<table>
<thead>
<tr>
<th>Specification</th>
<th>Contact material</th>
<th>Switching principle</th>
<th>Contact system</th>
<th>Electrical data</th>
<th>Mechanical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSE 61 per</td>
<td>Silver</td>
<td>Creep switch, Positive-opening</td>
<td>Normally-closed, double interruption</td>
<td>see page 15.2</td>
<td></td>
</tr>
<tr>
<td>BSE 85 per</td>
<td>Silver</td>
<td>Snap switch, positive opening (normally-closed)</td>
<td>Dual-changeover: 1. NO (snap function), 2. Positive-opening (double-interruption), all galvanically isolated</td>
<td>see page 15.2</td>
<td></td>
</tr>
<tr>
<td>BSE 30.0</td>
<td>Silver, gold plated</td>
<td>Snap switch</td>
<td>Dual changeover, one normally-open and one normally-closed, galvanically isolated</td>
<td>see page 15.2</td>
<td></td>
</tr>
</tbody>
</table>

#### Mechanical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>BSE 61 per</th>
<th>BSE 85 per</th>
<th>BSE 30.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
<td><strong>DIN 60204-1/VDE 0113</strong></td>
</tr>
<tr>
<td><strong>Plunger point to reference surface</strong></td>
<td>8 mm</td>
<td>8 mm</td>
<td>8 mm</td>
</tr>
<tr>
<td><strong>Switchpoint to reference surface</strong></td>
<td>7 mm</td>
<td>6.5 mm</td>
<td>6 mm</td>
</tr>
<tr>
<td><strong>Maximum plunger travel</strong></td>
<td>4 mm</td>
<td>4 mm</td>
<td>5.5 mm</td>
</tr>
<tr>
<td><strong>Assured opening after plunger travel</strong></td>
<td>2.5 mm</td>
<td>2.5 mm</td>
<td>min. 20 N</td>
</tr>
<tr>
<td><strong>Switching actuating force on plunger</strong></td>
<td>min. 15 N</td>
<td>min. 30 N</td>
<td>max. 300/min</td>
</tr>
<tr>
<td><strong>Switching frequency</strong></td>
<td>max. 300/min</td>
<td>max. 160/min</td>
<td>max. 300/min</td>
</tr>
<tr>
<td><strong>Approach speed</strong></td>
<td>Plunger D</td>
<td>40 m/min</td>
<td>40 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger E</td>
<td>30 m/min</td>
<td>30 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger K</td>
<td>10 m/min</td>
<td>10 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger R</td>
<td>60 m/min</td>
<td>60 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger L</td>
<td>120 m/min</td>
<td>120 m/min</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>Plunger D, E, K</td>
<td>± 0.002 mm</td>
<td>± 0.02 mm</td>
</tr>
<tr>
<td></td>
<td>Plunger R, L</td>
<td>± 0.01 mm</td>
<td>± 0.02 mm</td>
</tr>
</tbody>
</table>

For installation and notes, see page 1.3

www.balluff.com
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

Available sizes

<table>
<thead>
<tr>
<th>No. of plungers</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension $l_1$</td>
<td>12 mm</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>$l_2$ when $l_1$ = 16 mm</td>
<td>70</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions in mm

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

BNS 829-XXXX-D...-100-10-...

No. of plungers | Plunger style | Plunger spacing | Function indicator | Connector
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>02 or 06 (12 mm only)</td>
<td>D Chisel</td>
<td>12 mm</td>
<td>FD 6...60</td>
<td>S80R 5-pin, dual keyway right</td>
</tr>
<tr>
<td></td>
<td>K Ball</td>
<td>16 mm</td>
<td>FE 90...250 V AC/DC</td>
<td>S80L 5-pin, dual keyway left</td>
</tr>
<tr>
<td></td>
<td>R Roller</td>
<td>16 mm</td>
<td></td>
<td>S80S 5-pin, dual keyway right and left</td>
</tr>
<tr>
<td></td>
<td>L Roller bearing</td>
<td></td>
<td></td>
<td>S90R 12-pin, right</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S90L 12-pin, left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S90S 12-pin, right and left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S4R-I 4-pin, right only for IO-Link</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S4L-I 4-pin, left only for IO-Link</td>
</tr>
</tbody>
</table>

Note!
See accessory section for replacement plunger blocks and plungers.
Quick Change Plunger Block Multiple Position

### Mechanical Switches
**Series 100 per DIN 43697**

<table>
<thead>
<tr>
<th>Type</th>
<th>Multiple position switch with quick change plunger block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plunger spacing</td>
<td>12 mm or 16 mm per DIN 43697</td>
</tr>
<tr>
<td>Mounting and function dimensions</td>
<td></td>
</tr>
</tbody>
</table>

**Series 100**

**With switch element**
- BSE 30.0

**Part number**
- BNS 829-D-100-10

**Wiring diagram**

#### 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 to +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)

#### Function indicator
- Gasket
- LED

#### 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

#### Ambiente temperature range
- –5 to +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)

#### Function indicator
- Gasket
- LED

#### 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
- Repeatability
  - Plunger D, K: ± 0.002 mm
  - Plunger R, L: ± 0.01 mm

#### Installation
- Cam
- Cam tray

**Note!**
To ensure switching function, the dimension 5.0 is especially critical. Dimension is 5.05 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)

Available sizes

<table>
<thead>
<tr>
<th>No. of plungers</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension l₁ = 12 mm</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>105</td>
<td>120</td>
</tr>
<tr>
<td>l₂ when l₁ = 16 mm</td>
<td>70</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions in mm

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

Note!
See accessory section for replacement plunger blocks and 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)

Available sizes

<table>
<thead>
<tr>
<th>No. of plungers</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension l₁ = 12 mm</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>105</td>
<td>120</td>
</tr>
<tr>
<td>l₂ when l₁ = 16 mm</td>
<td>70</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions in mm

Ordering example:
BNS 823-X####-D_ _-_ _ _-100-_ _-_ _-_ _ _

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

**Series 100 per DIN 43697**

#### Type
- Multiple position switch with forced-opening contacts and quick change plunger block

#### Plunger spacing
- 12 mm or 16 mm per DIN 43697

#### Mounting and function dimensions

<table>
<thead>
<tr>
<th>Part number</th>
<th>Wiring diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSE 61 per DIN EN 60204-1/VDE 0113</td>
<td>BSE 85 per DIN EN 60204-1/VDE 0113</td>
</tr>
<tr>
<td>BNS 823-D-100-1</td>
<td>BNS 823-D-100-2</td>
</tr>
<tr>
<td>BSE 30.0</td>
<td></td>
</tr>
<tr>
<td>Connector S80R</td>
<td>Connector S90R</td>
</tr>
<tr>
<td>Connector S80L</td>
<td>Connector S90L</td>
</tr>
</tbody>
</table>

**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**

**Part number**
- BSE 61 per DIN EN 60204-1/VDE 0113
- BSE 85 per DIN EN 60204-1/VDE 0113
- BSE 30.0

**Wiring diagram**
- Connector S80R
- Connector S90R
- Connector S80L
- Connector S90L

**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**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BSE 61</th>
<th>BSE 85</th>
<th>BSE 30.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plunger point to reference surface</td>
<td>8 mm</td>
<td>8 mm</td>
<td>8 mm</td>
</tr>
<tr>
<td>Switchpoint to reference surface</td>
<td>7 mm</td>
<td>6.5 mm</td>
<td>6 mm</td>
</tr>
<tr>
<td>Maximum plunger travel</td>
<td>4 mm</td>
<td>4 mm</td>
<td>5.5 mm</td>
</tr>
<tr>
<td>Assured opening after plunger travel</td>
<td>2.5 mm</td>
<td>2.5 mm</td>
<td>min. 20 N</td>
</tr>
<tr>
<td>Switching actuating force on plunger</td>
<td>min. 15 N</td>
<td>min. 30 N</td>
<td>max. 300/min</td>
</tr>
<tr>
<td>Switching frequency</td>
<td>max. 300/min</td>
<td>max. 160/min</td>
<td>max. 300/min</td>
</tr>
<tr>
<td>Approach speed</td>
<td>Plunger D: 40 m/min</td>
<td>Plunger D: 40 m/min</td>
<td>Plunger D: 40 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger K: 10 m/min</td>
<td>Plunger K: 10 m/min</td>
<td>Plunger K: 10 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger R: 60 m/min</td>
<td>Plunger R: 60 m/min</td>
<td>Plunger R: 60 m/min</td>
</tr>
<tr>
<td></td>
<td>Plunger L: 120 m/min</td>
<td>Plunger L: 80 m/min</td>
<td>Plunger L: 120 m/min</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 0.002 mm</td>
<td>± 0.002 mm</td>
<td>± 0.002 mm</td>
</tr>
<tr>
<td></td>
<td>Plunger D, K</td>
<td>Plunger D, K</td>
<td>Plunger D, K</td>
</tr>
<tr>
<td></td>
<td>± 0.01 mm</td>
<td>± 0.02 mm</td>
<td>± 0.01 mm</td>
</tr>
</tbody>
</table>

For installation and notes, see page 1.7
**Mechanical Switches**
Series 602-11 per DIN 43697

**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 M25x1.5 on sides and in flange (Gasketed plugs included)
- Connector (note permissible operating voltage for the connectors, see page 15.16)

**Available sizes**

<table>
<thead>
<tr>
<th>Number of switch positions</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension l_1 = 12 mm</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>140</td>
<td>170</td>
<td>200</td>
</tr>
<tr>
<td>Dimension l_1</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Dimension l_2</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Dimension l_3 = 16 mm</td>
<td>70</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>140</td>
<td>170</td>
<td>200</td>
<td>240</td>
</tr>
<tr>
<td>Dimension l_4</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Dimension l_5</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Dimensions in mm

- Dimension l_1: 4 mm for inductive switch elements with sensing head Ø 10 mm
- Dimension l_1: 2 mm for inductive switch elements with sensing head Ø 15.5 mm

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

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

<table>
<thead>
<tr>
<th>No. of switch positions</th>
<th>Code for switch elements</th>
<th>Plunger spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>2x</td>
<td>12 12 mm</td>
</tr>
<tr>
<td>03</td>
<td>3x</td>
<td>16 16 mm</td>
</tr>
<tr>
<td>04</td>
<td>4x</td>
<td></td>
</tr>
</tbody>
</table>

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

**Series 100**

**Mechanical Switches**

**Series 602 per DIN 43697**

#### Inductive Multiple Position

<table>
<thead>
<tr>
<th>Type</th>
<th>Multiple position switch with inductive sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch position spacing</td>
<td>12 mm or 16 mm</td>
</tr>
<tr>
<td>Mounting and function dimensions</td>
<td>per DIN 43697</td>
</tr>
</tbody>
</table>

#### Part number

| Housing material | BNS 816-B_ _-_ _- -602-11- _ _ _ |
| 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Part number for replacement switch elements</th>
<th>Electrical version</th>
<th>Rated operating distance ( s_n )</th>
<th>Assured operating distance ( s_a )</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>BES 517-110-RK</td>
<td>PNP, complementary, 10...60 V DC, short circuit protected</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
<tr>
<td>NA</td>
<td>BES 517-108-RK</td>
<td>NPN, complementary, 10...60 V DC, short circuit protected</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
<tr>
<td>WS</td>
<td>BES 517-410-RK</td>
<td>NO, up to 250 V AC</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
<tr>
<td>WO</td>
<td>BES 517-421-RK</td>
<td>NC, up to 250 V AC</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
<tr>
<td>KHG</td>
<td>BES 517-560-H-RK</td>
<td>2-wire, NO, 10...55 V DC, short circuit protected</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
<tr>
<td>KHH</td>
<td>BES 517-561-H-RK</td>
<td>2-wire, NC, 10...55 V DC, short circuit protected</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
<tr>
<td>NG</td>
<td>BES 516-314-N-RK</td>
<td>2-wire, NAMUR, 7.7...9 V DC</td>
<td>2 mm</td>
<td>0...1.6 mm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Ordering code for replacement switch elements</th>
<th>Electrical version</th>
<th>Rated operating distance ( s_n )</th>
<th>Assured operating distance ( s_a )</th>
</tr>
</thead>
<tbody>
<tr>
<td>THA</td>
<td>BES 517-142-Y-RK</td>
<td>PNP, complementary, 10...30 V DC, short circuit protected</td>
<td>5 mm</td>
<td>0...4 mm</td>
</tr>
<tr>
<td>EJA</td>
<td>BES 517-463-RK</td>
<td>NO, up to 250 V AC</td>
<td>5 mm</td>
<td>0...4 mm</td>
</tr>
<tr>
<td>AAA</td>
<td>BES 517-464-RK</td>
<td>NC, up to 250 V AC</td>
<td>5 mm</td>
<td>0...4 mm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Ordering code for replacement switch elements</th>
<th>Electrical version</th>
<th>Additional information on request!</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH</td>
<td>BES 516-110-D-RK</td>
<td>PNP, complementary, 10...30 V DC</td>
<td>Additional information on request!</td>
</tr>
</tbody>
</table>

For additional electrical data see pages 15.4-15.7.

**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

**Installation**

Cam Cam tray

**Hybrid switch element with sensing head 15.5 mm,**

**for use with switch position spacing 16 mm**

<table>
<thead>
<tr>
<th>Code</th>
<th>Ordering code for replacement switch elements</th>
<th>Electrical version</th>
<th>Additional information on request!</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH</td>
<td>BES 516-110-D-RK</td>
<td>PNP, complementary, 10...30 V DC</td>
<td>Additional information on request!</td>
</tr>
</tbody>
</table>
Mechanical Switches
Series 602-11 per DIN 43697

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 frequencies 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.

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.

Extended Range
Inductive Multiple Position

Sensor compatible with pulsed power supply.

Complementary electronic switching elements allow the sensor to be used either as normally open or normally closed.
## Mechanical Switches
Series 602-11 per DIN 43697

### Extended Range Inductive Multiple Position

<table>
<thead>
<tr>
<th>Type</th>
<th>Multiple position switch with extended range inductive sensors</th>
</tr>
</thead>
</table>

- **Switch position spacing**: 12 mm
- **Mounting and function dimensions**: per DIN 43697

---

### Ordering code

#### 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 Ø 10 mm

<table>
<thead>
<tr>
<th>Inductive switch elements</th>
<th>Electrical version</th>
<th>Rated operating distance $s_n$</th>
<th>Assured operating distance $s_a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Field Replaceable</td>
<td>PNP, complementary, 10...60 V DC, short circuit protected, 200mA</td>
<td>4 mm</td>
<td>0...3.2 mm</td>
</tr>
</tbody>
</table>

#### Ordering example:

**BNS 816-X603-B####-00-12-602-11**

- **BNS 816-X####-B####-00-12-602-11**

#### Installation

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

---

#### No. of switch positions

<table>
<thead>
<tr>
<th>No. of switch positions</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2x</td>
<td>3x</td>
<td>4x</td>
<td>5x</td>
<td>6x</td>
</tr>
</tbody>
</table>

Note: See page 15.14 for connector options

---

#### Unique number to indicate special configuration, such as custom pre-wired connector (blank = standard assembly)
- **X580** = 2 position
- **X603** = 4 and 6 positions