BALLUFF

sensors worldwide

The Rotary Cam Switch Line

... rugged and reliable for decades

Balluff is a world leader in the field of position sensing.

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

Whether it's automation, object detection or rotary and linear motion feedback – Balluff is always the right partner.

Our QM system meets the requirements of DIN EN ISO 9001:2000. Eleven Balluff companies have a certified QM system, and two a certified environmental management system. Through the mastery of process-capable production and assembly technologies as well as statistical process control, we achieve consistently high product quality. Intensive testing before series production guarantees reliable function.

With more than 50 years of experience in the field of sensors, Balluff is today one of the most capable manufacturers of standard as well as custom rotary cam switches.

Innovative engineering and application-specific custom solutions are the outstanding features of our entire product range.

Highly qualified development engineers and experienced designers work closely with the production areas to guarantee mature standard products which can be used successfully and reliably in every area of automation – even under extreme operating conditions.

The CE Marking is your guarantee that our products meet the requirements of EC Directive 89/336/EC (EMC Directive) and 73/23/EC (Low-Voltage Directive).

QM System
(Quality Management System)

Protecting the environment and thrifty use of energy and raw materials are basic principles of our company. Our environmental management system has been DIN EN ISO 14001 certified by the DQS since 2000.

The Rotary Cam Switch Line

BG-PRÜFZERT
MHHW 00014
Sicherheit geprüft
tested safety

The Balluff Testing Laboratory operates in accordance with ISO/IEC 17025.

The Test Mark is your assurance that our products conform with the requirements of the following institutions: "US Safety System" and "Canadian Standards Association" under the auspices of Underwriters Laboratories Inc. (UL).

Rotary cam switches are used for controlling, automating, monitoring and counting work and cycle sequences based on given movements of a machine.

Applications

Balluff rotary cam switches are used successfully on presses, stamping machines, forging presses, sheet metal forming machines, welding machinery, machine tools, packaging machines, assembly machinery, transfer lines, transport equipment, lifts, elevators, construction machinery, mining equipment, steelworks and in the automobile industry.

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

The system for translating machine programs

Two independently rotating eccentric cam rings on each switch position enable stepless setting of pulse duration (on- and off-point) and pulse location (0° to 360°).
The machine program set to these parameters runs automatically. A mechanical or inductive switch element passes electrical control commands to the machine controller.

Reliable switching under extreme conditions

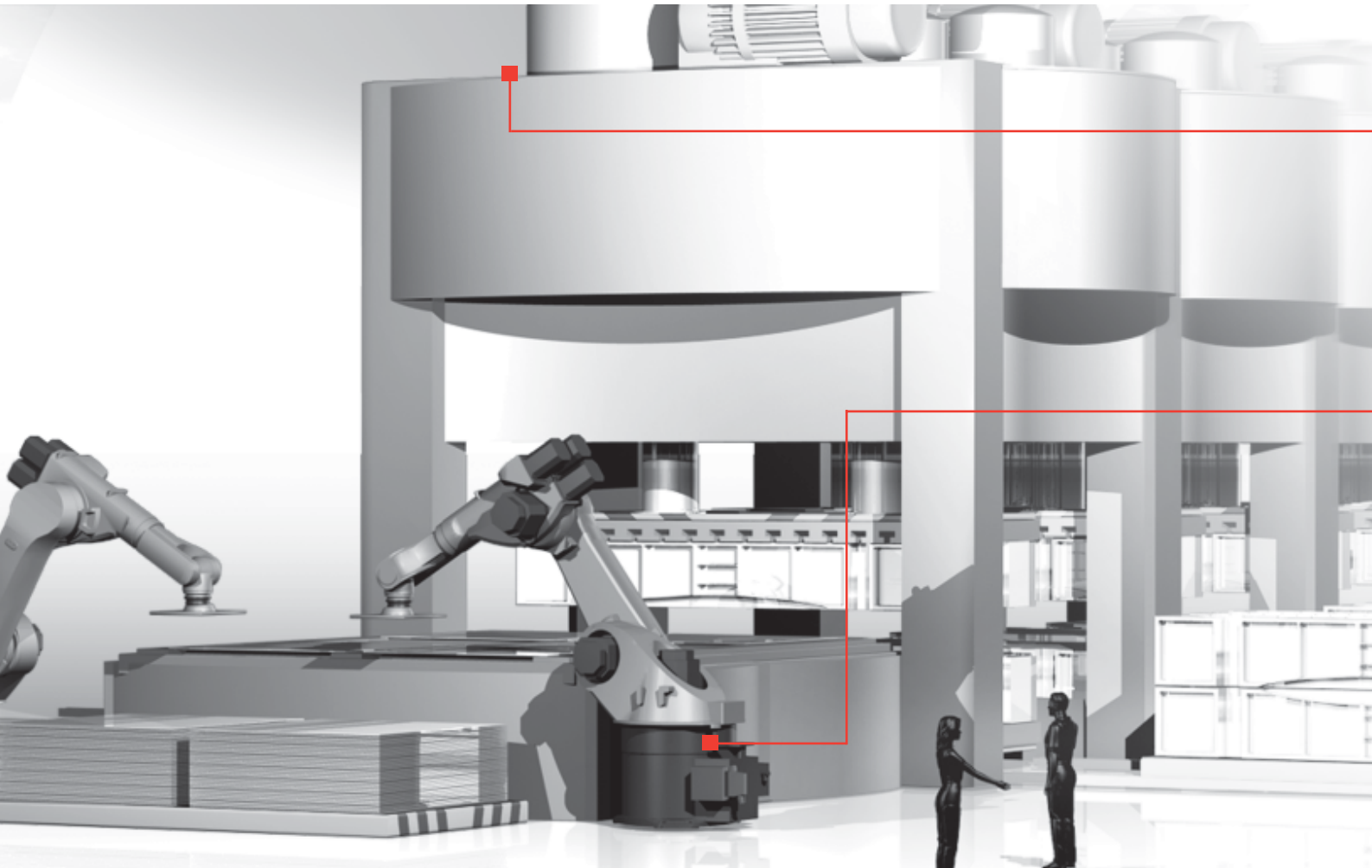
Balluff rotary cam switches have for decades proven themselves under the most difficult conditions. They ensure trouble-free function under conditions of vibration, shock, rapid temperature fluctuations and heavy presence of chips. Inductive rotary cam switches also feature high electromagnetic compatibility.

Safety of man and machine

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

Standard and application-specific rotary cam switches

In addition to standard applications, Balluff offers special rotary cam switches with features such as shaft break security as part of the safety regulations of the German Iron and Metalworkers Association. Included in the scope of delivery are also special versions with additional securing of the cam rings. A variety of accessories such as couplings and gears as well as additional equipment for special applications round out this versatile line.



Mechanical rotary cam switches

Rotary cam switches with mechanical switch elements are used for rotary speeds up to 300/min.
The following torques are needed to turn the rotary cam switch shaft with even actuation of all plungers.

3-position BSW	0.5 Nm
6-position BSW	1.0 Nm
9-position BSW	1.5 Nm
12-position BSW	2.0 Nm
20-position BSW	3.5 Nm

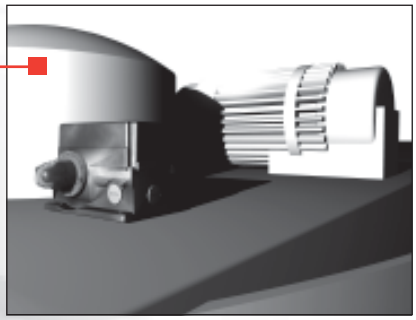
If multiple rotary cam switches are coupled together, the torques for the individual rotary cam switches add up accordingly. When the rotation speed is changed using gearing, the torque changes also in relation to the step-up or step-down.

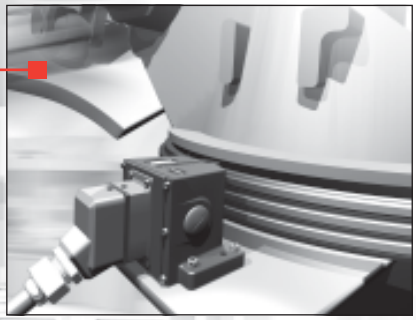
Features

- Up to 20 switch positions in one housing
- Rugged construction
- Maintenance-free, long service life
- No tightening or loosening of the cam rings
- Creep or snap switch elements with forced opening in accordance with DIN EN 60204-1/ VDE 0113 for the greatest possible safety
- Enclosure rating IP 65
- Mixed assemblies with safety and standard switch positions possible
- Broad range of applications
- Can be retrofitted with speed monitor, coupling and step-up or step-down gears

Inductive Rotary Cam Switches

Non-contact electronic switching. The switching operation is triggered by induction in an electronic switch element. Suitable for rotary speed up to 700/min.





Features

- No mechanical wear
- Up to 20 switch positions in one housing
- Wear- and maintenance-free
- Switching frequencies up to 1500 Hz
- AC-, DC-, 2-wire and NAMUR switch elements with different switching response for any electrical requirement
- Can be retrofitted with speed monitor, coupling and step-up or step-down gears

Safety rotary cam switches meeting trade association requirements

Special rotary cam switches fitted with shaft break monitoring as part of the safety requirements of the German Iron and Metalworkers Association are also included. Depending on the specific requirement, the rotary cam switch can be equipped in part or completely with forced opening creep switches (BSE 61) to EN 60 947-5-1: 1997 for use as safety rotary cam switches in accordance with the safety rules for press safety (ZH 1/457).

Special versions with encoder

On request.

Features

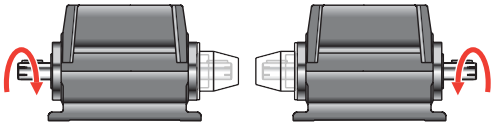
- Plexiglas protective cover against unauthorized access
- Cam rings with security devices against unintended adjustment

Accessories, Spare Parts

- Electromechanical switch elements
- Inductive switch elements
- Speed monitor
- Coupling
- Step-up/step-down gear

Drive type

The rotary cam switches can be driven from either the right or left side by a standard shaft end (40 or 20 mm long, Ø 20 mm) with fit-in key. Each shaft end has an M10 center thread 9 mm deep.



Construction

The shaft, cam ring set and plunger which actuates the mechanical switch elements are contained in a rugged housing.
The housing is divided into a lower section and cover, which are joined by hinges.
M25×1.5 cable fittings are located on three sides of the lower section for electrical installation.
A transparent shield protects the free shaft end opposite the drive side from touching and allows you to view the scaling ring with etched markings.

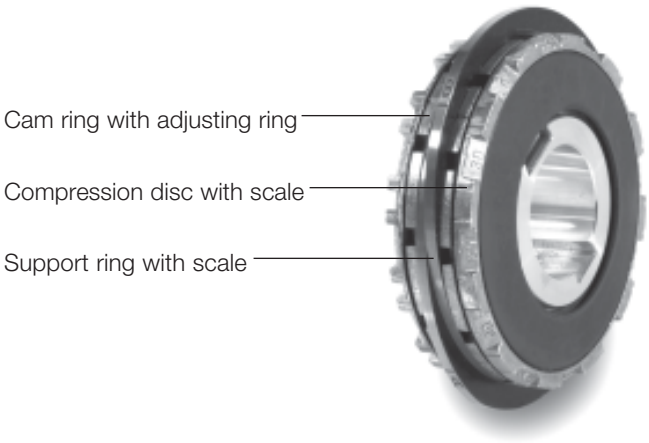
Balluff rotary cam switches can be ordered with 3, 6, 9, 12 or 20 switch positions.
Mounting holes for flange-mounting couplings and gear units (see Accessories) are located on both bearing flanges of the rotary cam switch).

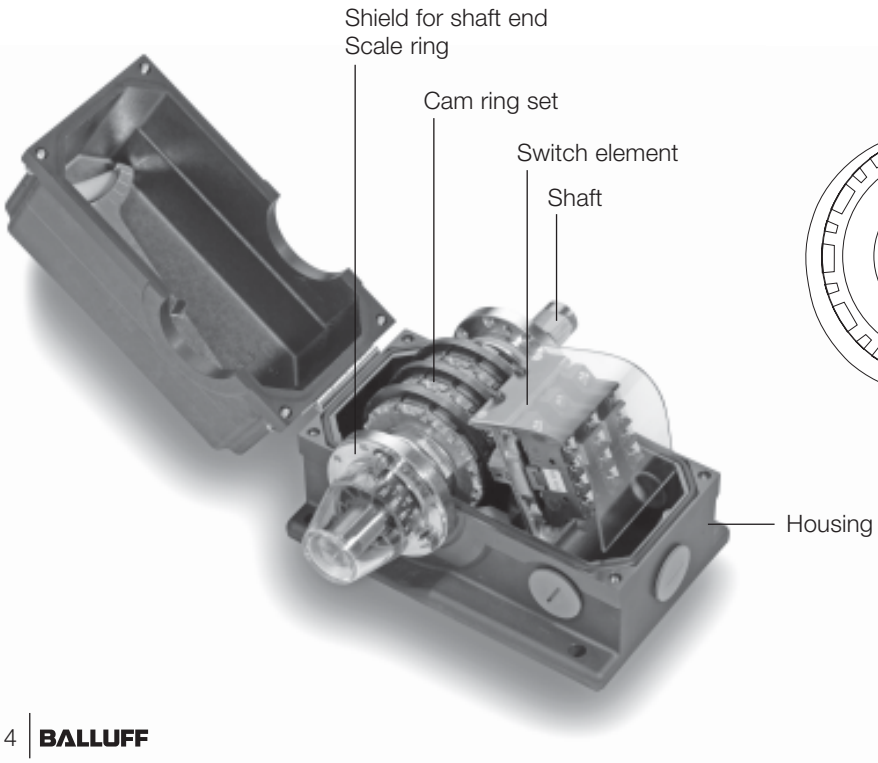
A cam ring set for each switch position is located on the shaft for actuating the individual switch elements.

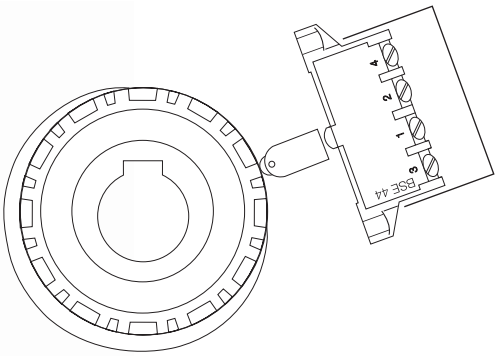
The shaft runs in maintenance-free bearings.
A cam ring set consists of:
– a support ring with scale
– two independently adjustable cam rings with adjusting rings
– a compression disc with scale.

This construction enables stepless adjustment of the switching points for each individual switch position between 0° and 360° without having to loosen or tighten a nut or screw.

The switching point is marked by a line on each cam ring.
The support ring and compression disc attached to the shaft have degrees marked in opposite directions for stepless setting of the pulse length and position.
The scale ring, which is also reads in both directions, allows the respective position of the shaft to be read off.







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The right switch element for every application

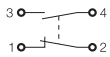
The switch element determines the switching behavior and, in emergency cases, the switching safety. Balluff offers switch elements for various functions.

Switch elements for standard applications

Rotary cam switches for standard applications without safety function are fitted with snap switch elements. Our line includes the following variants:

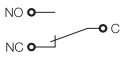
Snap switch element BSE 44.0

Dual changeover, one normally open and one normally closed, galvanically isolated.



Snap switch element BSE 67

Single-pole changeover



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

Application

For use in safety circuits per DIN EN 60204-1/VDE 0113, e.g. for end-of-travel restriction and E-Stop, rotary cam switches can be fitted with safety switches at all or individual switch positions.

Switch elements for safety functions

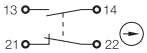
Switch elements for safety functions, such as E-Stop, end-of-travel restriction, have forced opening contacts in compliance with DIN EN 60204-1/VDE 0113. We offer the following variants:

Creep switch element BSE 61

NC, double-interrupting, forced opening.

Snap switch element BSE 85

Dual changeover, normally-open with snap function, normally-closed forced opening, double interruption, galvanically isolated

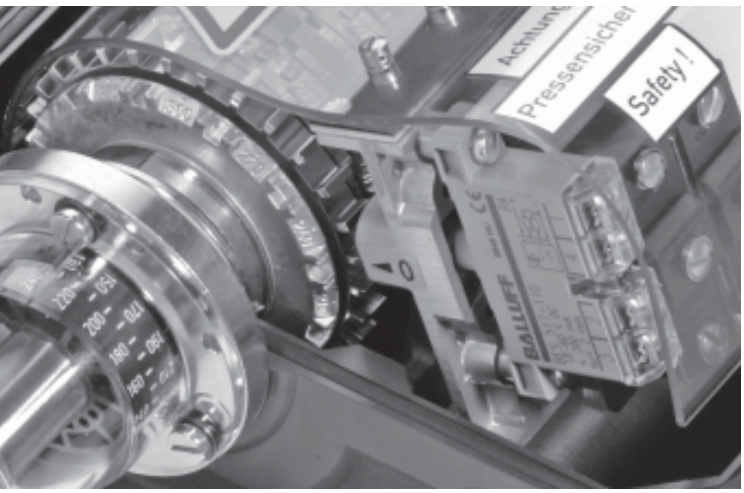


Mechanical rotary cam switches with safety switch positions in compliance with trade association

EN 60 947-5-1: 1997 in compliance with the safety rules for press safety (ZH 1/457).
For sizes:
BSW 813-493-X64
with 6, 9, 12 or 20 positions

Switch position combinations

Switches with safety switch positions can be assembled using both other mechanical elements and inductive elements. Such mixed assemblies can be provided on request. Refer also to Section 4.



Safety switch positions are indicated by red notches.

Construction of the inductive rotary cam switch standard series

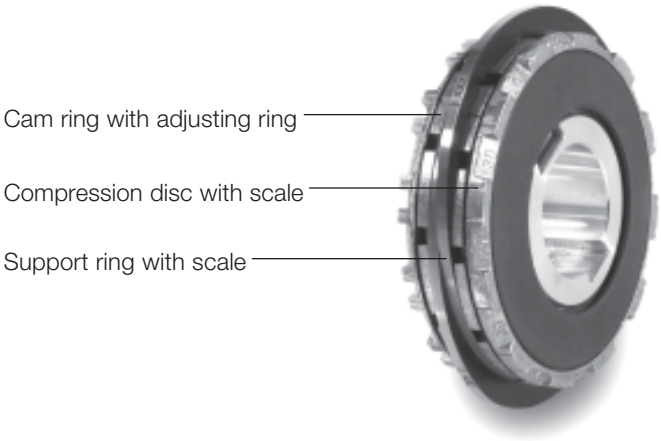
These rotary cam switches use the same housing as the mechanical versions, but different cam ring sets.
The switching function is handled by an inductive switch element whose active surface is damped contactlessly by the target discs (cam ring sets).
Two independently rotatable eccentric cam rings (180°), with exact edges for precisely defining the switching point, are used to determine the pulse length and pulse position.

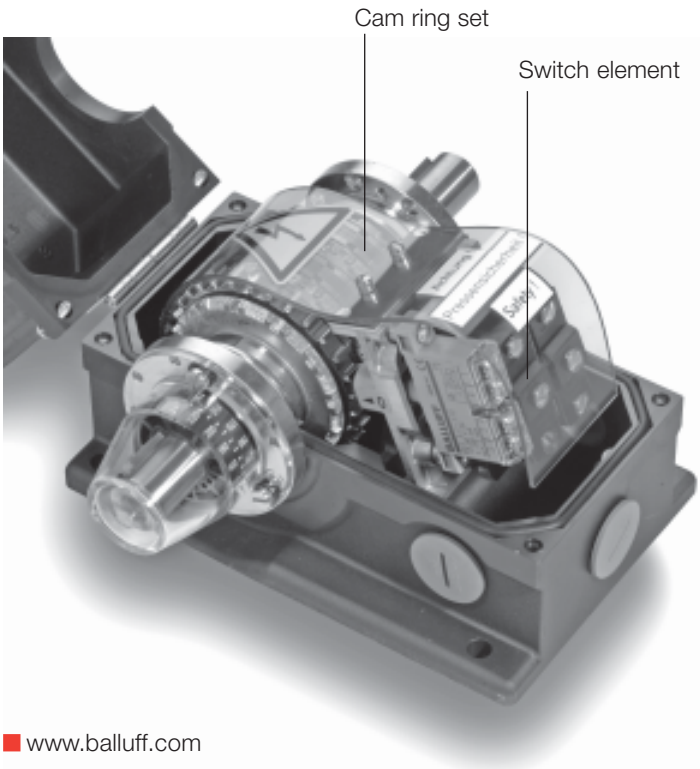
Principle of operation

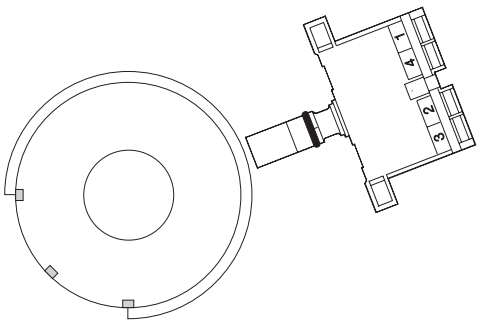
When the cam rings damp the switch element, energy is removed from the oscillator, and the oscillator voltage drops. This changes the state of the output signal ini the switch element.
The switch elements are suitable for direct logic control.

High-quality Neoprene seal

Inductive switch elements
Versions DC (PNP/NPN, NO/push-pull), AC (NO, NC), DC 2-wire (NO, NC), NAMUR.







Construction of inductive rotary cam switches BSW 816-207

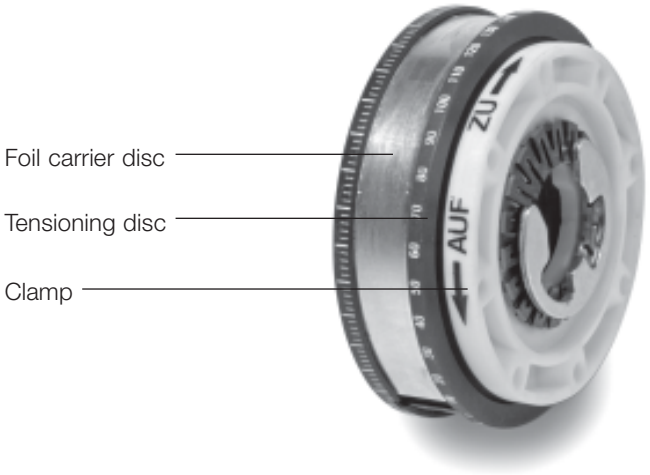
In contrast to the standard series, here the shaft is fitted with foil carrier discs instead of cam rings.
The two-part foil carrier disc is made of plastic with a guide scale from 0° to 360° with a clamp for holding the damping section.

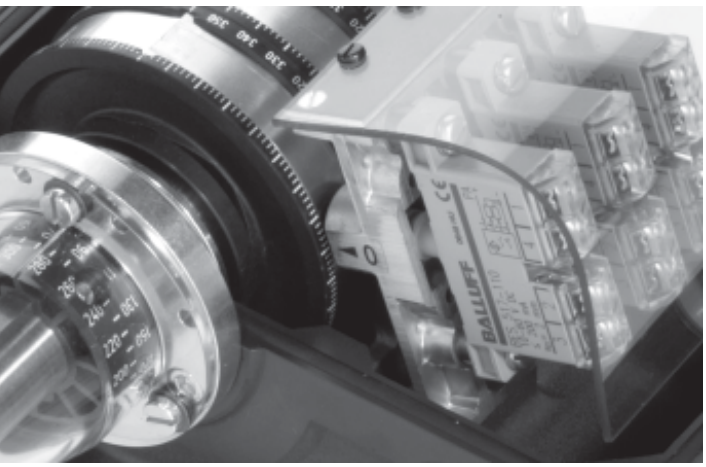
Aluminum foils are (with polyester or aluminum coating) are used to damp the individual inductive switch elements and are steplessly adjustable on the foil carrier disc and can be clamped at any angle. Depending on the application each switch position can also be fitted with several equally or variously long aluminum foils (corresponding to pulses).

For these rotary cam switches the same housings and same switch elements are used as for the inductive rotary cam switches in the standard series.

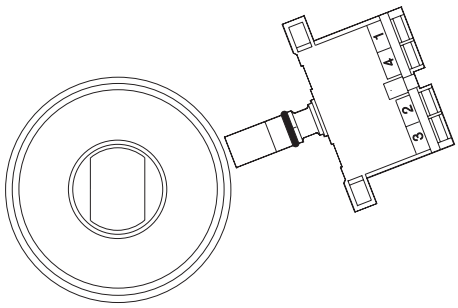
Special version

For run checking or speed monitoring an etched, epoxy resin coated copper foil is available for retrofitting a switch position.





Rotary cam switch with securable cam rings



Rotary cam switches with securable cam rings X64

These rotary cam switches are also equipped with a securing fixture, i.e. each individual cam ring is equipped with an adjusting ring and security plate. By simply bending the security plate into the slots of the adjusting ring each individual cam ring can be secured at any desired angle position (no drilling out necessary).

Rotary cam switches with speed monitor or run checking

The switch position furthest away as viewed from the drive side of the rotary cam switch is equipped, instead of the usual cam ring set and the corresponding snap switch, with a pulse sensor, consisting of a toothed disc with 30 teeth (= 30 pulses per revolution) and inductive electronic switch element (NO and NC).
The rotary motion of the cam switch shaft is monitored by this pulse sensor and evaluated with a speed monitor.

Rotary cam switches with additional speed monitor or run checking

This rotary cam switches includes an additional pulse sensor, so that no normal switch positions have to be sacrificed. There are two versions available.
– One pulse wheel each is located to the left or right of the complete cam ring package for optional assembly of the corresponding proximity switch
– Proximity switch or slot sensor is attached on the side opposite the drive (after the last normal switch position).

Features

- Adjusting mechanism for stepless setting of the switching pulses
- No loosening or tightening of the cam rings
- Precision snap switches depending on the BSW series: Model BSE 44.0 per DIN EN 50047 or Model BSE 67
- Drive can be located on either end of the shaft; guard cover and scale ring can be attached on both sides (shaft ends)
- Suitable for clockwise or counterclockwise rotation; the scale ring can be scaled in both directions
- Available with short (20 mm) or long (40 mm) shaft end with ∅ 20 mm

Mixed assembly

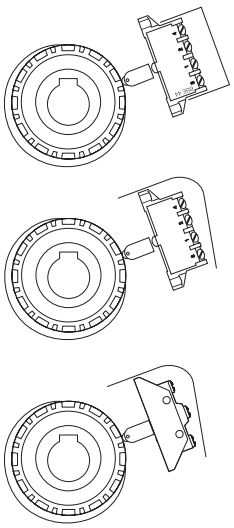
An extended mixed assembly with safety switch elements type BSE 61 is possible. For ordering code see page 18.

Dimensions (in mm)

Number of switch positions		3	6	9	12	20
Dimension	A	125	185	245	305	503
	B	105	165	225	285	483
	C, Version L	199	259	319	379	577
	C, Version K	159	219	279	339	537
Number of cable fittings		3	4	5	5	7

Ordering examples:
BSW 819-492-06L3
BSW 819-493-12K2
BSW 819-494-09L2

BSW 819-_ _ _-_ _ _ _



Rotary cam switch

492 Snap switch BSE 44.0 to DIN 43695, Pulse location also adjustable individually by ±20° for each switch position while running
493 Snap switch BSE 44.0 to DIN EN 50047, not adjustable while running
494 Snap switch BSE 67, pulse location not adjustable during running

No. of switch positions

03 3x
06 6x
09 9x
12 12x
20 20x

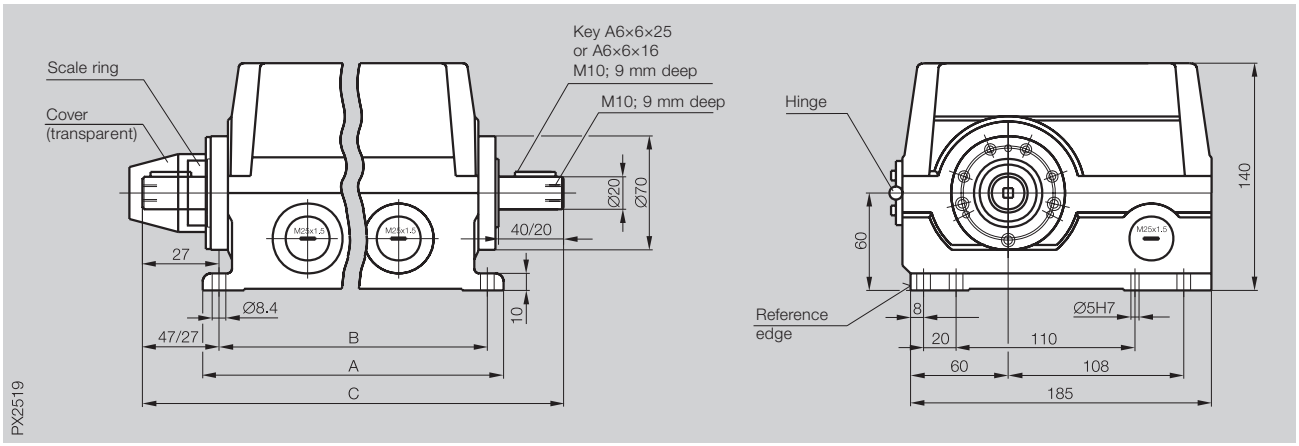
Shaft ends ∅ 20 mm

L Exposed length 40 mm
K Exposed length 20 mm

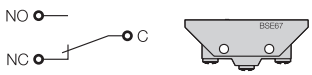
Drive type

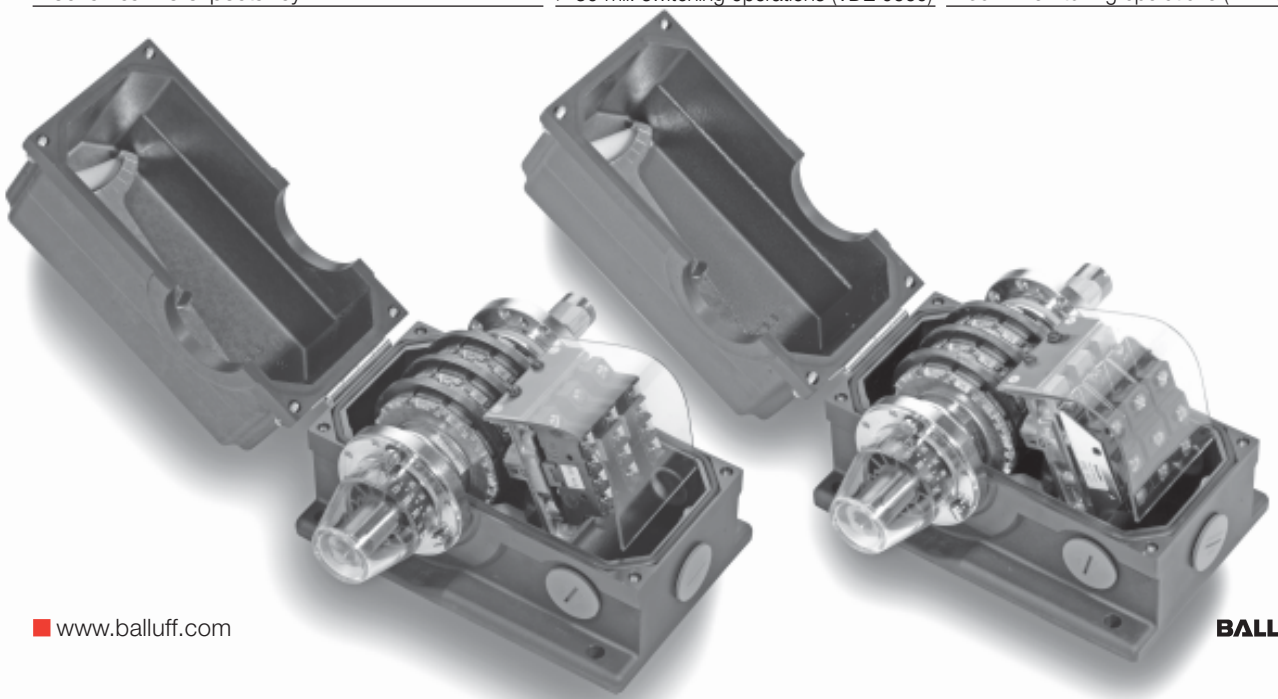
2 Drive left side, rotation direction left and right
3 Drive right side, rotation direction left and right

Type	Rotary cam switch
Description	BSW 819-492, BSW 819-493, BSW 819-494



Housing material	Cast aluminum, corrosion-resistant, anodized finish
Cable fitting in housing	Thread M25×1.5
Shaft	Steel, in maintenance-free roller bearings
Cam rings	Steel, run surfaces hardened and polished
Plunger material	Steel (rustproof); with built-in ball bearing as roller
Lubrication	None, maintenance-free, plunger in DU sleeve
Enclosure rating	IP 65 per DIN 40050
Speed	max. 200/min
Smallest opening angle	10° (BSW 819-494), 15° (BSW 819-492, BSW 819-493)
Permissible ambient temperature	–5...+80 °C
Service life	> 30 mil. revolutions

With switch element	**BSE 44.0** (to DIN EN 50047)	**BSE 67**
Wiring diagram, style		
Switch element		
Contact material	Silver, gold plated	Silver with parallel grooves in the snap springs
Switching principle	Snap switch	Snap switch
Contact system	Dual changeover, one NO and one NC, galvanically and thermally isolated	Single-pole changeover
Electrical data	see page 21	see page 21
Housing material	Duroplast, cover Thermoplast	Duroplast
Mechanical life expectancy	> 30 mil. switching operations (VDE 0660)	> 30 mil. switching operations (VDE 0660)



Features

- Rotary cam switch with safety switch positions per DIN EN 60204-1/ VDE 0113
- Adjusting mechanism for stepless setting of the switching pulses
- No loosening or tightening of the cam rings
- Switch elements BSE 61 or BSE 85 with safety switch positions per DIN EN 60204-1/ VDE 0113
- Guard for protecting switch elements from unauthorized access
- Drive can be located on either end of the shaft; guard cover and scale ring can be attached on both sides (shaft ends)
- Suitable for clockwise or counterclockwise rotation; the scale ring can be scaled in both directions
- Long exposed shaft end (40 mm) with ∅ 20 mm

Mixed assembly

An extended mixed assembly with safety switch elements type BSE 44.0, BSE 61, BSE 67 or BSE 85 is possible. For ordering code see page 18.

Securable cam rings to protect against unintended adjustment

These rotary cam switches are also equipped with a securing fixture, i.e. each individual cam ring is equipped with an adjusting ring and security plate. Simply bending the security panel into the slots of the adjusting ring secures each individual cam ring. For mechanical presses with manual insertion, note 5.4 of EN 692:1996.

Dimensions (in mm)

Number of switch positions		3	6	9	12	20
Dimension	A	125	185	245	305	503
	B	105	165	225	285	483
	C, Version L	199	259	319	379	577
	C, Version K	159	219	279	339	537
Number of cable fittings		3	4	5	5	7

Ordering examples:
BSW 813-493-X64-12L2
BSW 813-494-X64-03K3
BSW 813-495-X64-09L3

BSW 813-_ _ _-X64-_ _ _ _

Rotary cam switch

493 Creep switch element BSE 61 per DIN EN 60204-1/VDE0113
494 Creep switch element BSE 61 per DIN EN 60204-1/VDE0113
495 Creep switch element BSE 85 per DIN EN 60204-1/VDE0113

No. of switch positions

03 3x
06 6x
09 9x
12 12x
20 20x

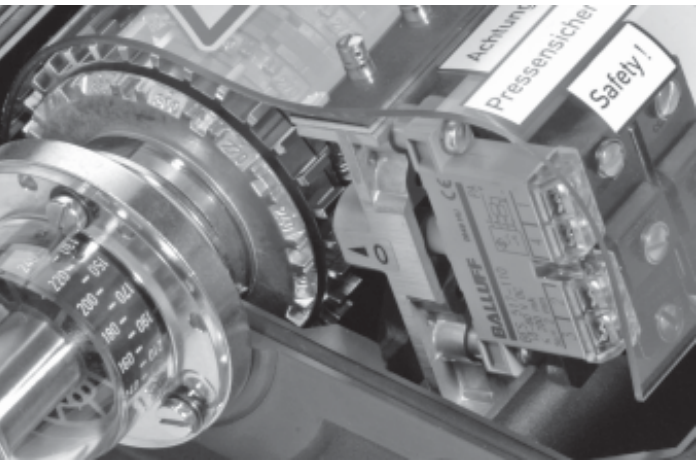
As per trade association rules only sizes with 6 to 20 switch positions are permitted.

Shaft ends ∅ 20 mm

L Exposed shaft length 40 mm
K Exposed shaft length 20 mm

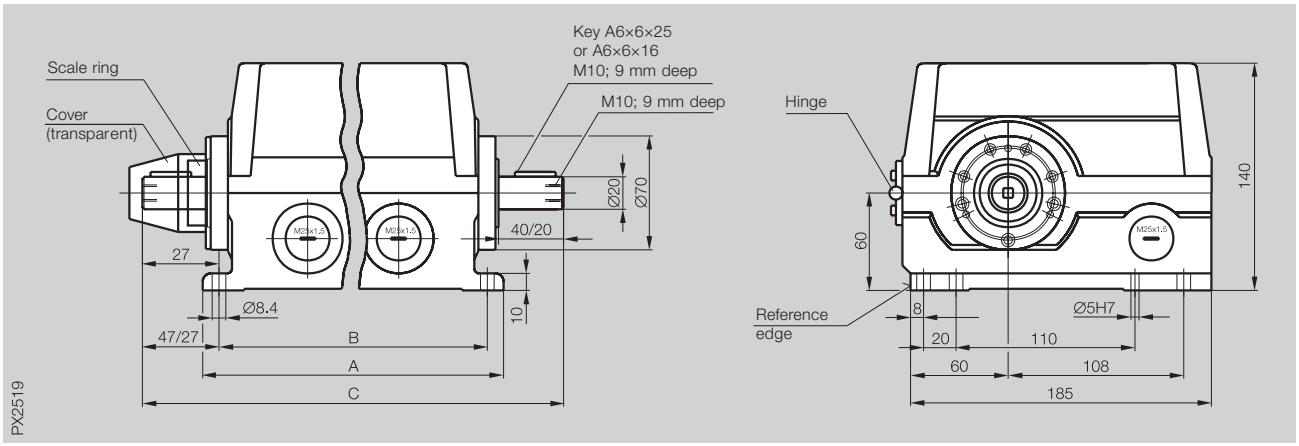
Drive type

2 Drive left side, rotation direction left and right
3 Drive right side, rotation direction left and right

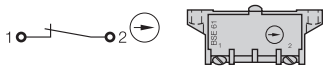
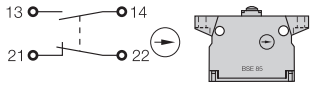


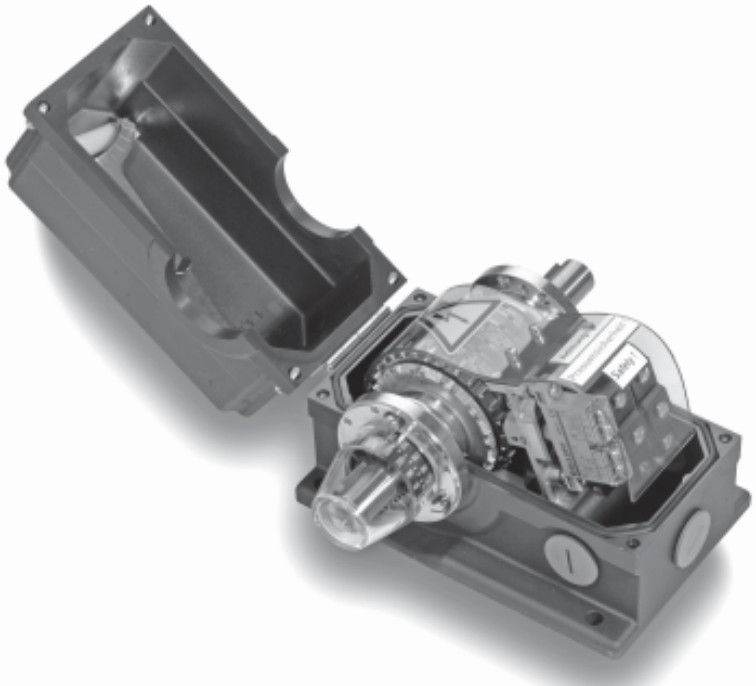
Safety rotary cam switch BSW 813-493 X64...

Type	Rotary cam switch
Description	BSW 813-493-X64, BSW 813-494-X64, BSW 813-495-X64 with forced opening contacts



Housing material	Cast aluminum, corrosion-resistant, anodized finish
Cable fitting in housing	Thread M25×1.5
Shaft	Steel, in maintenance-free roller bearings
Cam rings	Steel, run surfaces hardened and polished
Plunger material	Steel (rustproof); with built-in ball bearing as roller
Lubrication	None, maintenance-free, plunger in DU sleeve
Enclosure rating	IP 65 per DIN 40050
Speed	max. 200/min
Smallest opening angle	15°
Permissible ambient temperature	–5...+80 °C
Service life	> 30 mil. revolutions

With switch element to DIN EN 60204-1/VDE 0113	**BSE 61**	**BSE 85**
Wiring diagram, style		
Switch element		
Contact material	Silver	Silver
Switching principle	Creep switch circuit, forced opening	Snap switch circuit, forced opening
Contact system	Normally-closed, double interruption	Dual changeover, normally-open with snap function, normally-closed forced opening, double interruption, galvanically isolated
Electrical data	see page 21	see page 21
Housing material	Duroplast, cover Thermoplast	Thermoplast
Mechanical life expectancy	> 30 mil. switching operations (VDE 0660)	> 1 mil. switching operations (VDE 0660)



Features

- With inductive switch elements for 10...60 V (PNP/NPN) or 35...250 V AC
- Switch elements suitable for direct logic control
- Speeds up to 700/min
- Long life expectancy with wear-free switching operations
- Smooth running thanks to low centrifugal mass
- Unaffected by acceleration
- Enclosure rating IP 65
- Drive can be located on either end of the shaft; guard cover and scale ring can be attached on both sides (shaft ends)
- Suitable for clockwise or counterclockwise rotation; the scale ring can be scaled in both directions
- Long exposed shaft end (40 mm) with ∅ 20 mm

Mixed assembly

An extended mixed assembly with standard and safety switch elements is possible. For ordering code see page 18.

Dimensions (in mm)

Number of switch positions		3	6	9	12	20
Dimension	A	125	185	245	305	503
	B	105	165	225	285	483
	C, Version L	199	259	319	379	577
No. of cable fittings		3	4	5	5	7

Ordering examples:
BSW 816-203-03L3-PA
BSW 816-204-12L2-NA

BSW 816-_ _ _-_ _ L _-_ _

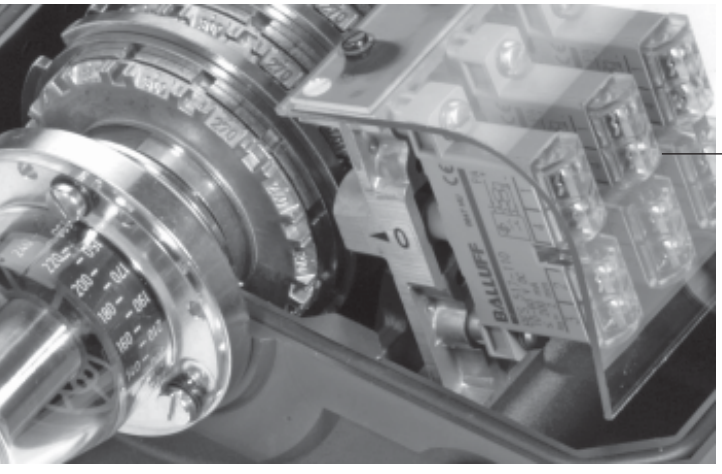
Rotary cam switch
203 Pulse position also adjustable on the fly by ±20° for each switch position
204 Pulse position not adjustable on the fly

No. of switch positions
03 3x
06 6x
09 9x
12 12x
20 20x

Shaft ends ∅ 20 mm
Exposed shaft length 40 mm M10 center thread on both shaft ends, 9 mm deep

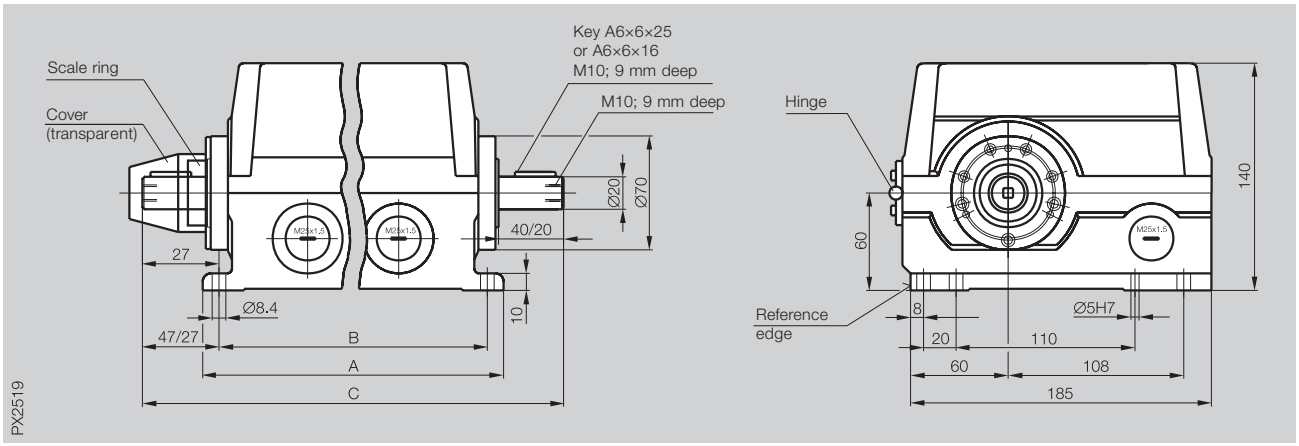
Drive type
2 Drive left side, rotation direction left and right
3 Drive right side, rotation direction left and right

Code for switch element
(see table at right)



Inductive switch elements

Type	Rotary cam switch
Description	BSW 816-203 with inductive switch elements
	BSW 816-204
	(switchpoint adjustable on the fly by ±20°)

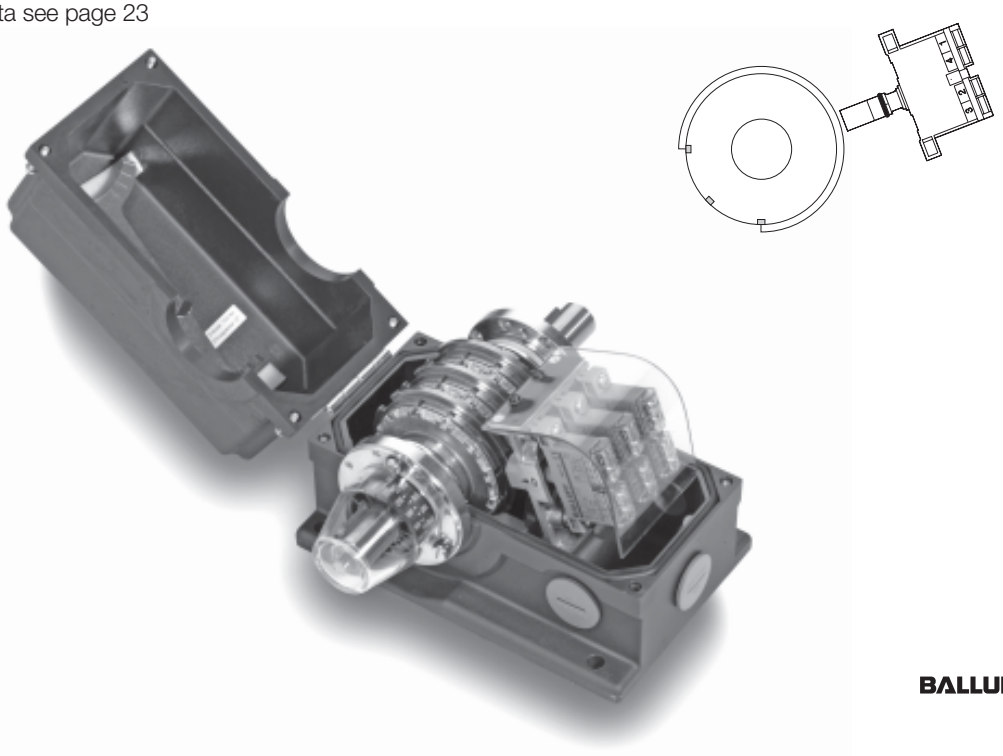


Housing material	Cast aluminum, corrosion-resistant, anodized finish
Cable fitting in housing	Thread M25×1.5
Shaft	Steel, in maintenance-free roller bearings
Cam rings	Non-rusting steel
Safety for AC switch elements	Plastic guard
Enclosure rating	IP 65 per DIN 40050
Speed	max. 700/min
Smallest opening angle when using	
DC switch elements	min. 10° at max. 100 rpm
AC switch elements	min. 15° at max. 200 rpm
	min. 45° at max. 300 rpm
	min. 75° at max. 700 rpm
Permissible ambient temperature	–5...+80 °C
Service life	> 50 mil. revolutions

Inductive switch elements with ∅ 10 mm head

Code	Electrical type	Rated switching distance s_n	Assured switching distance s_a
PA	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	NO, 35...250 V AC, 10 Hz	2 mm	0...1.6 mm
WO	NC, 35...250 V AC, 10 Hz	2 mm	0...1.6 mm
NG	NC, 2-wire, NAMUR, 7.7... 9 V DC	2 mm	0...1.6 mm

For additional electrical data see page 23



Features

- With inductive switch elements for 10...60 V (PNP/NPN) or 40...250 V AC
- Switch elements suitable for direct logic control
- Speeds up to 700/min
- Long life expectancy with wear-free switching operations
- Smooth running thanks to low centrifugal mass
- Unaffected by acceleration
- Enclosure rating IP 65
- Drive can be located on either end of the shaft; guard cover and scale ring can be attached on both sides (shaft ends)
- Suitable for clockwise or counterclockwise rotation; the scale ring can be scaled in both directions
- Long exposed shaft end (40 mm) with ∅ 20 mm

Depending on the application each switch position can also be fitted with several equally or variously long aluminum foils (corresponding to pulses) (order separately).

Damping the switch positions

Two types of damping foil are offered:
- For short pulse lengths up to max. 180° Order code 706687
- For longer pulse lengths 180° to max. 360° Order code 706688

The damping foils can be trimmed exactly to any desired length.

Run checking, speed monitoring

For retrofitting a switch position for run checking or speed monitoring, an etched, epoxy resin coated copper foil with 30 pulses/revolution is available (order code 705413, order separately).

Mixed assembly

An extended mixed assembly with standard and safety switch elements is possible. For ordering code see page 18.

Dimensions (in mm)

Number of switch positions		3	6	9	12	20
Dimension	A	125	185	245	305	503
	B	105	165	225	285	483
	C, Version L	199	259	319	379	577
No. of cable fittings		3	4	5	5	7

Ordering example:
BSW 816-207-12L3-PA

BSW 816-207-_ _ L _-_ _

Rotary cam switch
with foil carrier disc and damping section made of aluminum foil

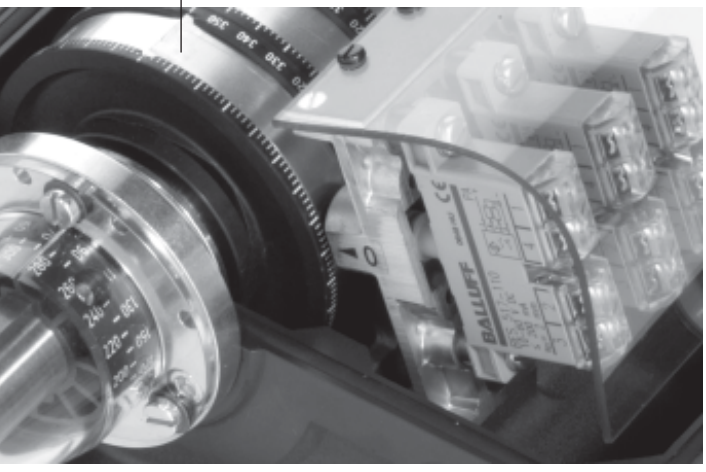
No. of switch positions
03 3x
06 6x
09 9x
12 12x
20 20x

Shaft ends ∅ 20 mm
Exposed shaft length 40 mm

Drive type
2 Drive left side, right rotation
3 Drive right side, left rotation

Code for switch element
(see table at right)

Damping foil

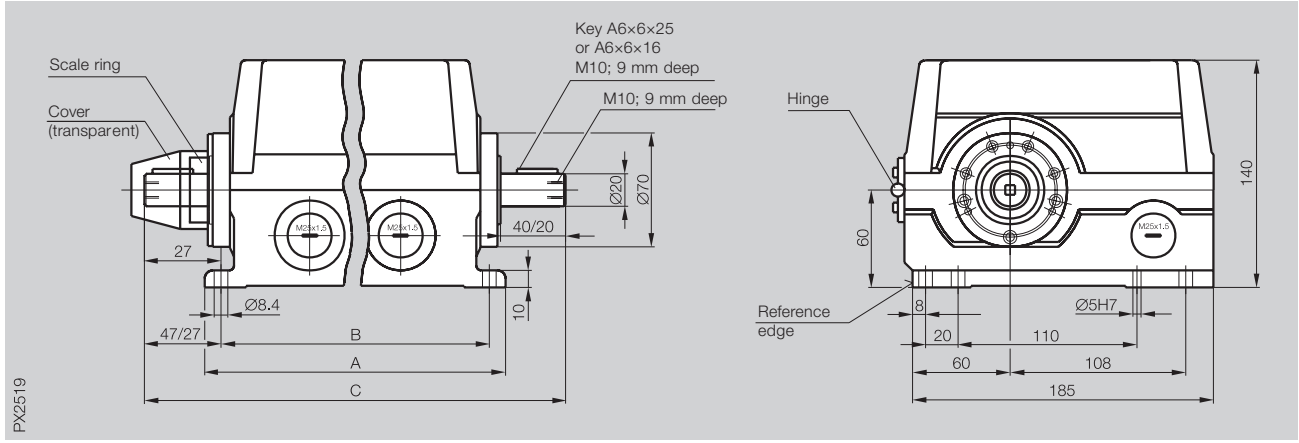


Aluminum damping foil for rotary cam switch BSW 816-207

Replacement needs
- For short pulse lengths up to max. 180° Order code 706687
- For longer pulse lengths 180° to max. 360° Order code 706688

The damping foils can be trimmed exactly to any desired length. Depending on the application each switch position can also be fitted with several equally or variously long aluminum foils (corresponding to pulses).

Type	Rotary cam switch
Description	BSW 816-207 with inductive switch elements

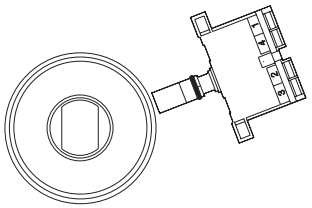


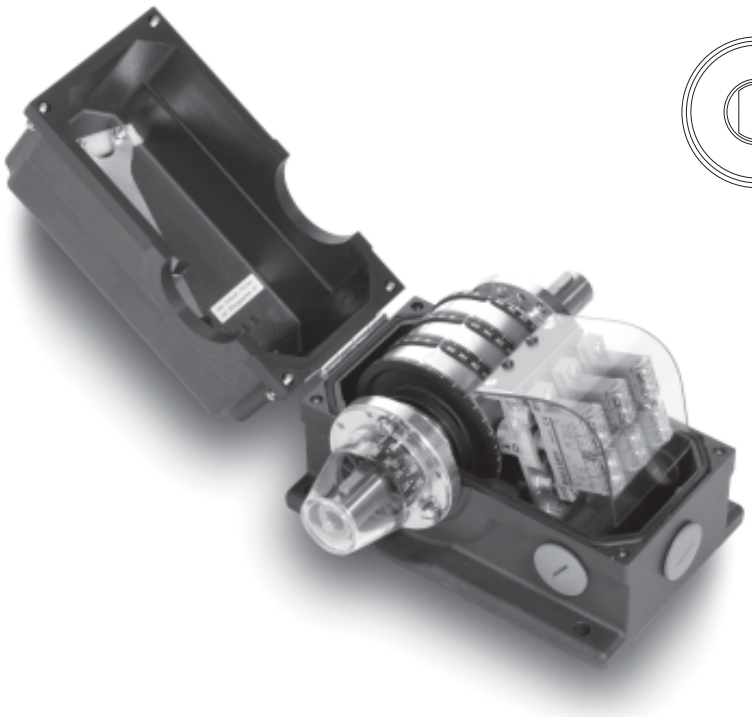
Housing material	Cast aluminum, corrosion-resistant, anodized finish
Cable fitting in housing	Thread M25×1.5
Shaft	Steel, in maintenance-free roller bearings
Foil carrier disc	Plastic
Damping the switch elements	Aluminum foil with coating 180° or 360°
Safety for AC switch elements	Plastic guard
Enclosure rating	IP 65 per DIN 40050
Speed	max. 700/min
Smallest opening angle when using	
DC switch elements	min. 10° at max. 100 rpm
AC switch elements	min. 15° at max. 200 rpm min. 45° at max. 300 rpm min. 75° at max. 700 rpm
Permissible ambient temperature	–5...+80 °C
Service life	> 50 mil. revolutions

Inductive switch elements with ∅ 10 mm head

Code	Electrical type	Rated switching distance s_n	Assured switching distance s_a
PA	PNP, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
NA	NPN, complementary, 10...60 V DC, short circuit protected	2 mm	0...1.6 mm
WS	NO, 35...250 V AC, 10 Hz	2 mm	0...1.6 mm
WO	NC, 35...250 V AC, 10 Hz	2 mm	0...1.6 mm
NG	NC, 2-wire, NAMUR, 7.7... 9 V DC	2 mm	0...1.6 mm

For additional electrical data see page 23





Mechanical and inductive switch positions in one rotary cam switch

Mixing options

The individual switch positions can be custom fitted.
The following possibilities are available:

- Mechanical switch elements
- Safety switch elements
- Inductive switch elements

When using safety switch positions to DIN EN 60204-1/ VDE 0113 the instructions in Section 2 must be followed!

Mechanical switch elements
(see Section 5 for technical data)

BSE 44.0, DIN EN 50047
BSE 67
BSE 61 to
DIN EN 60204-1/VDE 0113,
BSE 85 to
DIN EN 60204-1/VDE 0113

Inductive switch elements
(see Section 5 for technical data)

BES 517-108 (NA)
BES 517-110 (PA)
BES 517-410 (WS)
BES 517-421 (WO)
BES 516-314-N (NG)

Ordering

When ordering, specify the **individual switch positions** in plain English. Always start from the exposed (driven) shaft end.

Mixed assembly switches are given a special order code (see ordering examples)

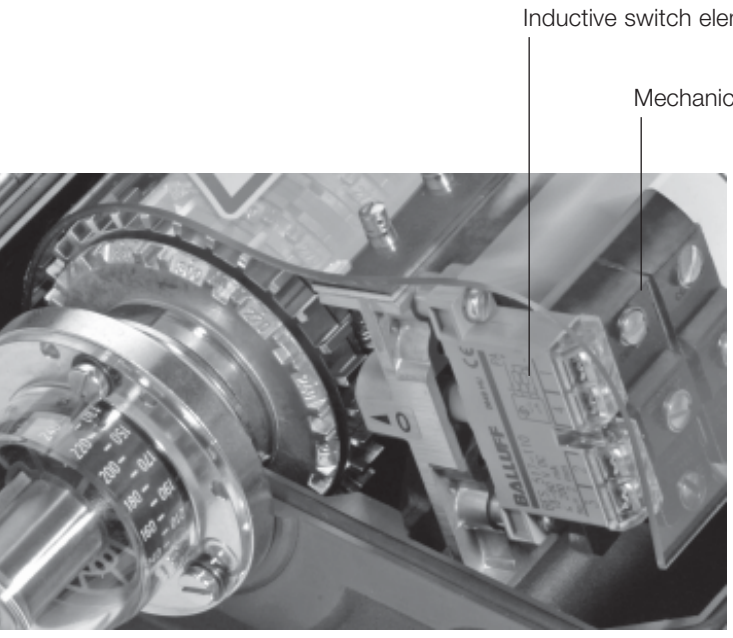
When reordering, specify the full product code including the 6-digit code for mixed assembly.

Order example for mechanical standard rotary cam switch:
BSW 819-493-12L3-55-xxxx

Rotary cam switch | **Mixed assembly** Internal code

Order example for inductive standard rotary cam switch:
BSW 816-207-06L3-55-xxxx

Rotary cam switch | **Mixed assembly** Internal code



Note for standard series
The standard versions are described in:

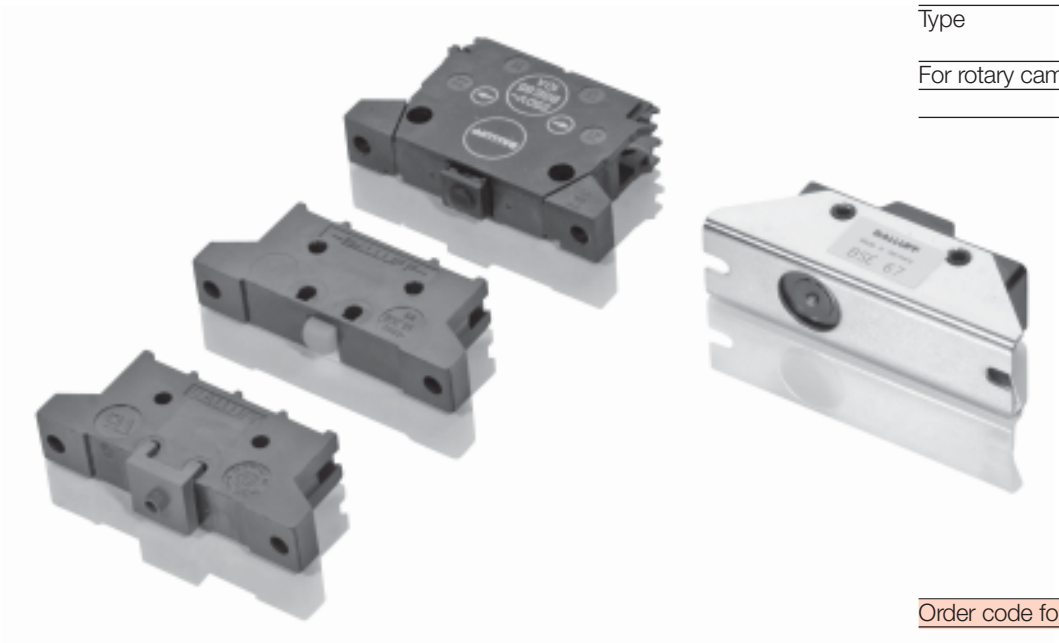
Section **1**
Mechanical Rotary Cam Switches

Section **2**
Mechanical Rotary Cam Switches to DIN EN 60204-1/VDE 0113

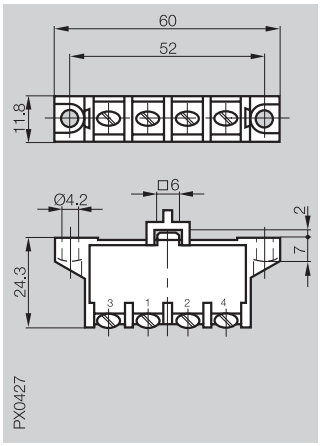
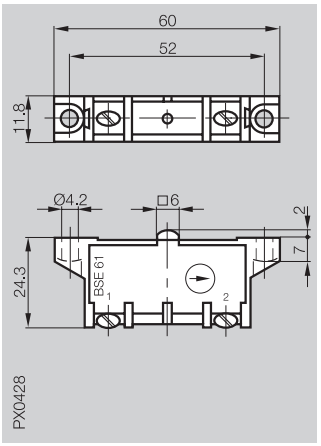
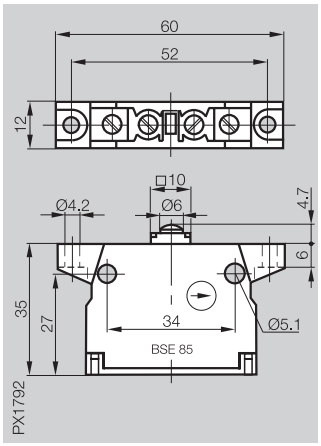
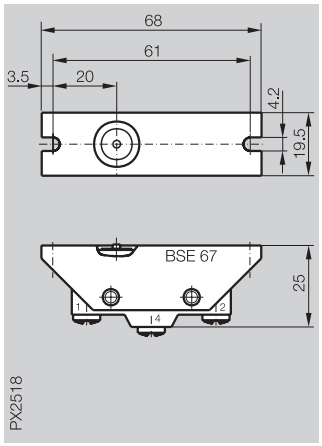
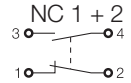
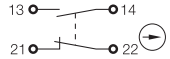
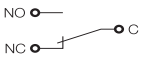
Section **3**
Inductive Rotary Cam Switches

Detailed information for switch elements can be found in:

Section **5**
Mechanical and Inductive Switch Elements



Type	
For rotary cam switch series BSW	
Order code for replacement switch elements	
Construction	
Contact material	
Switching principle	
Contact system	
Contact arrangement	
Wire cross-section (with end ferrule)	
Connection type	
Mechanical data	
Actuation force on switch plunger	
Bounce time	
Switchover time	
Switching rate	
Housing material	
Ambient temperature range T_a	
Electrical data	
Isolation	
Nominal voltage	
Constant current	
Minimum load at 24 V DC	
Contact resistance	
Switching capacity	AC 480 V, 40...60 Hz
	AC 250 V, 40...60 Hz
	DC 220 V
	DC 24 V
Service life	
Mechanical	
Electrical	
Approval	

	Snap switch element BSE 44.0	Creep switch element BSE 61 to DIN EN 60204-1	Snap switch element BSE 85 to DIN EN 60204-1	Snap switch element BSE 67
	819-492, 819-493	813-493	813-495	819-494
				
	BSE 44.0	BSE 61	BSE 85	BSE 67
	Silver, gold plated	**Silver**	**Silver**	**Silver**
	Snap switch	Creep switch, forced opening	Snap switch, forced opening (normally-closed)	Snap switch
	Dual changeover, one NO and one NC, galvanically and thermally isolated	Normally-closed, double interruption	Dual changeover, normally-open with snap function, normally-closed forced opening, double interruption, galvanically isolated	Single-pole changeover
	NO 3 + 4 NC 1 + 2 	NC 1 + 2 	NO 13 + 14 NC 21 + 22 	NO C + NO NC C + NC 
	max. 2×1.5 mm²	max. 2×1.5 mm²	max. 2×1.5 mm²	max. 2×1.5 mm²
	Screw connection M3	Screw connection M3	Screw connection M3.5	Screw connection
	min. 20 N	max. 15 N	min. 30 N	max. 3.6 N
	≤ 1.5 ms	N/A	≤ 3 ms	N/A
	≤ 10 ms	N/A	≤ 5 ms	N/A
	300 operations/min	300 operations/min	160 operations/min	300 operations/min
	Duro- and Thermoplast	Duro- and Thermoplast	Thermoplast	Duroplast
	–5...+80 °C	–5...+80 °C	–5...+80 °C	–5...+80 °C
	Group C (VDE 0110)	Group C (VDE 0110)	Group C (VDE 0110)	Group C (VDE 0110)
	250 V AC	250 V AC	250 V AC	500 V AC
	6 A	6 A	6 A	6 A
	≥ 20 mA	≥ 20 mA	≥ 20 mA	≥ 20 mA
	< 40 mΩ	< 40 mΩ	< 40 mΩ	< 20 mΩ
				15 A, cos φ = 1
	6 A, cos φ = 1 2 A, cos φ = 0.8 1 A, cos φ = 0.4	Depending on speed and switching rate	2 A, cos φ = 0.8	15 A, cos φ = 0.8
	0.5 A, L/R = 200 ms			0.25 A, L/R = 200 ms
	4 A, L/R = 200 ms			
	> 30 mil. switching operations (VDE 0660)	> 30 mil. switching operations (VDE 0660)	> 1 mil. switching operations (VDE 0660)	> 30 mil. switching operations (VDE 0660)
	Depending on load, switching frequency	depending on load, switching frequency	Depending on load, switching frequency	Depending on load, switching frequency
	UL, CSA	CSA	cULus	VDE, UL, CSA

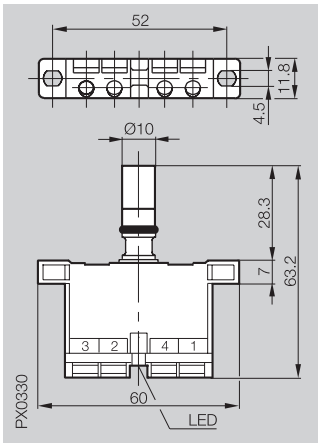
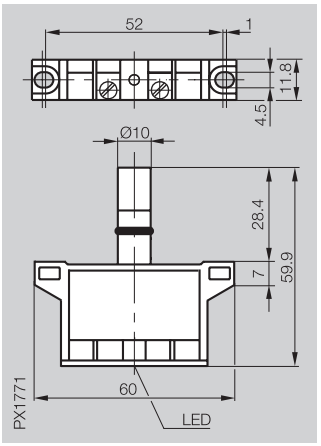
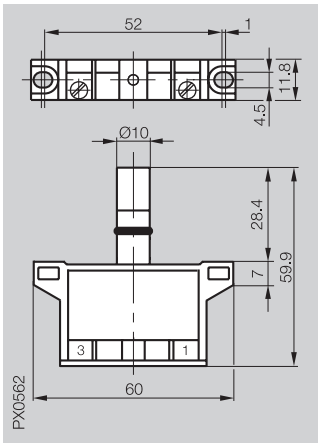
Code for inductive switch elements	
Rated operating distance s_n	
Assured operating distance s_a	
for rotary cam switch series BSW	

Order code for replacement switch elements

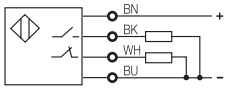
DC, PNP	NO	
3-/4-wire	push-pull	
DC, NPN	NO	
3-/4-wire	push-pull	
AC	NO	
	NC	
DC	NO	
2-wire	NC	
	NAMUR	

Rated operational voltage U_e	
Supply voltage U_S	
Voltage drop U_d at I_e static	
Rated insulation voltage U_i	
Rated operational current I_e	
No-load current I_0 damped/undamped	
Off-state current I_r	
Polarity reversal protected	
Short circuit protected	
Permissible load capacitance	
Repeat accuracy R	
Ambient temperature range T_a	
Frequency of operating cycles f	
Utilization category	
Function indicator	
Protection per IEC 60529	
Housing material	
Material of sensing face	
Connection type	
max. wire cross-section	
Approval	
Current draw at $s_r = 0/s_r = \infty$	
Permissible series resistance R_V	

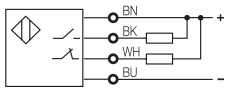
Connection diagrams

PA	NA	WS	WO	NG
2 mm		**2 mm**		**2 mm**
0...1.6 mm		0...1.6 mm		0...1.6 mm
816-203, 816-204, 816-207		816-203, 816-204, 816-207		816-203, 816-204, 816-207
				
BES 517-110-RK				
	BES 517-108-RK			
		BES 517-410-RK	BES 517-421-RK	
				BES 516-314-N-RK
24 V DC		110 V AC		8.2 V DC
10...60 V DC		35...250 V AC		7.7...9 V DC
≤ 1.5 V		≤ 8.5 V		
75 V DC		250 V AC		75 V DC
200 mA		100 mA		
≤ 15 mA/≤ 12 mA				
≤ 50 µA		≤ 1700 µA		
yes		yes		yes
yes		no		no
≤ 0.5 µF				
≤ 5 %		≤ 5 %		≤ 5 %
–25...+70 °C		–25...+70 °C		–25...+70 °C
1500 Hz		10 Hz		1000 Hz
DC 13		AC 140		
yes		yes		no
IP 67		IP 67		IP 67
PA 12		PA		PBT
PA 12		PA 12		PBT
Screw terminals		Screw terminals		Screw terminals
up to 1.5 mm²		up to 2.5 mm²		up to 2.5 mm²
		cULus		
				≤ 1 mA/≥ 4 mA
				550...1100 Ohm

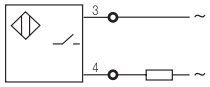
PNP



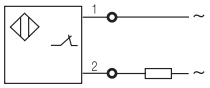
NPN



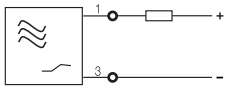
NO



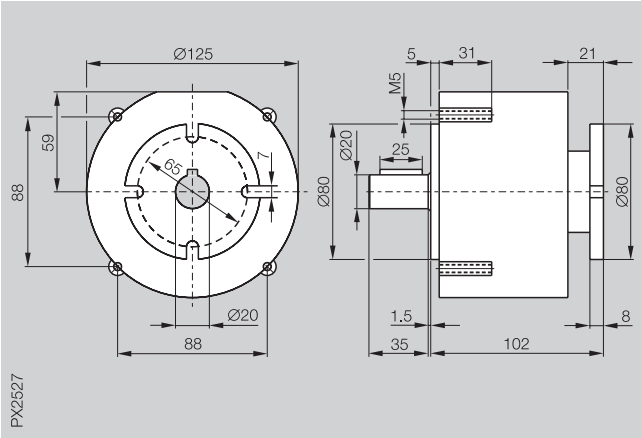
NC



NAMUR



Type	Step-up/step-down gear for rotary cam switches with shaft end L = 40 mm



Order code	BG-GV_ _	
	Step-down	Step-up
	3:1	1:3
	4:1	
	5:1	
	6:1	
	16:1	
	40:1	
	100:1	
	220:1	
	248:1	

Additional step-up and step-down ratios on request

The gear can be flanged directly to the rotary cam switch or installed between two rotary cam switches. The shaft end of the gear in the latter case is connected to the shaft end of the second rotary cam switch using a BSW 502-00-34 coupling.

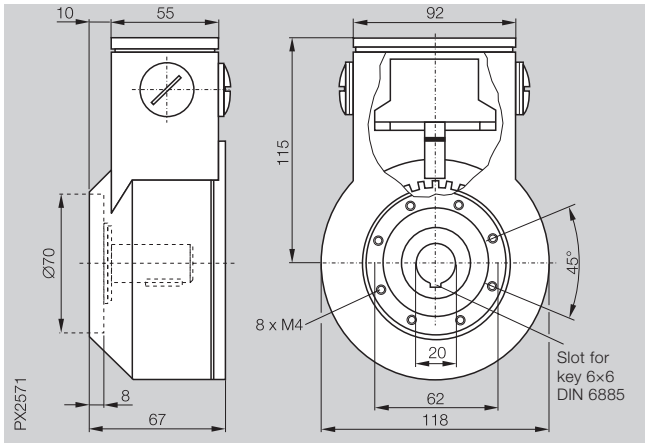
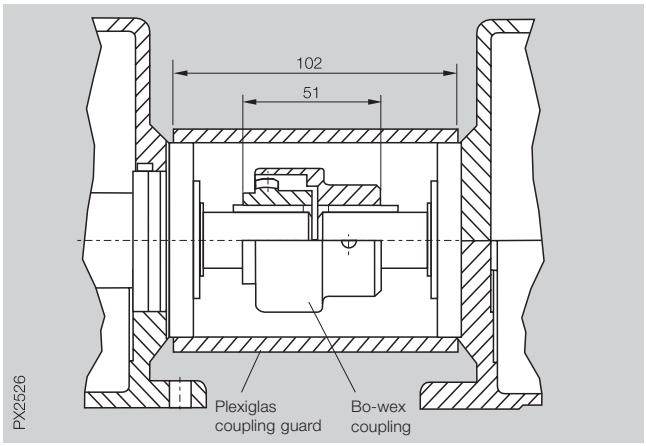
Install using adapter disc, order code 707505

Ordering examples:
BG-GV 1:3
BG-GV 16:1

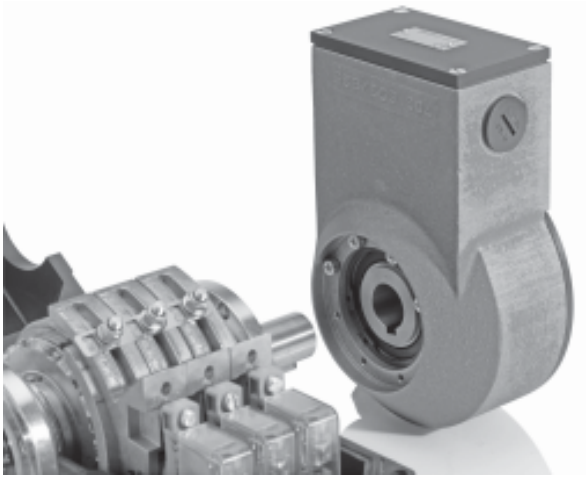
BG-GV _ _ /_ _

Gear

Step-up/ -down
see table

Type	Add-on unit for speed monitoring for rotary cam switches with shaft end L = 40 mm	Coupling for directly coupling rotary cam switches
		
Order code	BSW 502-00-46 with 1 switch position	BSW 502-00-34 for shaft end L = 40 mm BSW 502-00-24 for shaft end L = 20 mm
	Aluminum housing Components for pulse sensor (per switch position): Toothed disc with 30 teeth (30 pulses/revolution) Inductive switch element BES 517-110 (Code PA)	Suitable for directly coupling rotary cam switches, with Plexiglas coupling guard.

The external, retrofittable speed monitor is used for shaft break monitoring.
It is plugged into the right or left shaft end after the last switch position of the rotary cam switch as an additional switch position.
This enables a break to be detected even after the last switch position.



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