6. Safety sensors
Description

Area of application

In contrast to the electro-mechanical "type 2" - safety switches, safety sensors allow contactless position sensing of safety doors. This is for the benefit of machines, where it is likely to have a high amount of dust and contamination, and in hygiene-sensitive areas such as for machinery and equipment that are used to produce foodstuffs.

The foodstuff mechanical engineering industry was one of the first sectors to use safety solenoid switches instead of electromechanical safety switches, this was in the nineteen-eighties.

Meanwhile, the application area for safety sensors has significantly expanded. One reason for this is the wide range of products, that includes quite varied designs of safety-solenoid switches. In addition, there are series that are innovative and use the active principle for sensor target communication developed by Schmersal.

These series with the identifier CSS and RSS provide additional benefits such as increased tolerance against safety door offset, simplified safe signal evaluation and deployment of diagnostic-relevant information. Also the increased degree of protection against manipulation such as by individual coding is a motive for many mechanical engineers for the use of electronic safety sensors.

Design and way of functioning

Regardless of the mode of operation, the safety sensors each have a sensor and a target, that communicate with each other without making contact. If the sensor detects the target, the safety door and safety circuit are closed, and the machine can be started. Opening the safety door interrupts the safety circuit and the machine or the hazardous movement is safely shut down.

This basic principle is always the same. The method of detection for the various sensor families is however different.

Magnetic safety sensors BNS

The safety-solenoid switches of the BNS-series use the proven principle of safe magnet technology. These electromagnetic, electro-sensitive safety switchgear operate with two channels and are failsafe, as they have two safety contact paths. The combination and arrangement of the reed-tube in the sensor has the consequence that the sensor cannot be actuated with a conventional magnet, but only with the associated target. With this type of encoding a good protection against manipulation is ensured.

The BNS-sensors are compact and achieve high reacting distances. The sensors also act through plastic and stainless steel covers allowing a hidden installation. The user is on a wide program of different designs. The special features include sensors with stainless steel housing.

For evaluation, the electronic safety building blocks of the AES-series are used. The matched system of magnetic sensor and appropriate safety-oriented logic unit meets the requirements of the product standard EN 60947-5-3 for "Proximity switch with defined behaviour under fault conditions".

The magnetic-principle of the safety-oriented detectors of actuators is now being used with the safety door monitoring in integrated systems. The BNS-B20 series is an available system where the magnetic sensor is combined with the door handle and also includes the locking mechanism.

Electronic safety sensors CSS

As an alternative to the BNS - series is the electronic safety sensors of the CSS-series. Instead of the magnetic principle the Schmersal developed bi-directional "Coded Safety Sensor Technology (CSS) is used; this is based on the pulse-echo technique.

This principle makes very fast reactions possible. The CSS safety sensors are characterized by clean switching points and high noise immunity. The microprocessor technology enables the serial connection of up to 31 sensors on a common signal line in the "daisy chain" principle and their evaluation over a single safety relay component.

6. Safety sensors
Description

Electronic safety sensors CSS

The integrated electronics allow intelligent diagnostics, as well as simple and fast fault determination, such as with a cross-connection or a wiring fault. These non-safety-related signals can also be interfaced with the help of a SD interface with up to 31 integrated sensors and can be used with all common field bus protocols to transfer to a central control system.

Safety sensors of the CSS-series are available in cylindrical and rectangular form. The program also includes the CSS 34 F with integrated feedback circuit monitoring, which can be used without any additional safety relay module.

Electronic safety sensors RSS

The switching devices of the RSS-series are the most recent enlargement in the range of the electronic safety sensors for the Schmersal Group. The Schmersal developers successfully created a product using the RFID technology for safety oriented applications, which is frequently used in the industry.

The RFID-technology offers the advantage that the user can select from different types of coding. In the basic version the sensor accepts every suitable target. A second coded version reacts only with an individually assigned target. The teach-in process can be repeated indefinitely. Finally a third version is available that only accepts the target that was originally taught when first turned on.

Just like the CSS principle, the RSS safety sensor system is available in different designs, and is also integrated in other electronic designs of safety switchgear such as the solenoid interlock AZM 300.

CSS and RSS

A further advantage of the electronic sensors - this applies to the CSS and the RSS series – is that the designer in the selection of safety switchgear does not have to complete the entire procedure of the calculation or estimation of MTTFd - values according to EN ISO 13849-1, but with the risk assessment just simply has to use the manufacturers PFH values.

General Conclusion

All class 2 safety sensors shown in this section correspond to at least IP65 / IP67 protection type and can be used in conjunction with an appropriate safety relay module that reach the performance level d and e according to EN ISO 13849-1.

The requirements for such switching devices ("Proximity switch with defined behaviour under fault conditions") is described in the IEC 60947-5-3. In the classification according to the EN ISO 14119, the electromagnetic safety sensors of the BNS-series and the electronic safety sensors of the series CSS and RSS are coded, as well as the type 4-shift devices. he individual variants of the RSS series that can be coded are classified as high and thus particularly suitable for applications where the manipulation risk is high.

Included in the Schmersal Group safety sensor range includes versions with integrated AS-i SaW interface (AS-Interface Safety at Work). They take advantage of the simple and proven bus system based on the open standards AS-International and can be integrated over the appropriate system modules in parent communication networks ("Safety Integrated / Separated Safety").

Overview

Safety sensors		Refer to
BNS	Magnetic safety sensors	page 114
	Actuator and accessories	page 122
CSS / RSS	Electronic safety sensors	page 124
	Actuator and accessories	page 128

6. Safety sensors

BNS - Rectangular design - Overview of the series

	■ BNS 250	■ BNS 260	■ BNS 40S
Key Features			
	• Extremely compact design • Max. 3 contacts • Thermoplastic enclosure	• Extremely compact design • Max. 3 contacts • Thermoplastic enclosure	• Suitable for food processing industry • Max. 3 contacts • Stainless steel enclosure
Other versions			
ATEX / IECEx	■	–	■
AS-i SaW	–	■	–
Technical features			
Electrical characteristics			
Assured switching distance s_{ao}	4 mm	5 mm	8 mm
Assured switch-off distance s_{ar}	14 mm	15 mm	18 mm
Switching voltage without LED	max. 24 VDC	max. 75 VDC	max. 100 VAC/DC
with LED	max. 24 VDC	max. 24 VDC	max. 24 VDC
with connector	-	max. 30 VDC	-
Switching current without LED	max. 100 mA	max. 400 mA	max. 250 mA
with LED	max. 10 mA	max. 10 mA	max. 10 mA
Switching capacity without LED	max. 1 W	max. 10 VA	max. 3 W
with LED	max. 240 mW	max. 240 mW	max. 240 mW
Mechanical data			
Magnetic coding	■	■	■
Integrated evaluation	–	–	–
Connection	Cable	Cable or connector plug	Cable
Cable section	4 x 0.25 mm²; -2187: 6 x 0.25 mm²	4 x 0.25 mm²; -/01: 6 x 0.25 mm²	6 x 0.25 mm²
Dimensions (W x D x H)	33 x 13 x 25 mm	36 x 13 x 26 mm	88 x 14.5 x 27 mm
LED status display	–	■	■
Ambient conditions			
Ambient temperature	−25 °C … +70 °C	−25 °C … +70 °C	−25 °C … +80 °C
Protection class	IP67	IP67	IP69K
Safety classification			
Standards	EN ISO 13849-1	EN ISO 13849-1	EN ISO 13849-1
B_{10d} (NC / NO contact)	25,000,000	25,000,000	25,000,000
Certificates			

To get detailed information about the products and certificates, visit **www.schmersal.net**.

		
■ BNS 36	**■ BNS 16**	**■ BNS 333**
• High switching distance and offset possible • Max. 5 contacts • Thermoplastic enclosure	• Different approach possibilities • Max. 3 contacts • Thermoplastic enclosure	• Wiring compartment + integrated evaluation • 1 contact • Thermoplastic enclosure
–	–	–
■	■	–
7 mm; 10 mm (-2750)	8 mm	4 mm
17 mm; 20 mm (-2750)	18 mm	14 mm
max. 75 VDC	max. 100 VAC/DC	max. 250 VAC
max. 24 VDC	-	-
max. 30 VDC	-	-
max. 400 mA	max. 400 mA	max. 5 A
max. 10 mA	-	-
max. 10 VA	max. 10 W	max. 1250 W
max. 240 mW	-	-
■	■	■
–	–	■
Cable or connector plug	Screw terminal or connector plug	Screw terminals
4 x 0.25 mm²; -/01: 6 x 0.25 mm²	2 x 1.5 mm²	2 x 1.5 mm²
88 x 13 x 25 mm	52 x 39 x 90 mm	44 x 44 x 112 mm
■	–	■
−25 °C … +70 °C	−25 °C … +70 °C	−25 °C … +55 °C
IP67	IP67	IP65
EN ISO 13849-1	EN ISO 13849-1	EN ISO 13849-1 [1)]
25,000,000	25,000,000	20,000,000

[1)] Performance Level: PL c

6. Safety sensors

BNS - Rectangular design - Preferred types

Series	Design	Housing material	Sao/Sar	Actuator	Integr. evaluation	Contacts
BNS 250		Thermoplastic	4 / 14	BPS 250		1 NO / 1 NC
						1 NO / 2 NC
BNS 260		Thermoplastic	5 / 15	BPS 260-1 BPS 260-2		1 NO / 1 NC
						1 NO / 1 NC + signalling contact 1 NC
						2 NC
						2 NC + signalling contact 1 NC
BNS 40S		Stainless steel	8 / 18	BPS 40S-1 BPS 40S-2 BPS 40S-1-C BPS 40S-2-C		1 NO / 2 NC
BNS 16		Thermoplastic	8 / 18	BPS 16		1 NO / 2 NC
BNS 36		Thermoplastic	7 / 17	BPS 36-1 BPS 36-2		2 NC contact
						2 NC + signalling contact 1 NC
						1 NO / 2 NC
						1 NO / 2 NC + signalling contact 1 NC
BNS 333		Thermoplastic	4 / 14	BPS 300 BPS 303 BPS 303SS	■	1 NC

Actuators should be ordered separately. A selection can be found on page 122.
Information for the selection of suitable safety relay modules AES can be found in the chapter "Safety relay modules" (refer to page 216).

	Connection	LED available	Description	Type designation	Material number
	Cable		---	BNS 250-11Z	101120670
		■		BNS 250-11ZG	101120671
				BNS 250-12Z	101123071
		■		BNS 250-12ZG	101123072
	Cable			BNS 260-11Z-L	101184387
				BNS 260-11Z-R	101184371
	Connector plug			BNS 260-11Z-ST-L	101184379
				BNS 260-11Z-ST-R	101184363
		■		BNS 260-11ZG-ST-L	101184383
				BNS 260-11ZG-ST-R	101184367
				BNS 260-11/01Z-ST-R	101184364
		■		BNS 260-11/01ZG-ST-L	101184384
				BNS 260-02Z-ST-L	101184377
		■		BNS 260-02ZG-ST-R	101184365
	Cable			BNS 260-02/01Z-L	101184386
	Connector plug			BNS 260-02/01Z-ST-R	101184362
	Cable		Continuous threaded holes	BNS 40S-12Z	101215517
		■		BNS 40S-12ZG	101215516
			Hidden, rear-side threads	BNS 40S-12Z-C	101215518
		■		BNS 40S-12ZG-C	101215515
	Screw terminals		Actuating planes cover-side	BNS 16-12ZD	101172563
			Actuating planes left-hand side	BNS 16-12ZL	101172554
			Actuating planes right-hand side	BNS 16-12ZR	101172556
			Actuating planes bottom	BNS 16-12ZU	101172565
			Actuating planes front side	BNS 16-12ZV	101172553
	Cable			BNS 36-02Z-R	101193132
		■		BNS 36-02ZG-R	101190050
	Connector plug			BNS 36-02Z-ST-L	101193156
		■		BNS 36-02ZG-ST-R	101193168
				BNS 36-02/01Z-ST-L	101193249
				BNS 36-02/01Z-ST-R	101190024
	Cable			BNS 36-11Z-L	101193125
		■		BNS 36-11ZG-R	101193143
	Connector plug			BNS 36-11Z-ST-L	101193148
		■		BNS 36-11ZG-ST-R	101193158
	Cable			BNS 36-11/01Z-R	101190042
		■		BNS 36-11/01ZG-R	101193177
	Connector plug			BNS 36-11/01Z-ST-L	101193236
		■		BNS 36-11/01ZG-ST-R	101193254
	Screw terminals	■	Actuating planes cover-side	BNS 333-01YD	101169806
			Actuating planes front side	BNS 333-01YV	101169803

 Line and connector outlet on the right

 Line and connector outlet on the left

6. Safety sensors

BNS - Cylindrical and miscellaneous design - Overview of the series



	■ BNS 120	■ BNS 180	■ BNS 303
Key Features			
	• Cylind. design M12 • Max. 3 contacts • Thermoplastic encl.	• Cylind. design M18 • Max. 3 contacts • Thermoplastic encl.	• Cylind. design M30 • Max. 3 contacts • Thermoplastic encl.
Other versions			
ATEX / IECEx	■	■	■
AS-i SaW	–	–	–
Technical features			
Electrical characteristics			
Assured switching distance s_{ao}	10 mm (BP 6/BP 8); 20 mm (BP 10/15 SS)	10 mm (BP 6/BP 8); 20 mm (BP 10/15 SS)	5 mm; 8 mm (-2211)
Assured switch-off distance s_{ar}	22 mm (BP 6/BP 8); 32 mm (BP 10/15 SS)	22 mm (BP 6/BP 8); 32 mm (BP 10/15 SS)	15 mm; 18 mm (-2211)
Switching voltage without LED	max. 100 VAC/DC	max. 100 VAC/DC	max. 100 VAC/DC
with LED	–	–	max. 24 VDC
with connector	–	–	max. 100 VAC/DC
Switching current without LED	max. 250 mA	max. 250 mA	max. 400 mA
with LED	–	–	max. 10 mA
suffix -03Z	–	–	max. 250 mA
Switching capacity without LED	-02z: max. 3 W; -11z, -12z: max. 5 W	-02z: max. 3 W; -11z, -12z: max. 5 W	max. 10 W
with LED	–	–	max. 240 mW
Mechanical data			
Magnetic coding	–	–	■
Integrated evaluation	–	–	–
Connection	Cable	Cable	Cable or connector plug
Cable section	4 x 0.25 mm²	4 x 0.25 mm²	4 x 0.25 mm²
Dimensions (W x D x H)	M12 x 38.5 mm	M18 x 36 mm	M30 x 44 mm
Mounting hole	M12	M18	M30
LED status display	–	–	■
Ambient conditions			
Ambient temperature	−25 °C … +70 °C	−25 °C … +70 °C	−25 °C … +70 °C
Protection class	IP67	IP67	IP67
Safety classification			
Standards	EN ISO 13849-1	EN ISO 13849-1	EN ISO 13849-1
B_{10d} (NC / NO contact)	25,000,000	25,000,000	25,000,000
Certificates			

To get detailed information about the products and certificates, visit **www.schmersal.net**.

		
■ BNS 300	**■ BNS 30**	**■ BNS-B20**
• Cylind. design M30 • Integrated evaluation • 1 contact • Thermoplastic encl.	• Cylind. design M30 • Integrated evaluation • 1 contact • Metal enclosure	• Door handle actuator • Latching force 100 N • Max. 3 contacts • Thermoplastic encl.
–	–	–
–	–	–
5 mm; 8 mm (-2211)	5 mm; 8 mm (-2211, -2334)	0 mm
15 mm; 18 mm (-2211)	15 mm; 18 mm (-2211, -2334)	22 mm
max. 250 VAC	max. 250 VAC	max. 110 VAC/DC
–	max. 250 VAC	max. 24 VDC
–	–	max. 24 VDC
max. 3 A	max. 3 A	max. 250 mA
–	max. 3 A	max. 10 mA
–	–	–
max. 750 W	max. 750 W	max. 3 W
–	max. 750 W	max. 240 mW
■	■	■
■	■	–
Cable or connector plug	Cable or connector plug	Cable or connector plug
4 x 0.75 mm²	4 x 0.75 mm²	6 x 0.25 mm²
M30 x 78 mm	M30 x 78 mm	119.5 x 43.3 x 140 mm
M30	M30	–
■	■	■
−25 °C … +55 °C	−25 °C … +55 °C	−25 °C … +70 °C
IP67	IP67	IP67
EN ISO 13849-1 [1]	EN ISO 13849-1 [1]	EN ISO 13849-1
20,000,000	20,000,000	25,000,000

[1] Performance Level: PL c

6. Safety sensors

BNS - Cylindrical and miscellaneous design - Preferred types

Series	Design	Housing material	Sao/Sar	Actuator	Integr. evaluation	Contacts
BNS 120		Thermoplastic	10 / 22 mm 20 / 32 mm	BP 6 / BP 8 BP 10/15SS		2 NC contact 1 NO / 1 NC
BNS 180		Thermoplastic	10 / 22 mm 20 / 32 mm	BP 6 / BP 8 BP 10/15SS		2 NC contact 1 NO / 1 NC
BNS 303		Thermoplastic	5 / 15 mm 8 / 18 mm	BPS 300 BPS 303 BPS 303SS		1 NO / 1 NC
BNS 300		Thermoplastic	5 / 15 mm 8 / 18 mm	BPS 300 BPS 303 BPS 303SS	■	1 NC contact
BNS 30		Metal	8 / 18 mm	BPS 300 BPS 303 BPS 303SS	■	1 NC contact
BNS-B20		Thermoplastic	0 / 22 mm	BNS-B20-B01		1 NO / 2 NC

Actuators should be ordered separately. A selection can be found on page 122.
Information for the selection of suitable safety relay modules AES can be found in the chapter "Safety relay modules" (refer to page 216).

	Connection	LED available	Description	Type designation	Material number
	Cable		---	**BNS 120-02Z**	**101144422**
				BNS 120-11Z	**101128296**
	Cable		---	**BNS 180-02Z**	**101133009**
				BNS 180-11Z	**101120933**
	Cable		---	**BNS 303-11Z**	**101115682**
		■		**BNS 303-11ZG**	**101138262**
	Connector plug			**BNS 303-11ZG-ST**	**101174794**
				BNS 303-11ZG-ST-2211	**101194346**
	Cable	■	---	**BNS 300-01ZG**	**101110514**
	Connector plug			**BNS 300-01ZG-ST**	**101144214**
				BNS 300-01ZG-ST-2211	**101186264**
	Cable	■	Increased switching distance	**BNS 30-01ZG-2211**	**101166315**
	Connector plug			**BNS 30-01Z-ST-2211**	**101181851**
	Cable		Door hinge on the right-hand side	**BNS-B20-12Z-R**	**101186267**
	Connector plug		Door hinge on the left-hand side	**BNS-B20-12Z-ST-L**	**101186261**
			Door hinge on the right-hand side	**BNS-B20-12Z-ST-R**	**101186260**
		■	Door hinge on the left-hand side	**BNS-B20-12ZG-ST-L**	**101177733**
			Door hinge on the right-hand side	**BNS-B20-12ZG-ST-R**	**101177734**

6. Safety sensors

BNS - Actuator and accessories

BPS 250 — 101120594

- Actuator for BNS 250
- Thermoplastic enclosure

Spacer BNS 250 — 101131223

- Thermoplastic enclosure
- To mount the magnetic safety sensor and actuator on ferromagnetic material

BPS 260-.

- Actuator and sensor on a mounting level:
  BPS 260-1 **101184395**
- Actuator 90° attached to the sensor:
  BPS 260-2 **101184396**

Spacer BNS 260 — 101184643

- Thermoplastic enclosure
- To mount the magnetic safety sensor and actuator on ferromagnetic material

BPS 40S-.

- Actuator for BNS 40S
- Actuator and sensor on a mounting level:
  BPS 40S-1 **101215268**
- Actuator 90° attached to the sensor:
  BPS 40S-2 **101215269**

BPS 40S-.-C

- Actuator for BNS 40S-...-C
- Actuator and sensor on a mounting level:
  BPS 40S-1-C **101215266**
- Actuator 90° attached to the sensor:
  BPS 40S-2-C **101215267**

BPS 16 — 101172566

- Actuator for BNS 16
- Thermoplastic enclosure

BPS 36-.

- Actuator and sensor on a mounting level:
  BPS 36-1 **101190052**
- Actuator 90° attached to the sensor:
  BPS 36-2 **101191859**

Spacer BNS 36 — 101188624

- Thermoplastic enclosure
- To mount the magnetic safety sensor and actuator on ferromagnetic material

Detailed information for the selection of actuators and accessories can be found at **www.schmersal.net**.

6. Safety sensors

BNS - Actuator and accessories

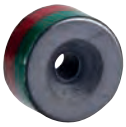
BP 6 — 101091837

- Actuator, unenclosed
- S-pole marked red
- Not coded

BP 8 — 101054816

- Actuator, unenclosed
- S-pole marked red
- Not coded

BP 10 — 101057531



- Actuator, unenclosed
- Colour coding of poles by labels
- Not coded

BP 15 SS — 101139818

- Actuator, stainless steel
- Suitable for food processing industry
- Not coded

BPS 300 — 101113734

- Actuator, with plastic enclosure

BPS 303 — 101117076

- Actuator, with plastic enclosure
- Suitable for food processing industry

BPS 303 SS — 101141156

- Actuator, stainless steel
- Suitable for food processing industry

BNS-B20-B01 — 101177737

- Actuator for BNS-B20
- Order the door handle actuator separately.
- Thermoplastic enclosure

AES

- Information for the selection of suitable safety relay modules AES can be found in the chapter "Safety relay modules" (refer to page 216).

Detailed information for the selection of actuators and accessories can be found at **www.schmersal.net**.

6. Safety sensors

RSS/CSS - Overview of the series

	■ RSS 16	■ RSS 36	■ RSS 260
Key Features			
	• Three actuating directions • Door stop with magnetic latching • Thermoplastic encl.	• As end stop with magnetic latching • Thermoplastic enclosure	• Extremely compact design • Thermoplastic enclosure
Other versions			
ATEX / IECEx	–	–	–
AS-i SaW	–	■	–
Technical features			
Electrical characteristics			
Assured switching distance s_{ao}	12 mm, with latching: 5 mm	10 mm	From front 10 mm, lateral 6 mm
Assured switch-off distance s_{ar}	30 mm	16 mm	From front 18 mm, lateral 15 mm
Number of outputs	2x OSSD, 1x Diagnostic	2x OSSD, 1x Diagnostic	2x OSSD, 1x Diagnostic
Operating voltage	24 VDC (PELV)	24 VDC (PELV)	24 VDC (PELV)
Power consumption	< 0.1 A without load	< 0,1 A without load	< 0,1 A without load
Max. switching capacity U/I	24 VDC / 1 A	24 VDC / 250 mA	24 VDC / 250 mA
Mechanical data			
Individual coding possible	■	■	■
Serial diagnostic	■	■	■
Connection	Connector plug, cage clamps, screw terminals	Cable or connector plug	Connector plug
Cable section	–	0.35 mm²	0.14 mm²
Dimensions (W x D x H)	52 x 91 x 30 mm	106.3 x 25 x 22 mm	40 x 18 x 29.5 mm
LED status display	■	■	■
Ambient conditions			
Ambient temperature	−25 °C … +70 °C	−25 °C … +70 °C	−25 °C … max. +65 °C
Protection class	IP65 / IP66 / IP67	IP65 / IP67; Connector plug: IP69K	IP65 / IP67
Safety classification			
Standards	EN ISO 13849-1, IEC 61508, IEC 62061	EN ISO 13849-1, IEC 61508, IEC 62061	EN ISO 13849-1, IEC 61508, IEC 62061
PL[1)]	e	e	e
Category[1)]	4	4	4
PFH-value	6.3 x 10^{-11}/h	2.7 x 10^{-10}/h	6.8 x 10^{-10}/h
SIL[1)]	3	3	3
Certificates	TÜV cULus EAC	TÜV cULus EAC	TÜV cULus EAC

To get detailed information about the products and certificates, visit **www.schmersal.net**.

				
■ CSS 30	**■ CSS 30S**	**■ CSS 300**	**■ CSS 34**	**■ CSS 180**
• High switching distance • Cylind. design M30 • Metal enclosure	• Functions through stainless steel • Cylind. design M30 • Stainless steel encl.	• Functions through stainless steel • Cylind. design M30 • Thermoplastic encl.	• CSS 34 F with integrated feedback-loop monitoring saves on safety evaluation • Thermoplastic encl.	• Cylind. design M18 • Thermoplastic enclosure
–	–	–	–	■
–	–	–	–	–
CST 30-1: 12 mm; CST 34-S-3: 10 mm	8 mm	8 mm	depending actuator, see table page 130	7 mm
CST 30-1: 19 mm; CST 34-S-3: 16 mm	15 mm	15 mm	depending actuator, see table page 130	10 mm
2x OSSD, 1x Diagnostic	2x OSSD, 1x Diagnostic	2x OSSD, 1x Diagnostic	2x OSSD, 1x Diagnostic	2x OSSD, 1x Diagnostic
24 VDC (PELV)	24 VDC (PELV)	24 VDC (PELV)	24 VDC (PELV)	24 VDC (PELV)
< 0,1 A without load	< 0,1 A without load	< 0,1 A without load	< 0,1 A without load	< 0,1 A without load
24 VDC / 500 mA	24 VDC / 250 mA	24 VDC / 250 mA	24 VDC / 250 mA	24 VDC / 500 mA
–	–	–	–	–
–	■	■	■	–
Cable	Connector plug	Connector plug	Cable or connector plug	Cable or cable with connector plug or connector plug
0.25 mm²	–	–	0.35 mm²	0.25 … 0.5 mm²
Ø M30	Ø M30	Ø M30	27 x 108.2 x 35 mm	Ø M18
■	■	■	■	■
−25 °C … max. +70 °C	−25 °C … +65 °C	−25 °C … +60 °C	−25 °C … max. +70 °C	−25 °C … max. +70 °C
IP65 / IP67	IP65 / IP67 / IP68; IP69K	IP65 / IP67	IP65 / IP67	IP65 / IP67
EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
e	e	e	e	e
4	4	4	4	4
2.5 x 10^{-9}/h	3.6 x 10^{-9}/h	3.6 x 10^{-9}/h	3.6 x 10^{-9}/h	2.5 x 10^{-9}/h
3	3	3	3	3

[1] Also with series-wiring

6. Safety sensors

RSS/CSS - Preferred types

Series	Design	Housing material	Sao/Sar	Actuator	Actuation direction
RSS 16		Thermoplastic	12 / 30	RST-16-1 RST 16-1-R RST-U-2	From head From top From below
RSS 36		Thermoplastic	10 / 16	RST 36-1 RST 36-1-R RST 16-1 RST-U-2	From side
RSS 260		Thermoplastic	10 / 18	RST 260-1 RST 16-1 RST-U-2	From side
CSS 30		Metal	12 / 19	CST 30-1 CST 34-S-3	From head
CSS 30S		Metal	8 / 15	CST 30S-1	
CSS 300		Thermoplastic	8 / 15	CST 30S-1	
CSS 34		Thermoplastic	depending on the actuator, see table page 130	CST 34-S-1 CST 34-S-2 CST 34-S-3 CST 34-V-1 CST 180-1 CST 180-2	From head From side
CSS 180		Thermoplastic	7 / 10	CST 180-1 CST 180-2	From head

Actuators should be ordered separately. A selection can be found on page 128.

	Safety output	Diagnostic	Connection	Type designation	Material number
	2 p-type, short-circuit proof safety outputs	Conventional	Connector plug	RSS16-D-R-ST8H	103004338
				RSS16-D-ST8H	103004370
				RSS16-I2-D-R-ST8H	103004367
		Serial		RSS16-SD-ST8H	103006685
		Conventional	Cage clamps	RSS16-D-CC	103004372
				RSS16-D-R-CC	103004365
			Screw connection	RSS16-D-R-SK	103004341
	2 p-type, short-circuit proof safety outputs	Conventional	Cable [1]	RSS 36-D	101213955
				RSS 36-D-R	101213959
			Connector plug	RSS 36-D-ST	101213954
				RSS 36-I1-D-R-ST	101216957
				RSS 36-I1-D-ST	101216958
				RSS 36-I2-D-R-ST	101214773
				RSS 36-I2-D-ST	101216956
		Serial		RSS 36-SD-ST	101214772
	2 p-type, short-circuit proof safety outputs	Conventional	Connector plug	RSS260-D-ST	103003602
				RSS260-I1-D-ST	103003606
				RSS260-I2-D-ST	103003607
		Serial		RSS260-SD-ST	103003605
	2 p-type, short-circuit proof safety outputs	Conventional	Cable [1]	CSS 15-30-2P+D-M-L	101209841
			Connector plug	CSS 11-30S-D-M-ST	101204612
		Serial		CSS 11-30S-SD-M-ST	101204613
		Conventional	Connector plug	CSS 11-300-D-M-ST	101213904
		Serial		CSS 11-300-SD-M-ST	101213905
	2 p-type, short-circuit proof safety outputs	Conventional	Cable [1]	CSS 12-34-V-D-M-L	101181060
			Connector plug	CSS 12-34-V-D-M-ST	101181065
		Serial	Cable [1]	CSS 12-34-V-SD-M-L	101181062
			Connector plug	CSS 12-34-V-SD-M-ST	101181067
		Conventional		CSS 12-34F0-V-D-M-ST	101189088
				CSS 12-34F1-V-D-M-ST	101188768
			Cable [1]	CSS 14-34-S-D-M-L	101181059
			Connector plug	CSS 14-34-S-D-M-ST	101181063
		Serial	Cable [1]	CSS 14-34-S-SD-M-L	101181061
			Connector plug	CSS 14-34-S-SD-M-ST	101181066
		Conventional		CSS 14-34F0-S-D-M-ST	101188767
				CSS 14-34F1-S-D-M-ST	101189087
	2 p-type, short-circuit proof safety outputs	Without	Cable [1]	CSS 8-180-2P-E-L	101167896
			Cable [1] with connector	CSS 8-180-2P-E-LST	101167897
			Cable [1]	CSS 8-180-2P-Y-L	101165294
			Cable [1] with connector	CSS 8-180-2P-Y-LST	101167898
		Conventional	Cable [1]	CSS 8-180-2P+D-E-L	101169552
			Cable [1] with connector	CSS 8-180-2P+D-E-LST	101169553
			Cable [1]	CSS 8-180-2P+D-M-L	101169558
			Cable [1] with connector	CSS 8-180-2P+D-M-LST	101169560
			Connector plug	CSS 8-180-2P+D-M-ST	101209595

[1] Standard cable length 2 m; other lengths upon request

6. Safety sensors

RSS/CSS - Actuator and accessories

RST 16-1 — 103004336

- Flat actuator for RSS 16, RSS 36 and RSS 260
- Thermoplastic enclosure

RST16-1-R — 103004337

- Actuator with latching function for RSS 16-…-R
- Plastic and stainless steel enclosure

RST 36-.

- Actuator for RSS 36
  RST 36-1 **101213820**
- Actuator with latching magnet:
  RST 36-1-R **101213821**

ACC RSS 36-SK — 101215048

- Sealing kit for RSS 36
- To seal the mounting holes and as spacer

RST 260-1 — 103004318

- Actuator for RSS 260
- Thermoplastic enclosure

RST-U-2 — 103005994

- Small actuator for RSS 16, RSS 36 and RSS 260
- Thermoplastic enclosure

CST 34-S-1 — 101181085

- Actuator for CSS 34
- Thermoplastic enclosure
- Lateral active surface (type plate)

CST 34-S-2 — 101196101

- Actuator for CSS 34
- Thermoplastic enclosure
- Actuator with double solenoid, for increased misalignment
- Lateral active surface (type plate)

CST 34-V-1 — 101181429

- Actuator for CSS 34
- Thermoplastic enclosure
- Frontal active surface (blue clamp)

Detailed information for the selection of actuators and accessories can be found at **www.schmersal.net**.

6. Safety sensors

RSS/CSS - Actuator and accessories

CST 34-S-3 — 101203434

- Small actuator for CSS 34 and CSS 30
- Thermoplastic enclosure

CST 30-1 — 101209887

- Actuator for CSS 30
- Thermoplastic enclosure M30

CST 30S-1 — 101193607

- Actuator for CSS 30S and CSS 300
- Stainless steel enclosure M30

CST 180-1 — 101177198

- Actuator for CSS 180 and CSS 34
- Plastic housing with cross borehole
- Incl. H18 clamp

CST 180-2 — 101179574

- Actuator for CSS 180 and CSS 34
- Thermoplastic enclosure M18
- Without clamp

CSA-M-1 — 101173457

- Magnetic snap lock
- For play-free interlocking of light guards

H 30 — 101068520

- Clamp for CSS 30, 30S and 300
- For a smooth fitting of the safety sensors with cylindrical shape Ø 30

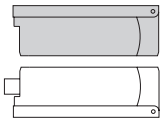
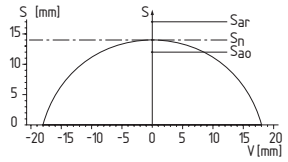
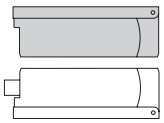
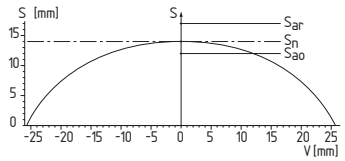
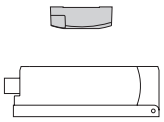
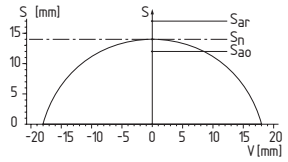
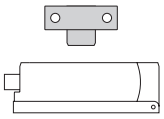
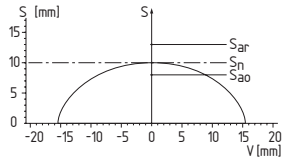
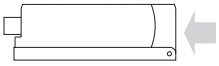
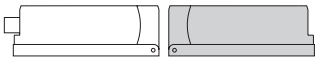
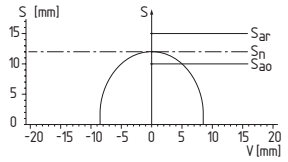
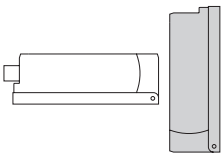
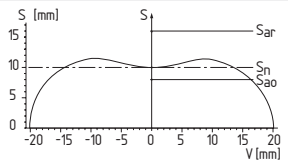
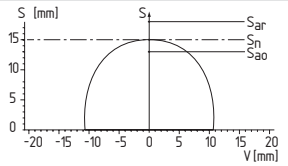
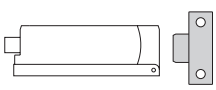
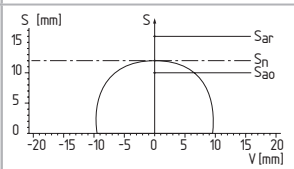
H 18 — 101068879

- Clamp for CSS 180
- For a smooth fitting of the safety sensors with cylindrical shape Ø 18

Detailed information for the selection of actuators and accessories can be found at **www.schmersal.net**.

6. Safety sensors

CSS 34 - Actuator-Overview

Safety sensor	Actuator	Actuation	Switching distances to IEC 60947-5-3:		
Lateral actuation  CSS 14-34-S …	CST 34-S-1 		S_n S_{ao} S_{ar}	14 mm 12 mm 17 mm	
	CST 34-S-2 		S_n S_{ao} S_{ar}	14 mm 12 mm 17 mm	
	CST 34-S-3 		S_n S_{ao} S_{ar}	14 mm 12 mm 17 mm	
	CST 180-1 / CST 180-2 		S_n S_{ao} S_{ar}	10 mm 8 mm 13 mm	
Actuation from front  CSS 12-34-V …	CST 34-V-1 		S_n S_{ao} S_{ar}	12 mm 10 mm 15 mm	
	CST 34-S-2 		S_n S_{ao} S_{ar}	10 mm 8 mm 16 mm	
	CST 34-S-3 		S_n S_{ao} S_{ar}	15 mm 13 mm 18 mm	
	CST 180-1 / CST 180-2 		S_n S_{ao} S_{ar}	12 mm 10 mm 16 mm	

6. Safety sensors

Series-wiring with serial diagnostic function - Accessories

SD-I-DP-V0-2 101192805

- Profibus gateway
- Interface: 9-pole SUB-D connector, default profibus connection (DP-A, DP-B, 5V, GND)

SD-I-U-PN 101210918

- UNIVERSAL gateway
- Field bus interface: PROFINET IO
- Further interfaces: EtherNet IP, CC-Link, DeviceNet, CANopen, Modbus/TCP

CSS-T 101190026

- T-adapter
- 1 connector, 5-pole; 2 couplings, 5- and 8-pole
- M12 screw locking

CSS-T-A 101190025

- Terminating plug for T-adapter
- 1 connector, 5-pole
- M12 screw locking

CSS-Y-8P 101209416

- Y-adapter
- 2 couplings, 8-pole; 1 connector, 8-pole
- M12 screw locking

CSS-Y-A-8P 101209414

- Terminating plug for Y-adapter
- 1 connector, 8-pole
- M12 screw locking