

# Limit Switches according to EN 50041

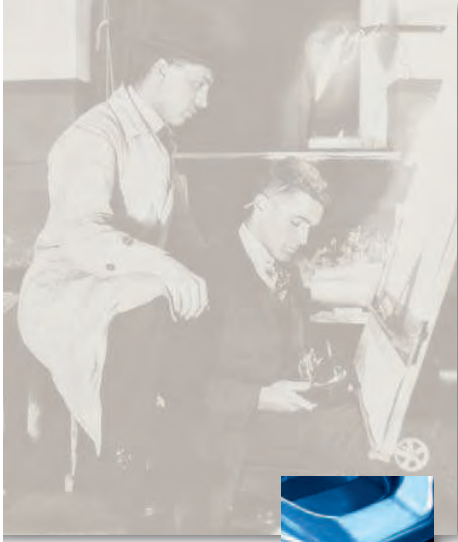


More than safety.



**EUCHNER**

# More than safety.



Emil Euchner, the company's founder and inventor of the multiple limit switch, circa 1928.



## Around the world – the Swabian specialists in motion sequence control for mechanical and systems engineering.

EUCHNER's history began in 1940 with the establishment of an engineering office by Emil Euchner. Since that time, EUCHNER has been involved in the design and development of switchgear for controlling a wide variety of motion sequences in mechanical and systems engineering. In 1953, Emil Euchner founded EUCHNER + Co., a milestone in the company's history. In 1952, he developed the first multiple limit switch – to this day a symbol of the enterprising spirit of this family-owned company.

## Automation – Safety – ManMachine

Today, our products range from electromechanical and electronic components to complex system solutions. With this wide range of products we can provide the necessary technologies to offer the right solution for special requirements – regardless of whether these relate to reliable and precise positioning or to components and systems for safety engineering in the automation sector.

EUCHNER products are sold through a world-wide sales network of competent partners. With our closeness to the customer and the guarantee of reliable solutions throughout the globe, we enjoy the confidence of customers all over the world.

## Quality, reliability, precision

Quality, reliability and precision are the hallmarks of our corporate philosophy. They represent concepts and values to which we feel totally committed.

At EUCHNER, quality means that all our employees take personal responsibility for the company as a whole and, in particular, for their own field of work. This individual commitment to perfection results in products which are ideally tailored to the customers' needs and the requirements of the market. After all: our customers and their needs are the focus of all our efforts. Through efficient and effective use of resources, the promotion of personal initiative and courage in finding unusual solutions to the benefit of our customers, we ensure a high level of customer satisfaction. We familiarize ourselves with their needs, requirements and products and we learn from the experiences of our customers' own customers.

## EUCHNER – More than safety.



Quality – made by EUCHNER

## Limit switches according to EN 50041

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## Introduction

### EUCHNER limit switches - precise, reliable and versatile

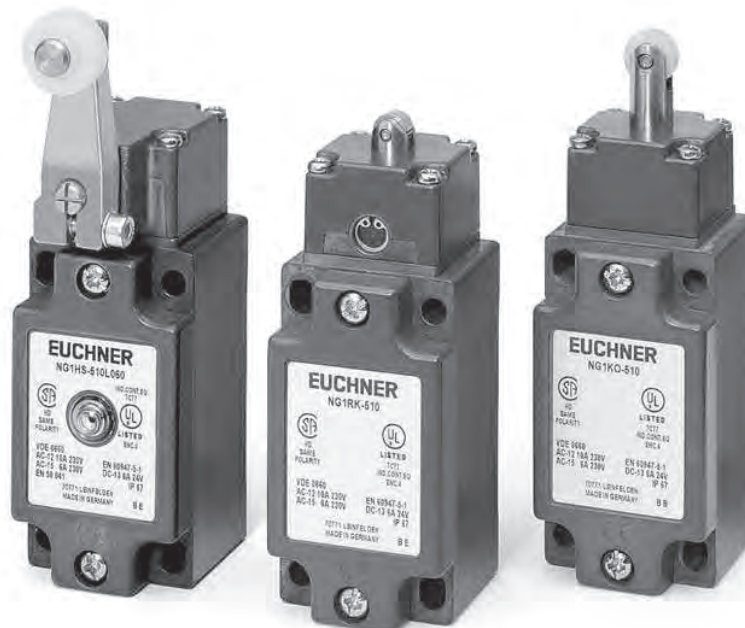
EUCHNER limit switches are manufactured in accordance with the European standard EN 50041. Robust construction and the use of high quality corrosion resistant materials, precision finishing and degree of protection IP 67 according to IEC 60529 guarantee trouble-free and reliable operation under the toughest conditions.

### Approvals for type series NG ...



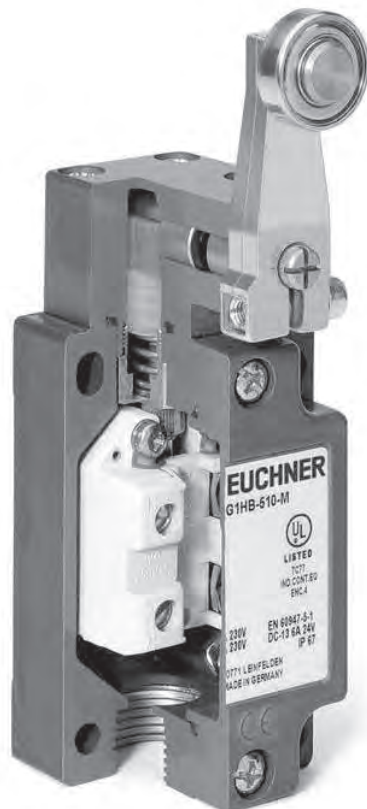
Various EUCHNER limit switch designs can be used as safety switches with certain switching elements whose NC contacts are positively opened by a rigid plunger, even if the switching element is damaged due to a broken spring or contact weld. Limit switches with direct opening action contacts are used in those cases where a guarantee of machine and/or human safety is absolutely essential. Example: End travel limit switching or an EMERGENCY STOP.

### Approvals for type series NZ ...

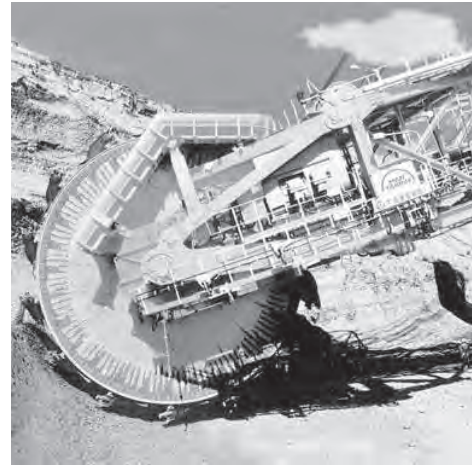


## EUCHNER limit switches offer important advantages and special features

- ▶ Housing and cover made of robust die-cast aluminum.
- ▶ Actuation heads can be adjusted 4 x 90°, lever arm can be adjusted and fixed either continuously or 4 x 90°
- ▶ Switching elements with 2 or 4 contacts (e.g. 2 direct opening action contacts + 2 NO contacts), silver alloy contacts, gold flashed
- ▶ Cable entry M 20x1.5 or plug connection
- ▶ Mechanical service life up to 30 million operating cycles
- ▶ Degree of protection according to IEC 60529 IP 67
- ▶ High switching accuracy up to  $\pm 0.002$  mm
- ▶ Use of silicone-free lubricants
- ▶ Diaphragm seal and cover seal made of NBR plastic (acrylonitrile rubber) to protect the switching chamber against coolants and lubricants
- ▶ High flexibility is guaranteed by the optional LED function display, plug connector and multiple adjustability



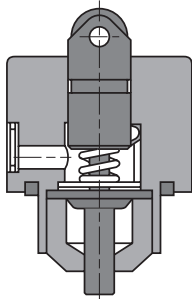
Typical applications for type series NG... and NZ... limit switches



## Limit switch in detail

### Plunger actuation

The plunger actuated versions allow the user a choice of 6 different designs. The stainless steel hardened standard plunger with telescopic action (safety limit switches with direct opening action contacts have rigid plungers) is precisely guided within the anodized die-cast alloy head, and is almost maintenance free. The approach direction of the actuator head can be easily changed by 90°.



### The diaphragm seal

In switches with plunger actuation, the plunger chamber and the switch chamber are separated by a diaphragm seal made of NBR (acrylonitrile rubber). Because of their outstanding technical properties, NBR materials are used wherever possible for all mechanical and system engineering applications.

The seal is firmly fixed to the plunger, and after each switching operation it is returned to the initial position by the plunger return spring and not by the switching element.

Any build-up of pressure during plunger actuation is reliably prevented by a relief valve.

The switching element is actuated by means of a metal cap pressed onto the seal.

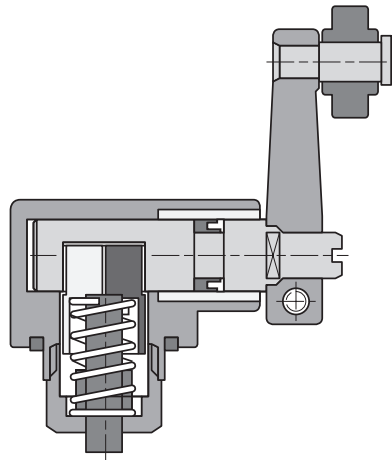
Switching point displacement (a logical consequence due to the high elasticity of the seal) is therefore completely eliminated.

### Lever-arm actuation

Different types of actuators may be used for lever-arm actuation. The stainless steel shaft is guided precisely through the housing.

With the numerous adjusting options a high degree of flexibility is given:

- ▶ Approach direction adjustable by 4 x 90°
- ▶ Actuator direction for lever-arm actuation adjustable by 4 x 90°
- ▶ Switches to the left, or to the right, or on both sides



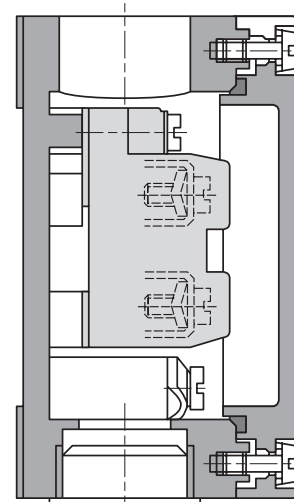
### The edge seal

In lever-arm actuated switches, an edge seal protects the actuating mechanism and the switch chamber against dirt and dust. The edge seal, which is made of NBR, is resistant to all known coolants and lubricants.

### The housing

With their robust design, the die-cast alloy housings have proven themselves highly resistant to corrosion even under the toughest conditions.

Either the M20 x 1.5 cable gland or the pre-wired plug connector (straight or angled) may be used for the cable. The angled plug connector can be adjusted in 7 directions around the longitudinal axis of the switch.



### Cable connections

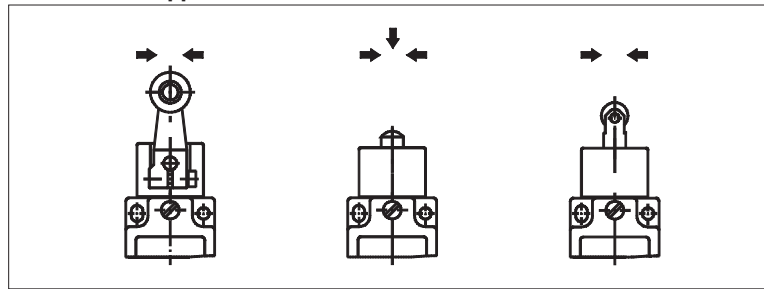
Before delivery to the customer, EUCHNER limit switches according to EN 50041 undergo routine check tests for compliance with degree of protection IP 67. In order to obtain this degree of protection, only high-quality metal cable glands with captive sealing rings or the pre-wired straight or angled plug connector must be used.

### Function display

Limit switches may be fitted with an LED on request. Voltage ranges of 10 to 60 V AC/DC, 110 V AC and 230 V AC are available.

## Adjustment options

### Actuator and approach directions



Lever arm  
 HS = steel roller      WO = domed plunger      RG = plastic roller  
 HB = plastic roller      KO = ball plunger      RS, RK, RL = steel roller

The large selection of actuator heads guarantees maximum flexibility and is suitable for a variety of applications.

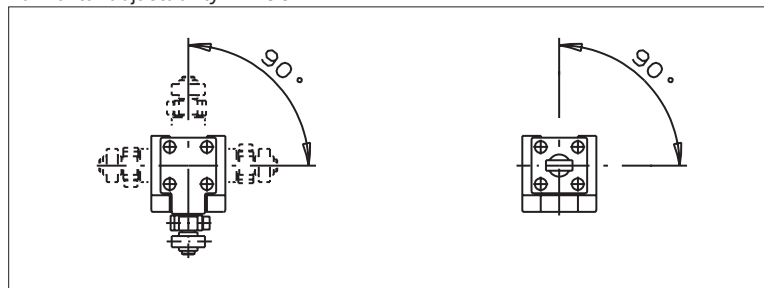
For example, the aluminum lever arm is used for high approach speeds and generous actuating mechanism tolerances.

The domed plunger with its polished-ground surface is designed for a high repeat accuracy of  $\pm 0.002$  mm.

The ball plungers can be actuated from a number of different directions.

### Adjustment option for the actuator

horizontal adjustability 4 x 90°

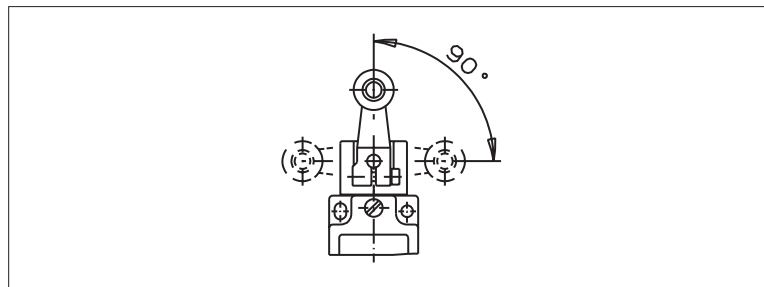


Lever arm

Straight actuator

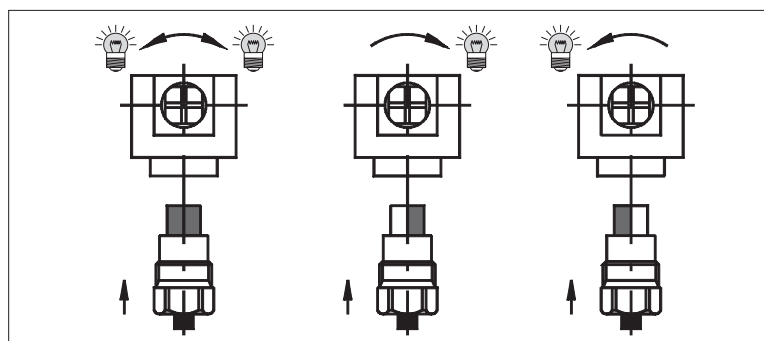
Having removed the stainless steel mounting screws, the actuator heads can each be adjusted horizontally by 90°.

### Vertical adjustment 4 x 90°



In the case of limit switches with no safety function, the lever arm can be adjusted continuously. However limit switches with a safety function, can be adjusted by 90°.

### Adjustment option for switching direction



Left/right  
switching  
(default setting)

right  
switching

left  
switching

On delivery, the lever-arm actuation is set to left and right switching.

If necessary, it can be set to right switching or left switching only.



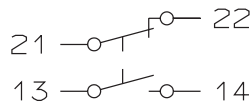
## Switching elements

### Switching element ES 510 <sup>2)</sup>

(without direct opening action)  
Snap-action contact element with one NC contact and one NO contact.

Double gap contacts, electrically isolated switching bridge, silver alloy gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NG...

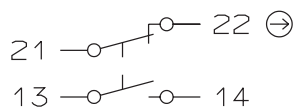


### Switching element ES 511 <sup>2)</sup>

Snap-action contact element with one direct opening action contact and one NO contact.

Double gap contacts, electrically isolated contact elements, silver alloy gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NZ...

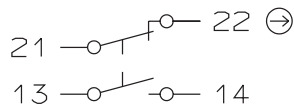


### Switching element ES 528H <sup>1) 3)</sup>

Slow-action contact element with one direct opening action contact and one NO contact.

Double gap contacts, electrically isolated H-contact bridges for currents from 1 mA to 4 A, silver alloy, gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NZ...

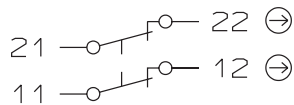


### Switching element ES 538H <sup>1) 3)</sup>

Slow-action contact element with two direct opening action contacts.

Double gap contacts, electrically isolated H-contact bridges for currents from 1 mA to 4 A, silver alloy, gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NZ...

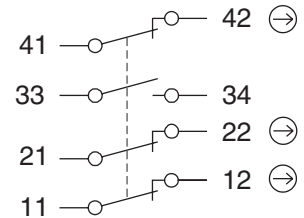


### Switching element SK 2131 H <sup>3)</sup>

Slow-action contact element with three direct opening action contacts and one NO contact.

Double gap contacts, electrically isolated H-contact bridges for currents from 1 mA to 4 A, silver alloy, gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NZ...

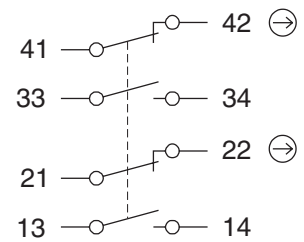


### Switching element SK 3131 H <sup>3)</sup>

Slow-action contact element with two direct opening action contacts and two NO contacts.

Double gap contacts, electrically isolated H-contact bridges for currents from 1 mA to 4 A, silver alloy, gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NZ...

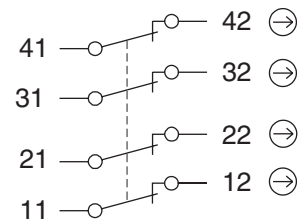


### Switching element SK 2121 H <sup>3)</sup>

Slow-action contact element with four direct opening action contacts.

Double gap contacts, electrically isolated H-contact bridges for currents from 1 mA to 4 A, silver alloy, gold flashed contact material, screw terminals with self-lifting clamp washers.

Used for NZ...



EUCHNER limit switches marked with this symbol meet the IEC 60947-5-1 requirements for safety limit switches with direct opening action contacts.

**Safety switching elements marked with this symbol are not available as replacement switching elements.**

#### 1) Slow-action contact element

The slow-action contact element has a contact element which opens and closes depending on its actuation speed.

#### 2) Snap-action contact element

The snap-action contact element has a contact element which opens and closes regardless of its actuation speed.

#### 3) H-contact bridge

The design properties of the H-contact bridge (H-shaped) ensure that these switching elements reliably switch currents from 1 mA (e.g. low current PLCs) to 4 A.

## Wiring diagrams

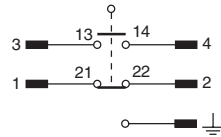
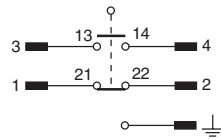
### Plug connector SR6

Pin assignment for plug  
(Top view of on switch  
mounted connector)



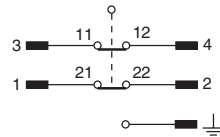
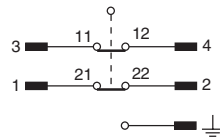
### Contact assignment for switching elements

ES 510 / ES 511 / ES 528H



with LED display

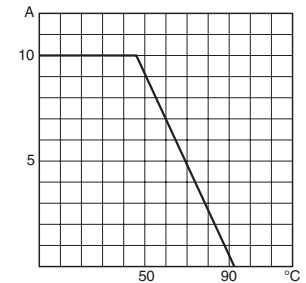
ES 538H



with LED display

### Derating diagram

for connection cross section  
1,5 mm<sup>2</sup>



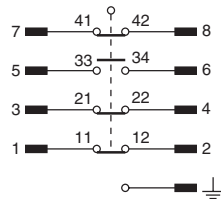
### Plug connector SR11

Pin assignment for plug  
(Top view of on switch  
mounted connector)

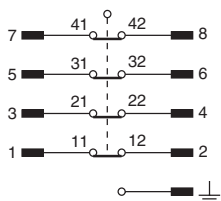


### Contact assignment for switching elements

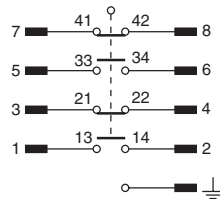
SK 2131H



SK 2121H

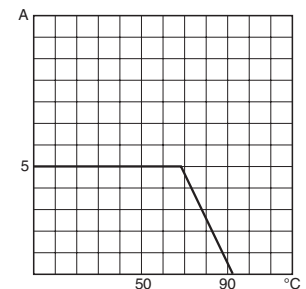


SK 3131H



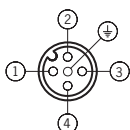
### Derating diagram

for connection cross section  
0,5 mm<sup>2</sup>



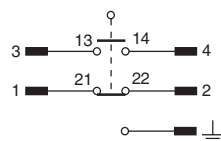
### Plug connector SVM5 (M12, 5-pole)

Pin assignment for plug  
(Top view of on switch  
mounted connector)



### Contact assignment for switching elements

ES 510 / ES 511 /  
ES 528H / ES 538H



## Plunger types

Plungers for limit switches are made of stainless steel and are extremely accurate.

With its special surface-finished plunger guide, an extremely reliable and maintenance-free operation is given.

There are two different types of actuating systems, depending on the application. For standard applications, the plunger is fitted with a telescopic device. With this system, the plunger can be depressed to the reference surface without damaging the switching element.

Instead of this telescopic plunger, limit switches which have a safety function (with safety switching element) have a *rigid* plunger which ensures a direct opening action contact in accordance with IEC 60947-5-1. This means that in the event of mechanical failure of the switching element - e.g. failure of a contact spring or contact weld resulting from an overload, - the contact point will be reliably opened.

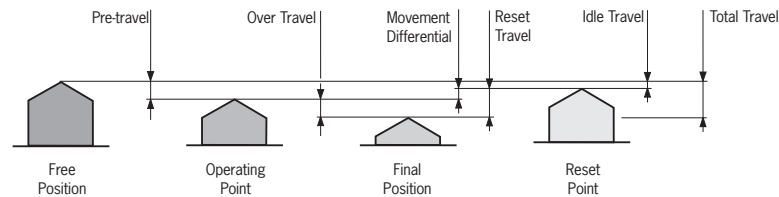
## Plunger travel

The pictures show the various positions of plunger actuated by a control cam.

The precise values for the relevant design are shown in the technical data.

## Travel ratio plunger-switching cam

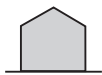
All the plunger travel data shown in the technical data refers to axial actuation. The travel for radial actuation with angled switching cams is increased and this must be calculated.



## Plunger types

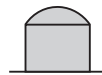
Depending on the technical requirements, four different plunger types (chisel, roller, ball and domed plungers) are used.

### Chisel plunger



Hardened and polish-ground.  
Repeat accuracy to  $\pm 0.002$  mm.  
Max. approach speed of 10 m/min.  
With its high repeat accuracy, the domed plunger is ideal for setting reference points for moderate approach speeds.

### Domed plunger



Hardened and polish-ground.  
Repeat accuracy to  $\pm 0.002$  mm.  
Max. approach speed of 10 m/min.  
This plunger can be actuated from a number of different directions.  
For use in conjunction with safety switching elements!

### Roller plunger



Hardened roller.  
Repeat accuracy to  $\pm 0.01$  mm.  
Max. approach speed of 50 m/min.  
The roller plunger is suitable for higher approach speeds. For very high approach speeds and long travel distances, roller plungers with a protected ball bearing can be offered on request.

### Extended roller plunger



Robust roller plunger for moderate approach speeds.

### Ball plunger



Hardened ball.  
Repeat accuracy to  $\pm 0.01$  mm.  
Max. approach speed of 10 m/min.  
This plunger can be actuated from a number of different directions.  
It must not be used in conjunction with safety switching elements!

## Limit switch type series NG1.../NZ1...

- ▶ Roller lever arm **HB** (plastic roller)  
**HS** (steel roller)
- ▶ Cable entry **M20 x 1.5**

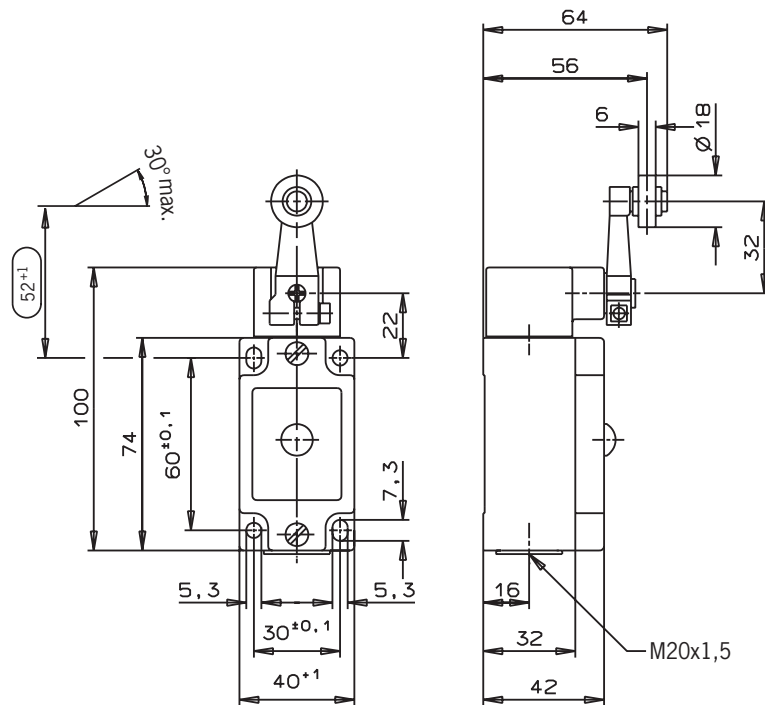
NG...



NZ...



## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
- ES 511** Snap-action contact element  
1 direct opening action contact  
+ 1 NO contact
- ES 528H** Slow-action contact element  
1 direct opening action contact  
+ 1 NO contact
- ES 538H** Slow-action contact element  
2 direct opening action contacts
- SK 2131H** Slow-action contact element  
3 direct opening action contacts  
+ 1 NO contact
- SK 3131H** Slow-action contact element  
2 direct opening action contacts  
+ 2 NO contact

(for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC L060
- ▶ 110 V AC ±15% L110
- ▶ 230 V AC ±15% L220

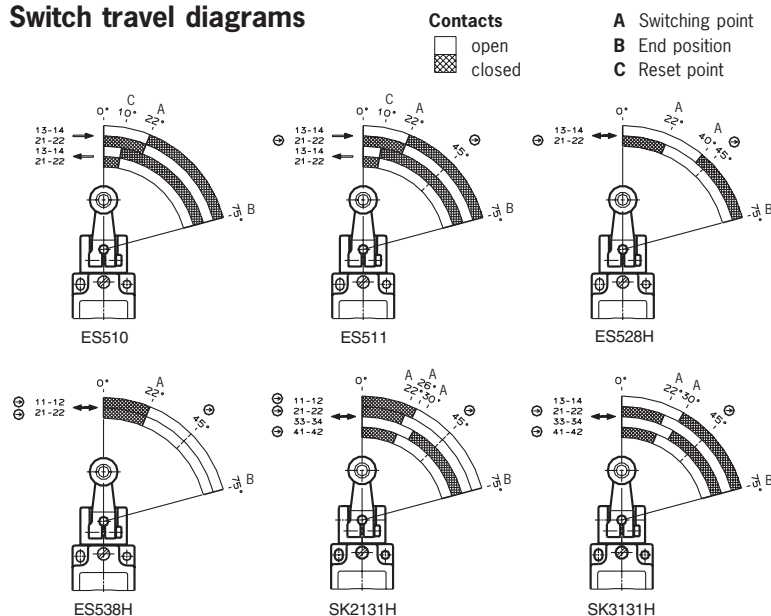
## Adjustment options

Horizontal and vertical 4 x 90° (see page 8).

## Switching direction

Switches to the right, left and to both sides (see page 8).

## Switch travel diagrams



⚠ If damaged or worn, safety switches should be replaced as a unit.

## Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam gap shown in the dimension  $52^{+1}$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Technical data

Parameters	Value				Unit	
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 67					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80				°C	
Weight	Approx. 0.3				kg	
Actuator	Roller lever arm					
Roller material	Plastic (HB)	Steel (HS)				
Approach speed, max. <sup>1)</sup>	300	60		m/min		
Approach speed, min.	0.1			m/min		
Repeat accuracy	± 0.25			°		
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram			°		
Actuating force, min.	15			N		
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖			
	ES 511 1 NC ⊖ + 1 NO	SK 2131H 3 NC ⊖ + 1 NO	SK 3131H 2 NC ⊖ + 2 NO			
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge				
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4				ms	
Contact bounce time	< 3				ms	
Rated impulse withstand voltage U <sub>imp</sub>	2.5				kV	
Rated insulation voltage U <sub>i</sub>	250				V	
Utilization category according to IEC 60947-5-1	AC12	I <sub>e</sub> 10 A U <sub>e</sub> 230 V	-			
	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V			
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	10/6	4				A gG
Type of connection	Screw terminal <sup>2)</sup>					
Conductor cross-section, max.	2 x 1.5				mm <sup>2</sup>	

1) The approach speed specified applies to an approach angle of 30°.

2) For wiring diagram see page 9.

## Ordering table

Type Series	Roller	Switching Element	Order No.				
			None	Function Display L060	L110	L220	
<b>NG1...-M</b>  <b>NZ1...-M</b>	<b>HB</b> Plastic roller	-510	079 926	090 360	on request		
		-511	079 952	090 039			
		-528	088 199	090 965			
			-538	090 966	090 967		
			-2131	090 968	-	-	-
			-3131	090 969	-	-	-
<b>NG1...-M</b>  <b>NZ1...-M</b>	<b>HS</b> Steel roller	-510	079 927	079 937	on request		
		-511	079 953	090 035			
		-528	090 970	090 971			
			-538	090 972	090 760		
			-2131	090 973	-	-	-
			-3131	090 747	-	-	-

**Ordering example:** Limit switch without safety function **NG**, cable entry **1**, roller lever arm with steel roller **HS**, snap-action contact element **510**, function display **L060** 10 - 60 V, metric thread M20 x 1.5 **M**  
**NG1HS-510L060-M**

**Order No. 079 937**

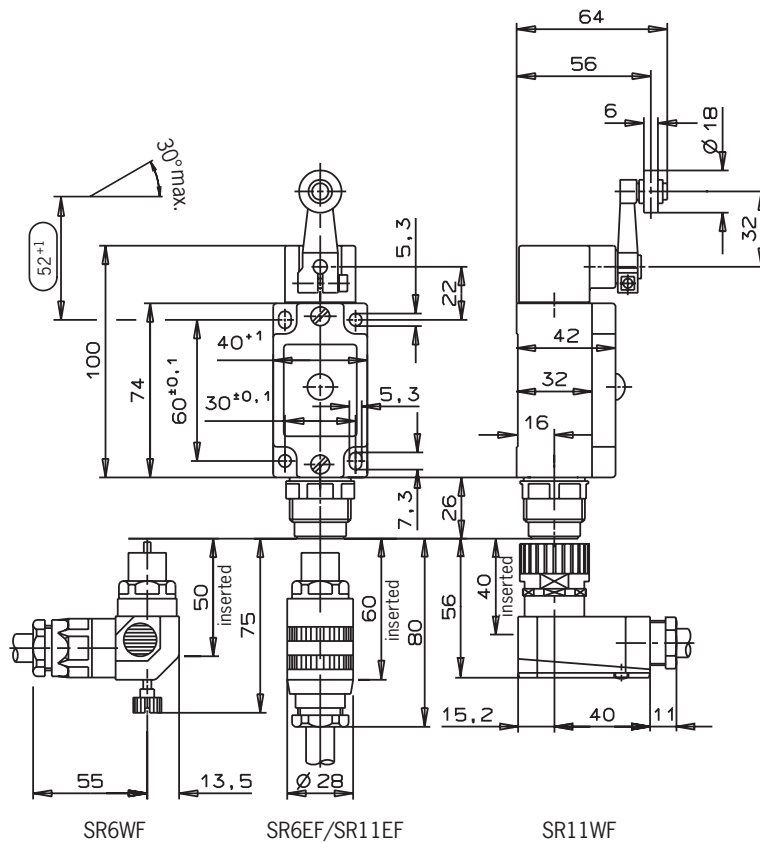
## Limit switch type series NG2.../NZ2...

- ▶ **Roller lever arm** **HB** (plastic roller)  
**HS** (steel roller)
- ▶ **Plug connectors** **SR6** and **SR11**

## NZ...



## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
  - ES 511** Snap-action contact element  
1 direct opening action contact  
+ 1 NO contact
  - ES 528H** Slow-action contact element  
1 direct opening action contact  
+ 1 NO contact
  - ES 538H** Slow-action contact element  
2 direct opening action contacts
  - SK 2131H** Slow-action contact element  
3 direct opening action contacts  
+ 1 NO contact
  - SK 3131H** Slow-action contact element  
2 direct opening action contacts  
+ 2 NO contact
- (for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

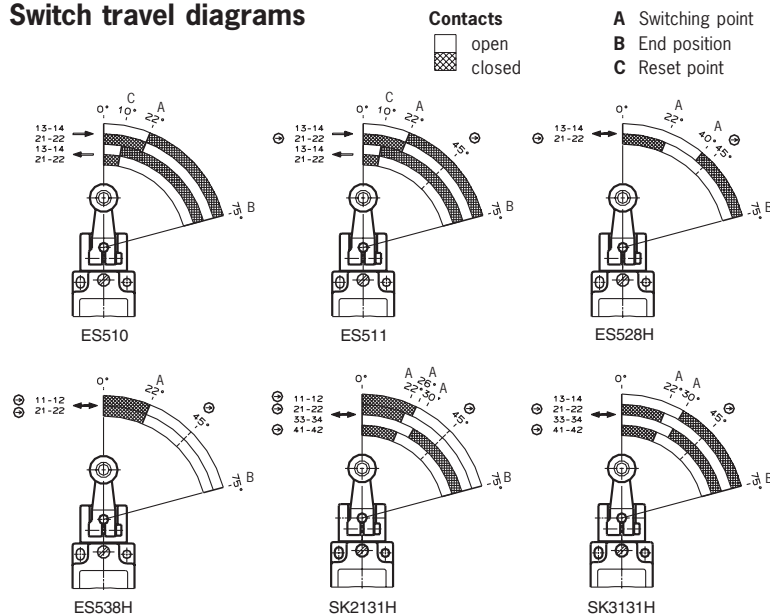
## Adjustment options

Horizontal and vertical 4 x 90° (see page 8).

## Switching direction

Switches to the right, left and to both sides (see page 8).

## Switch travel diagrams



⚠ If damaged or worn, safety switches should be replaced as a unit.

### Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam gap shown in the dimension  $52^{+1}$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Technical data

Parameters	Value					Unit
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 65					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80					°C
Weight	Approx. 0.3					kg
Actuator	Roller lever arm					
Roller material	Plastic (HB)		Steel (HS)			
Approach speed, max. <sup>1)</sup>	300		60			m/min
Approach speed, min.	0.1					m/min
Repeat accuracy	± 0.25					°
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram					°
Actuating force, min.	15					N
Switching elements	ES 510	ES 528H		ES 538H		
	1 NC + 1 NO	1 NC ⊖ + 1 NO		2 NC ⊖		
Switching principle	ES 511	SK 2131H		SK 3131H		
	1 NC ⊖ + 1 NO	3 NC ⊖ + 1 NO		2 NC ⊖ + 2 NO		
Switching principle	Snap-action contact element		Slow-action contact element with H-contact bridge			
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4					ms
Contact bounce time	< 3					ms
Rated impulse withstand voltage U <sub>imp</sub>	2.5					kV
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6		4			A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	6		4			A gG
Type of connection	Plug connector to DIN 43651 <sup>2)</sup>					
Rated insulation voltage U <sub>i</sub>	with plug connector SR6					V
	with plug connector SR11					
Rated impulse withstand voltage U <sub>imp</sub>	with plug connector SR6					kV
	with plug connector SR11					
Utilization category according to IEC 60947-5-1	with plug connector SR6	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V		I <sub>e</sub> 4 A U <sub>e</sub> 230 V	
		DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V		I <sub>e</sub> 4 A U <sub>e</sub> 24 V	
	with plug connector SR11	AC15			I <sub>e</sub> 4 A U <sub>e</sub> 50 V	
		DC13			I <sub>e</sub> 4 A U <sub>e</sub> 24 V	

1) The approach speed specified applies to an approach angle of 30°.

2) For wiring and derating diagram see page 10.

## Ordering table

Type Series	Roller	Switching Element	Order No.		
			Plug Connector / Function Display		SR11 without LED
			SR6 without LED	SR6 with L060	
NG2...  NZ2...	HB Plastic roller	-510	089 088	089 089	-
		-511	089 091	089 092	-
		-528	090 845	090 846	-
		-538	090 847	090 848	-
		-2131	-	-	090 136
		-3131	-	-	090 137
NG2...  NZ2...	HS Steel roller	-510	090 851	089 090	-
		-511	089 093	089 094	-
		-528	090 852	088 196	-
		-538	090 853	090 854	-
		-2131	-	-	090 146
		-3131	-	-	090 856

**Ordering example:** Limit switch without safety function **NG**, plug connector **2**, roller lever arm with steel roller **HS**, snap-action contact element **510**, function display **L060** 10 - 60 V  
**NG2HS-510L060**

Order No. 089 090

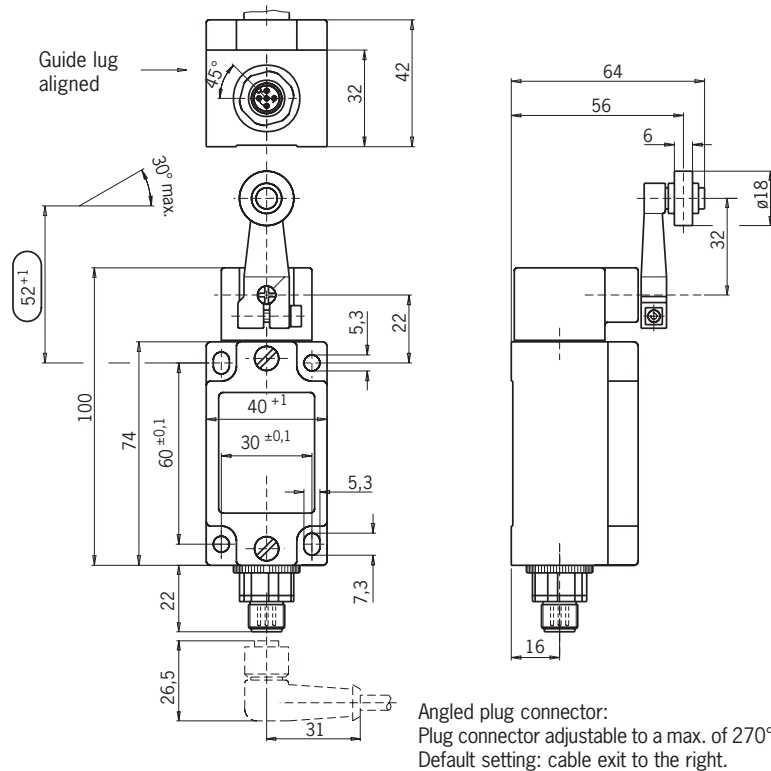
## Limit switch type series NG2.../NZ2...

- ▶ **Roller lever arm** HB (plastic roller)  
HS (steel roller)
- ▶ **M12/SVM5 plug connector**

NZ...



### Dimension drawing



### Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
- ES 511** Snap-action contact element  
1 direct opening action contact  
+ 1 NO contact
- ES 528H** Slow-action contact element  
1 direct opening action contact  
+ 1 NO contact
- ES 538H** Slow-action contact element  
2 direct opening action contacts  
(for further details see page 9)

### LED function display

Available on request

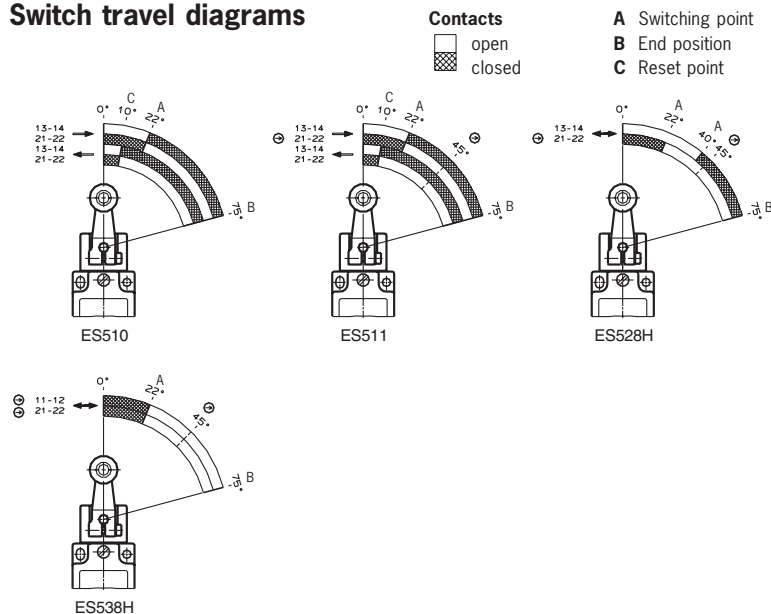
### Adjustment options

Horizontal and vertical 4 x 90° (see page 8).

### Switching direction

Switches to the right, left and to both sides (see page 8).

### Switch travel diagrams



⚠ If damaged or worn, safety switches should be replaced as a unit.

### Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam gap shown in the dimension  $52^{+1}$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.



## Technical data

Parameters	Value				Unit	
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 67					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80				°C	
Weight	Approx. 0.3				kg	
Actuator	Roller lever arm					
Roller material	Plastic (HB)	Steel (HS)				
Approach speed, max. <sup>1)</sup>	300	60		m/min		
Approach speed, min.	0.1			m/min		
Repeat accuracy	± 0.25			°		
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram			°		
Actuating force, min.	15			N		
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖			
	ES 511 1 NC ⊖ + 1 NO					
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge				
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4				ms	
Contact bounce time	< 3				ms	
Rated impulse withstand voltage U <sub>imp</sub>	2.0				kV	
Rated insulation voltage U <sub>i</sub>	50				V	
Utilization category according to IEC 60947-5-1						
with SVM5 plug connector	AC15	I <sub>e</sub> 4 A U <sub>e</sub> 30 V	I <sub>e</sub> 4 A U <sub>e</sub> 30 V			
	DC13	I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	4	4			A	
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	4	4			A gG	
Type of connection	M12 plug connector <sup>2)</sup>					

1) The approach speed specified applies to an approach angle of 30°.

2) For wiring diagram see page 10.

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Plug Connector	SVM5
NG2...	HB Plastic roller	-510	088 631	
		-511	090 861	
		-528	090 864	
		-538	090 862	
NG2...	HS Steel roller	-510	090 866	
		-511	090 867	
		-528	090 868	
		-538	090 869	

**Ordering example:** Limit switch without safety function **NG**, plug connector **2**, roller lever arm with steel roller **HS**, snap-action contact element **510**, M12 plug with PE connection **SVM5**  
**NG2HS-510SVM5**

**Order No. 090 866**

## Limit switch type series NG1.../NZ1...

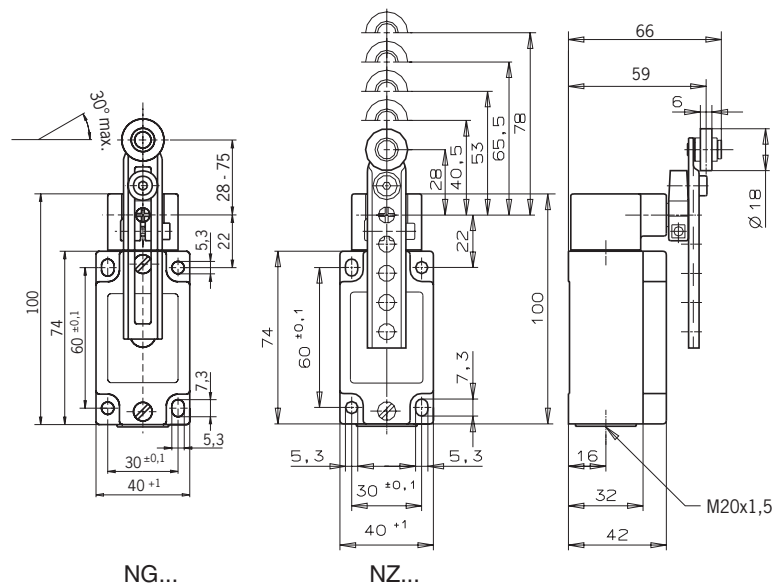
- ▶ **Adjustable roller lever arm**  
**VB** (plastic) / **PB** (plastic roller)  
**VS** (steel roller) / **PS** (steel roller)
- ▶ **Cable entry M20 x 1.5** (plug connector on request)

NZ...



\* Approval applied

## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
- ES 511** Snap-action contact element  
1 direct opening action contact + 1 NO contact
- ES 528H** Slow-action contact element  
1 direct opening action contact + 1 NO contact
- ES 538H** Slow-action contact element  
2 direct opening action contacts
- SK 2131H** Slow-action contact element  
3 direct opening action contact + 1 NO contact
- SK 3131H** Slow-action contact element  
2 direct opening action contact + 2 NO contact

(for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

## Adjustment options

Horizontal and vertical 4 x 90° (see page 8).

## Switching direction

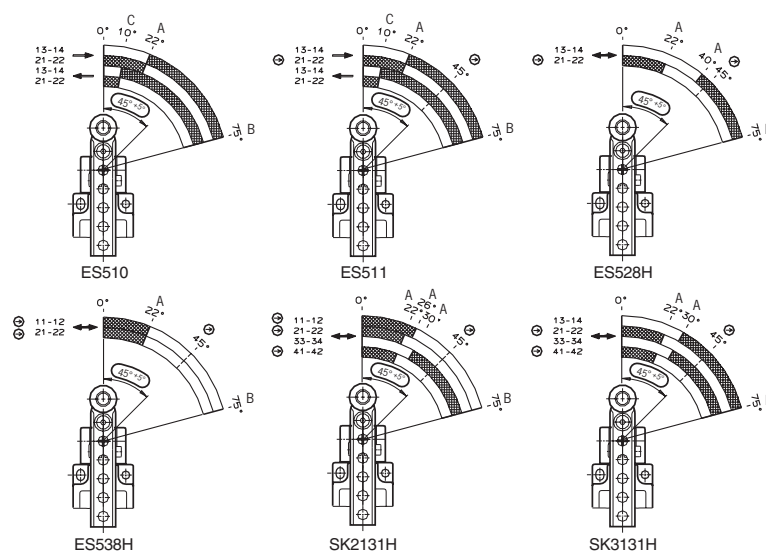
Switches to the right, left and to both sides (see page 8).

## Switch travel diagrams

### Contacts



- A** Switching point
- B** End position
- C** Reset point



⚠ If damaged or worn, safety switches should be replaced as a unit.

### ⚠ Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam must actuate the lever arm to an angle of  $(45^\circ \pm 5^\circ)$ . Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Technical data

Parameters	Value				Unit	
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 67					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80				°C	
Weight	Approx. 0.3				kg	
Actuator	Adjustable Roller lever arm					
Roller material	Plastic (VB)	Plastic (PB)	Steel (VS)	Steel (PS)		
Approach speed, max. <sup>1)</sup>	120	120	30	30	m/min	
Approach speed, min.	0.5				m/min	
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram				°	
Actuating force, min.	15				N	
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖			
	ES 511 1 NC ⊖ + 1 NO	SK 2131H 3 NC ⊖ + 1 NO	SK 3131H 2 NC ⊖ + 2 NO			
Switching principle contact bridge	Snap-action contact element		Slow-action contact element with H-contact bridge			
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4				ms	
Contact bounce time	< 3				ms	
Rated impulse withstand voltage U <sub>imp</sub>	2.5				kV	
Rated insulation voltage U <sub>i</sub>	250				V	
Utilization category according to IEC 60947-5-1						
	AC12	I <sub>e</sub> 10 A U <sub>e</sub> 230 V	-			
	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V			
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	10/6	4				A gG
Type of connection	Screw terminal <sup>2)</sup>					
Conductor cross-section, max.	2 x 1.5				mm <sup>2</sup>	

1) The approach speed specified applies to an approach angle of 30°.

2) For wiring diagram see page 9.

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Function Display	L060
NG1...-M	<b>VB</b> Plastic roller	-510	086 322	091 288
	<b>VS</b> Steel roller	-510	079 934	090 599
NZ1...-M	<b>PB</b> Plastic roller	-511	088 618	on request
		-528	090 870	
		-538	090 871	
		-2131	090 872	-
		-3131	090 873	-
	<b>PS</b> Steel roller	-511	088 613	-
		-528	090 874	090 430
		-538	090 875	-
		-2131	090 876	-
		-3131	090 877	-

**Ordering example:** Limit switch with safety function **NZ**, cable entry **1**, adjustable roller lever arm with plastic roller **PB**, Snap-action contact element **511**, metric thread M20 x 1.5 **M**  
**NZ1PB-511-M**

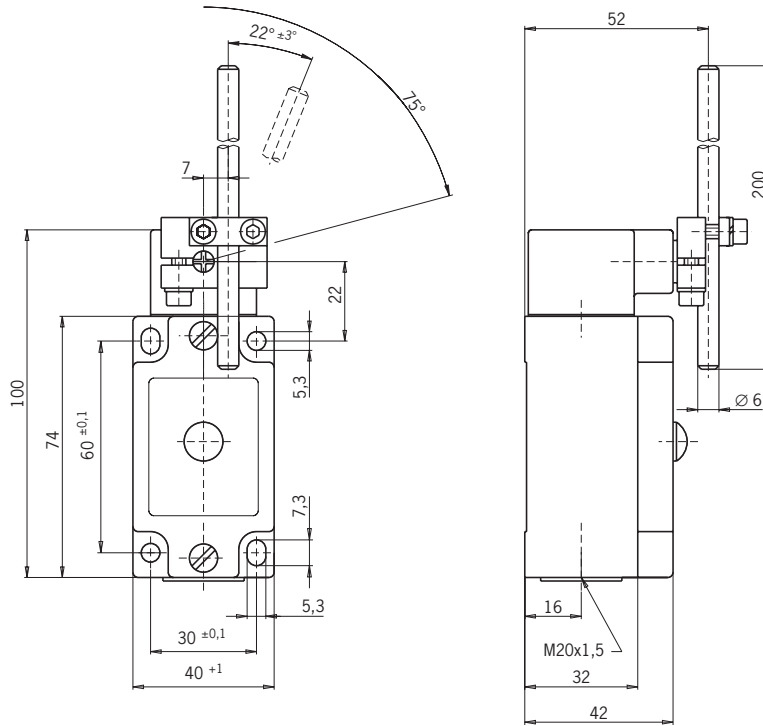
**Order No. 088 613**

## Limit switch type series NG1...



- ▶ **Pivoted lever arm SB** (plastic rod)  
**SM** (aluminum rod)
- ▶ **Cable entry M20 x 1.5** (plug connector on request)

## Dimension drawing



## Switching elements

**ES 510** Snap-action contact element  
1 NC contact + 1 NO contact  
(for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

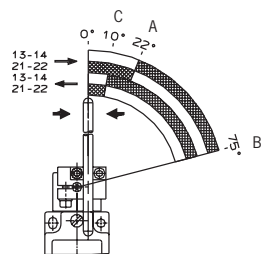
## Adjustment options

Horizontal and vertical 4 x 90° (see page 8).

## Switching direction

Switches to the right, left and to both sides (see page 8).

## Switch travel diagrams



### Contacts



**A** Switching point

**B** End position

**C** Reset point

## Technical data

Parameters	Value		Unit
Housing material	Anodized die-cast alloy		
Degree of protection according to IEC 60529	IP 67		
Installation position	Optional		
Mechanical service life	30 x 10 <sup>6</sup> switching cycles		
Ambient temperature	-25 to +80		°C
Weight	Approx. 0.3		kg
Actuator	Pivoted lever arm		
Roller material	Plastic (SB)	Aluminum (SM)	
Approach speed, max.	60		m/min
Approach speed, min.	0.5		m/min
Repeat accuracy	± 1		°
Actuating force, min.	15		N
Switching elements	ES 510 1 NC + 1 NO		
Switching principle	Snap-action contact element		
Contact material	Silver alloy, gold flashed		
Contact closing time	< 4		ms
Contact bounce time	< 3		ms
Rated impulse withstand voltage U <sub>imp</sub>	2.5		kV
Rated insulation voltage U <sub>i</sub>	250		V
Utilization category according to IEC 60947-5-1			
	AC12	I <sub>e</sub> 10 A U <sub>e</sub> 230 V	
	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	
Switching current min. at	10		mA
Switching voltage	24		V DC
Conventional thermal current I <sub>th</sub>	6		A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	10/6		A gG
Type of connection	Screw terminal <sup>1)</sup>		
Conductor cross-section, max.	2 x 1.5		mm <sup>2</sup>

1) For wiring diagram see page 9.

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			None	Function Display L060
NG1...-M	SB plastic rod	-510	088 609	090 577
	SM Aluminum rod		079 932	090 575

**Ordering example:** Limit switch without safety function **NG**, cable entry **1**, pivoted arm lever with plastic rod **SB**, snap-action contact element **510**, function display **L060** 10 - 60 V, metric thread M20 x 1.5 **M**  
**NG1SB-510L060-M**

**Order No. 090 577**

## Limit switch type series NG1.../NZ1...

### ▶ Plunger actuator

- WO** (Domed plunger) / **KO** (Ball plunger)
- DO** (Chisel plunger) / **RK** (Roller plunger with small steel roller)

### ▶ Cable entry M20 x 1.5

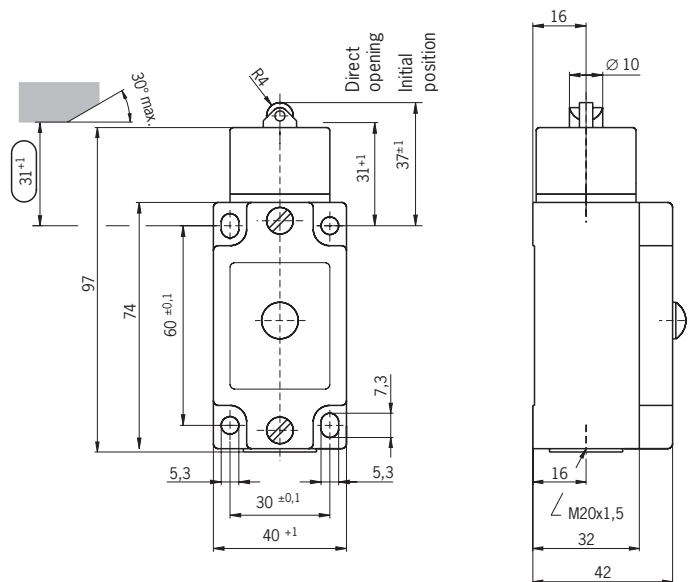
NG...



NZ...



## Dimension drawing



⚠ To obtain the direct opening travel, the switching cam gap shown in the dimension  $31_{\pm 0.1}$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
  - ES 511** Snap-action contact element  
1 direct opening action contact + 1 NO contact
  - ES 528H** Slow-action contact element  
1 direct opening action contact + 1 NO contact
  - ES 538H** Slow-action contact element  
2 direct opening action contacts
  - SK 2131H** Slow-action contact element  
3 direct opening action contacts + 1 NO contact
  - SK 3131H** Slow-action contact element  
2 direct opening action contacts + 2 NO contact
- (for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

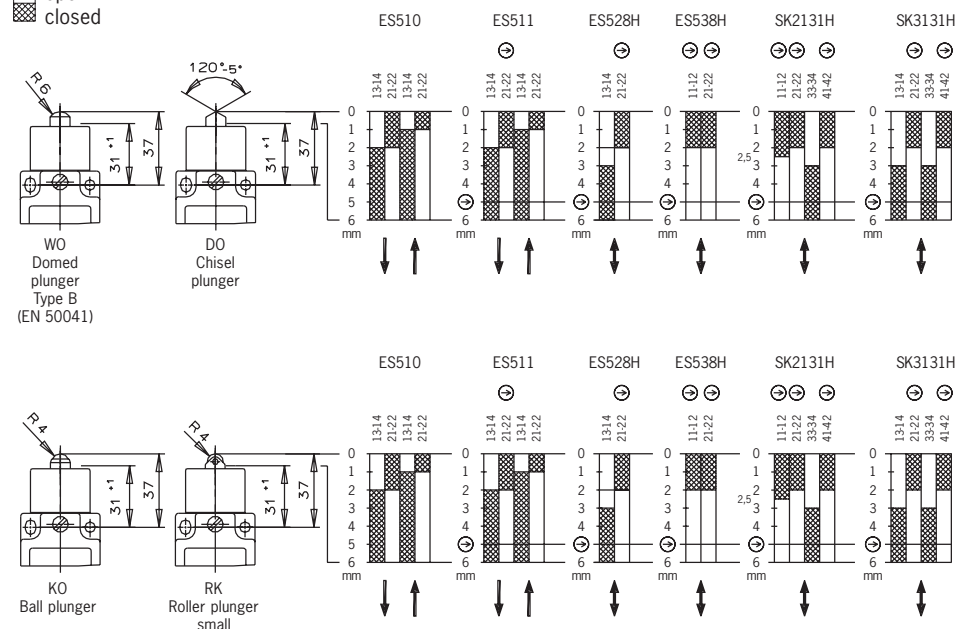
- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

## Adjustment options

Horizontal 4 x 90° (see page 8).

## Switch travel diagrams

### Contacts



## Technical data

Parameters	Value				Unit	
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 67					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80				°C	
Weight	Approx. 0.3				kg	
Actuator	Domed plunger (WO)	Chisel plunger (DO)	Ball plunger (KO)	Roller plunger Small (RK)		
Approach speed, max. <sup>1)</sup>	10			50	m/min	
Approach speed, min.	0.1				m/min	
Repeat accuracy <sup>3)</sup>	± 0.002		0.01		mm	
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram				mm	
Actuating force, min.	15				N	
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖			
	ES 511 1 NC ⊖ + 1 NO	SK 2131H 3 NC ⊖ + 1 NO	SK 3131H 2 NC ⊖ + 2 NO			
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge				
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4				ms	
Contact bounce time	< 3				ms	
Rated impulse withstand voltage U <sub>imp</sub>	2.5				kV	
Rated insulation voltage U <sub>i</sub>	250				V	
Utilization category according to IEC 60947-5-1	AC12	I <sub>e</sub> 10 A U <sub>e</sub> 230 V	-			
	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V			
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	10/6	4				A gG
Type of connection	Screw terminal <sup>2)</sup>					
Conductor cross-section, max.	2 x 1.5				mm <sup>2</sup>	

1) The approach speed specified applies in conjunction with EUCHNER control cams is in accordance with DIN 69639.

2) For wiring diagram see page 9.

3) The reproducible repeat accuracy refers to the plunger's axial travel, after a run-in of approx. 2000 switching cycles

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Function Display	
			None	L060
NG1...-M	WO Domed plunger	-510	079 945	on request
		-511	088 611	089 057
		-528	089 624	089 078
		-538	090 878	089 046
		-2131	089 629	-
NG1...-M	DO Chisel plunger	-3131	089 626	-
		-510	088 616	
		-511	088 620	
		-528	090 901	
		-538	090 902	on request
NG1...-M	RK Roller plunger small	-2131	090 903	
		-3131	090 904	
		-510	088 619	
		-511	088 608	090 354
		-528	090 905	090 358
NG1...-M	KO Ball plunger	-538	090 906	on request
		-2131	090 907	-
		-3131	090 908	-
		-510	088 604	on request

**Ordering example:** Limit switch without safety function **NZ**, cable entry **1**, domed plunger **WO**, snap-action contact element **511**, function display **L060** 10 - 60 V, metric thread M20 x 1.5 **M**  
**NZ1WO-511L060-M**

**Order No. 089 057**

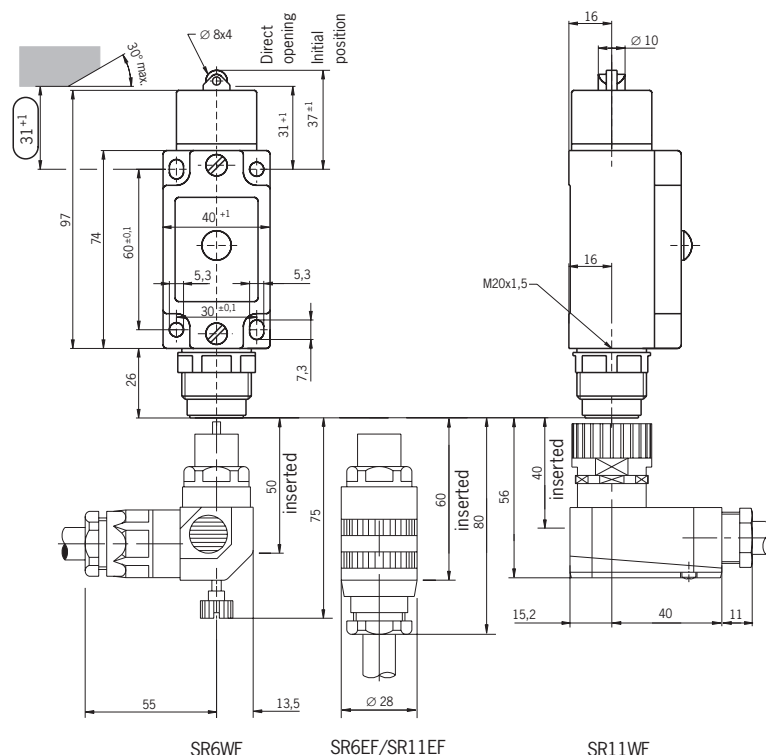
## Limit switch type series NG2.../NZ2...

- ▶ **Plunger actuator**  
**WO** (Domed plunger) / **KO** (Ball plunger)  
**DO** (Chisel plunger) / **RK** (Roller plunger with small steel roller)
- ▶ **Plug connectors SR6 and SR11**

NZ...



## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
  - ES 511** Snap-action contact element  
1 direct opening action contact + 1 NO contact
  - ES 528H** Slow-action contact element  
1 direct opening action contact + 1 NO contact
  - ES 538H** Slow-action contact element  
2 direct opening action contacts
  - SK 2131H** Slow-action contact element  
3 direct opening action contacts + 1 NO contact
  - SK 3131H** Slow-action contact element  
2 direct opening action contacts + 2 NO contact
- (for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

## Adjustment options

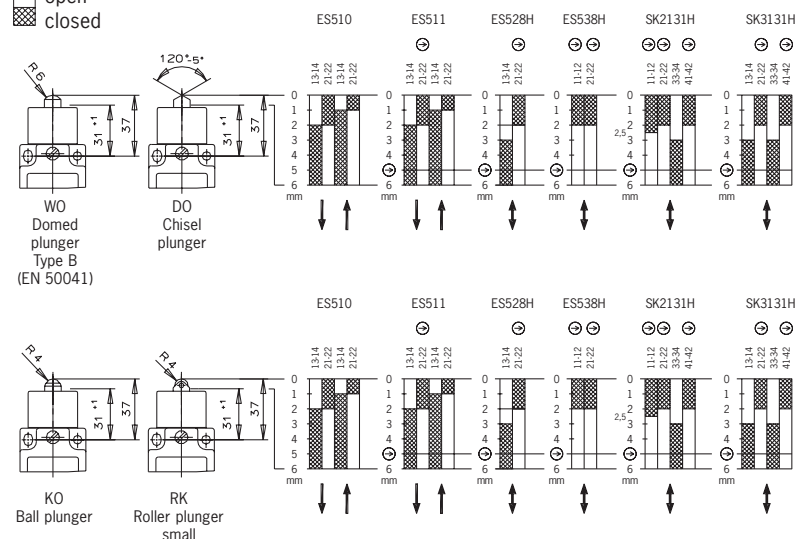
Horizontal 4 x 90° (see page 8).

⚠ To obtain the direct opening travel the switching cam gap shown in the dimension (31+1) must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Switch travel diagrams

### Contacts

- open
- ▨ closed





## Technical data

Parameters	Value					Unit
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 65					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80					°C
Weight	Approx. 0.3					kg
Actuator	Domed plunger (WO)	Chisel plunger (DO)	Ball plunger (KO)	Roller plunger Small (RK)		
Approach speed, max. <sup>1)</sup>	10		50		m/min	
Approach speed, min.	0.1					m/min
Repeat accuracy <sup>3)</sup>	± 0.002		0.01			mm
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram					mm
Actuating force, min.	15					N
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖	ES 511 1 NC ⊖ + 1 NO		
Switching principle	Snap-action contact element		Slow-action contact element with H-contact bridge			
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4					ms
Contact bounce time	< 3					ms
Rated impulse withstand voltage U <sub>imp</sub>	2.5					kV
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6		4			A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	6		4			A gG
Type of connection	Plug connector to DIN 43651 <sup>2)</sup>					
Rated insulation voltage U <sub>i</sub>						
with plug connector SR6	250					V
with plug connector SR11	50					
Rated impulse withstand voltage U <sub>imp</sub>						
with plug connector SR6	2.5					kV
with plug connector SR11	1.5					
Utilization category according to IEC 60947-5-1						
with plug connector SR6	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V			
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
with plug connector SR11	AC15		I <sub>e</sub> 4 A U <sub>e</sub> 50 V			
	DC13		I <sub>e</sub> 4 A U <sub>e</sub> 24 V			

1) The approach speed specified applies in conjunction with EUCHNER control cams is in accordance with DIN 69639.

2) For wiring and derating diagram see page 10.

3) The reproducible repeat accuracy refers to the plunger's axial travel, after a run-in of approx. 2000 switching cycles

## Ordering table

Type Series	Roller	Switching Element	Order No.		
			None	Function Display L060	
NG2...	WO Domed plunger	-510	090 012	on request	
NZ2...		-511	090 909	091 280	
		-528	090 910	091 279	
		-538	090 911	087 558	
		-2131	090 912	-	
		-3131	090 913	-	
NG2...	DO Chisel plunger	-510	090 011	on request	
NZ2...		-511	090 015		
		-528	090 914		
		-538	090 915		
		-2131	090 916		-
		-3131	090 917		-
NG2...	RK Roller plunger small	-510	090 918	on request	
NZ2...		-511	090 016		
		-528	090 919		091 292
		-538	090 920		on request
		-2131	090 921		-
		-3131	090 922		-
NG2...	KO Ball plunger	-510	090 020	on request	



## Technical data

Parameters	Value				Unit
Housing material	Anodized die-cast alloy				
Degree of protection according to IEC 60529	IP 67				
Installation position	Optional				
Mechanical service life	30 x 10 <sup>6</sup> switching cycles				
Ambient temperature	-25 to +80				°C
Weight	Approx. 0.3				kg
Actuator	Domed plunger (WO)	Chisel plunger (DO)	Ball plunger (KO)	Roller plunger Small (RK)	
Approach speed, max. <sup>1)</sup>	10			50	m/min
Approach speed, min.	0.1				m/min
Repeat accuracy <sup>3)</sup>	± 0.002		0.01		mm
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram				mm
Actuating force, min.	15				N
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖		
	ES 511 1 NC ⊖ + 1 NO				
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge			
Contact material	Silver alloy, gold flashed				
Contact closing time	< 4				ms
Contact bounce time	< 3				ms
Rated impulse withstand voltage U <sub>imp</sub>	2.0				kV
Rated insulation voltage U <sub>i</sub>	50				V
Utilization category according to IEC 60947-5-1 with SVM5 plug connector	AC15	I <sub>e</sub> 4 A U <sub>e</sub> 30 V	I <sub>e</sub> 4 A U <sub>e</sub> 30 V		
	DC13	I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V		
Switching current min. at	10	1	10	1	10
Switching voltage	24	24	12	24	12
Conventional thermal current I <sub>th</sub>	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	4				A gG
Type of connection	M12 plug connector <sup>2)</sup>				

1) The approach speed specified applies in conjunction with EUCHNER control cams is in accordance with DIN 69639.

2) For wiring diagram see page 10.

3) The reproducible repeat accuracy refers to the plunger's axial travel, after a run-in of approx. 2000 switching cycles

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Plug Connector SVM5	
NG2...	WO Domed plunger	-510	090 018	
NZ2...		-511	089 014	
		-528	090 923	
		-538	090 924	
NG2...	DO Chisel plunger	-510	090 014	
NZ2...		-511	090 927	
		-528	090 928	
		-538	090 929	
NG2...	RK Roller plunger small	-510	089 020	
NZ2...		-511	089 007	
		-528	090 930	
		-538	089 018	
NG2...	KO Ball plunger	-510	090 931	

**Ordering example:** Limit switch without safety function **NG**, plug connector **2**, small roller plunger with steel roller **RK**, snap-action contact element **510**, M12 plug with PE connection **SVM5**  
**NG2RK-510SVM5**

**Order No. 089 020**

## Limit switch type series NG1.../NZ1...

- ▶ **Plunger actuator**
  - RG** (Roller plunger - plastic roller)
  - RS** (Roller plunger - steel roller)
  - RL** (Extended roller plunger)
- ▶ **Cable entry M20 x 1.5**

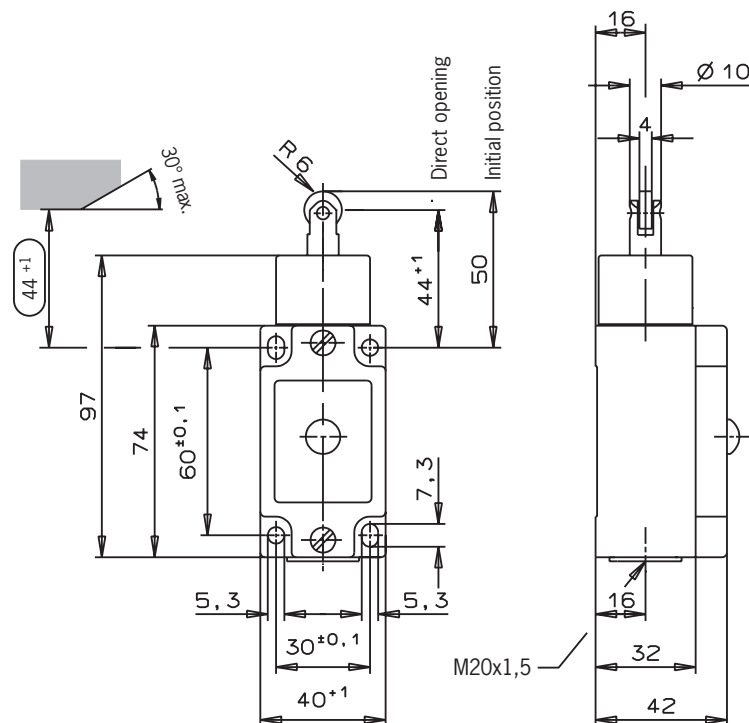
NG...



NZ...



## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
  - ES 511** Snap-action contact element  
1 direct opening action contact + 1 NO contact
  - ES 528H** Slow-action contact element  
1 direct opening action contact + 1 NO contact
  - ES 538H** Slow-action contact element  
2 direct opening action contacts
  - SK 2131H** Slow-action contact element  
3 direct opening action contacts + 1 NO contact
  - SK 3131H** Slow-action contact element  
2 direct opening action contacts + 2 NO contact
- (for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC  $\pm 15\%$  (on request) L110
- ▶ 230 V AC  $\pm 15\%$  (on request) L220

## Adjustment options

Horizontal  $4 \times 90^\circ$  (see page 8).

⚠ If damaged or worn, safety switches should be replaced as a unit.

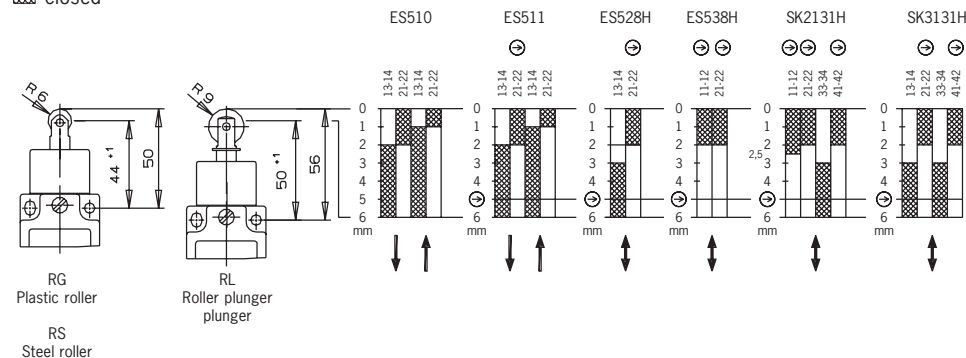
### Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam gap shown in the dimension  $44^{+1}$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Switch travel diagrams

### Contacts

- open
- ▨ closed



## Technical data

Parameters	Value				Unit	
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 67					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80				°C	
Weight	Approx. 0.3				kg	
Actuator	Roller plunger Plastic roller (RG)	Roller plunger Steel (RS)	Roller plunger Extended (RL)			
Approach speed, max. <sup>1)</sup>	20				m/min	
Approach speed, min.	0.1				m/min	
Repeat accuracy <sup>3)</sup>	± 0.1				mm	
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram				mm	
Actuating force, min.	15				N	
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖			
	ES 511 1 NC ⊖ + 1 NO	SK 2131H 3 NC ⊖ + 1 NO	SK 3131H 2 NC ⊖ + 2 NO			
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge				
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4				ms	
Contact bounce time	< 3				ms	
Rated impulse withstand voltage U <sub>imp</sub>	2.5				kV	
Rated insulation voltage U <sub>i</sub>	250				V	
Utilization category according to IEC 60947-5-1	AC12	I <sub>e</sub> 10 A U <sub>e</sub> 230 V	-			
	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V			
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	10/6	4				A gG
Type of connection	Screw terminal <sup>2)</sup>					
Conductor cross-section, max.	2 x 1.5				mm <sup>2</sup>	

1) The approach speed specified applies in conjunction with EUCHNER control cams is in accordance with DIN 69639.

2) For wiring diagram see page 9.

3) The reproducible repeat accuracy refers to the plunger's axial travel, after a run-in of approx. 2000 switching cycles

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Function Display	L060
NG1...-M	RG Roller plunger Plastic roller	-510	079 941	090 398
		-511	088 605	089 052
		-528	090 932	090 008
		-538	090 933	090 009
		-2131	090 934	-
		-3131	090 935	-
NG1...-M	RS Roller plunger Steel roller	-510	079 942	079 943
		-511	079 960	089 053
		-528	089 627	086 413
		-538	090 936	090 555
		-2131	089 633	-
		-3131	089 631	-
NG1...-M	RL Extended roller plunger	-510	086 324	090 602
		-511	088 614	088 996
		-528	090 937	090 938
		-538	090 939	090 940
		-2131	090 941	-
		-3131	090 942	-

**Ordering example:** Limit switch with safety function **NZ**, cable entry **1**,  
Roller plunger with plastic roller **RG**, snap-action contact element **511**,  
function display **L060** 10 - 60 V, metric thread M20 x 1.5 **M**  
**NZ1RG-511L060-M**

**Order No. 089 052**

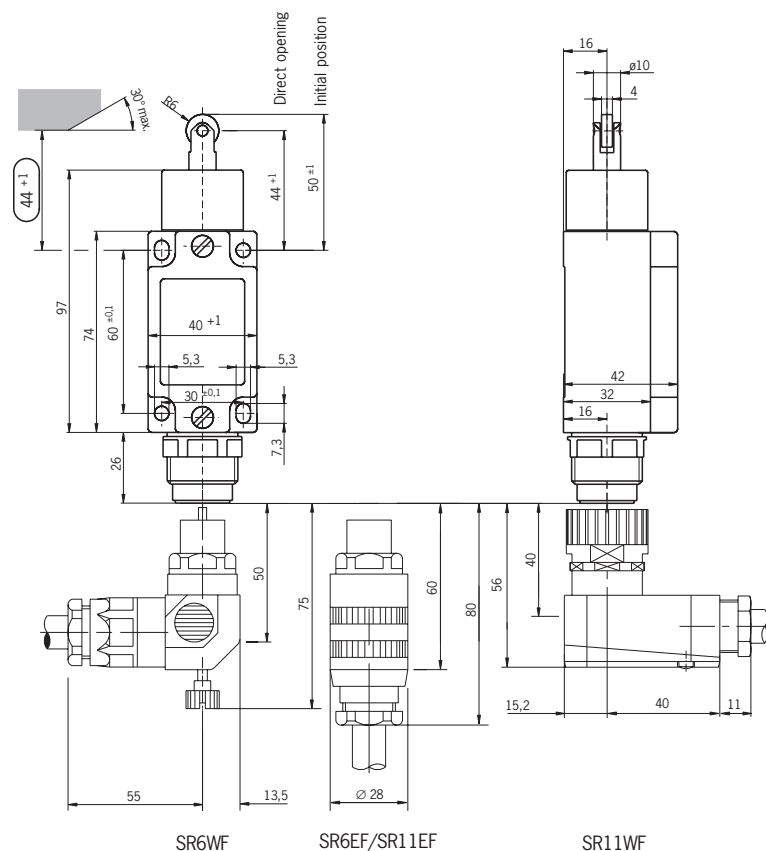
## Limit switch type series NG2.../NZ2...

- ▶ **Plunger actuator** **RG** (Roller plunger - plastic roller)  
**RS** (Roller plunger - steel roller)  
**RL** (Extended roller plunger)
- ▶ **Plug connectors** **SR6** and **SR11**

## NZ...



## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
- ES 511** Snap-action contact element  
1 direct opening action contact + 1 NO contact
- ES 528H** Slow-action contact element  
1 direct opening action contact + 1 NO contact
- ES 538H** Slow-action contact element  
2 direct opening action contacts
- SK 2131H** Slow-action contact element  
3 direct opening action contacts + 1 NO contact
- SK 3131H** Slow-action contact element  
2 direct opening action contacts + 2 NO contact

(for further details see page 9)

## LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

## Adjustment options

Horizontal 4 x 90° (see page 8).

⚠ If damaged or worn, safety switches should be replaced as a unit.

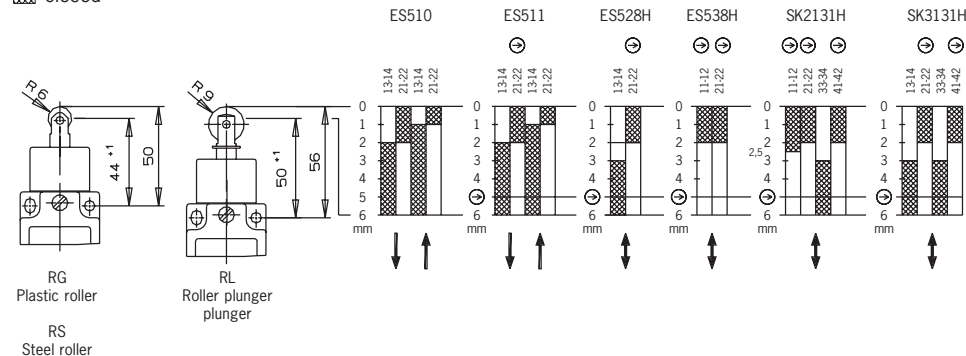
## Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam gap shown in the dimension  $44 \pm 0.1$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Switch travel diagrams

### Contacts

- open
- ▣ closed



## Technical data

Parameters	Value					Unit
Housing material	Anodized die-cast alloy					
Degree of protection according to IEC 60529	IP 65					
Installation position	Optional					
Mechanical service life	30 x 10 <sup>6</sup> switching cycles					
Ambient temperature	-25 to +80					°C
Weight	Approx. 0.3					kg
Actuator	Roller plunger Plastic roller (RG)	Roller plunger Steel (RS)	Roller plunger Extended (RL)			
Approach speed, max. <sup>1)</sup>	20					m/min
Approach speed, min.	0.1					m/min
Repeat accuracy <sup>3)</sup>	± 0.1					mm
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram					mm
Actuating force, min.	15					N
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖			
	ES 511 1 NC ⊖ + 1 NO	SK 2131H 3 NC ⊖ + 1 NO	SK 3131H 2 NC ⊖ + 2 NO			
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge				
Contact material	Silver alloy, gold flashed					
Contact closing time	< 4					ms
Contact bounce time	< 3					ms
Rated impulse withstand voltage U <sub>imp</sub>	2.5	2.5				kV
Switching current min. at	10	1	10	1	10	mA
Switching voltage	24	24	12	24	12	V DC
Conventional thermal current I <sub>th</sub>	6	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	6	4				A gG
Type of connection	Plug connector to DIN 43651 <sup>2)</sup>					
Rated insulation voltage U <sub>i</sub>						
with plug connector SR6	250					V
with plug connector SR11	50					
Rated impulse withstand voltage U <sub>imp</sub>						
with plug connector SR6	2.5					kV
with plug connector SR11	1.5					
Utilization category according to IEC 60947-5-1						
with plug connector SR6	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V			
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			
with plug connector SR11	AC15	I <sub>e</sub> 4 A U <sub>e</sub> 50 V	I <sub>e</sub> 4 A U <sub>e</sub> 50 V			
	DC13	I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V			

1) The approach speed specified applies in conjunction with EUCHNER control cams is in accordance with DIN 69639.

2) For wiring and derating diagram see page 10.

3) The reproducible repeat accuracy refers to the plunger's axial travel, after a run-in of approx. 2000 switching cycles

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			None	Function Display L060
NG2...	RG Roller plunger Plastic roller	-510	090 021	090 949
		-511	090 032	091 284
		-528	090 943	090 944
		-538	090 945	090 946
		-2131	090 947	-
		-3131	090 948	-
NG2...	RS Roller plunger Steel roller	-510	090 953	on request
		-511	090 024	090 147
		-528	090 950	088 197
		-538	090 951	090 952
		-2131	090 149	-
		-3131	090 954	-
NG2...	RL Extended roller plunger	-510	090 022	091 285
		-511	090 025	090 955
		-528	090 956	091 282
		-538	090 957	091 278
		-2131	090 958	-
		-3131	090 959	-

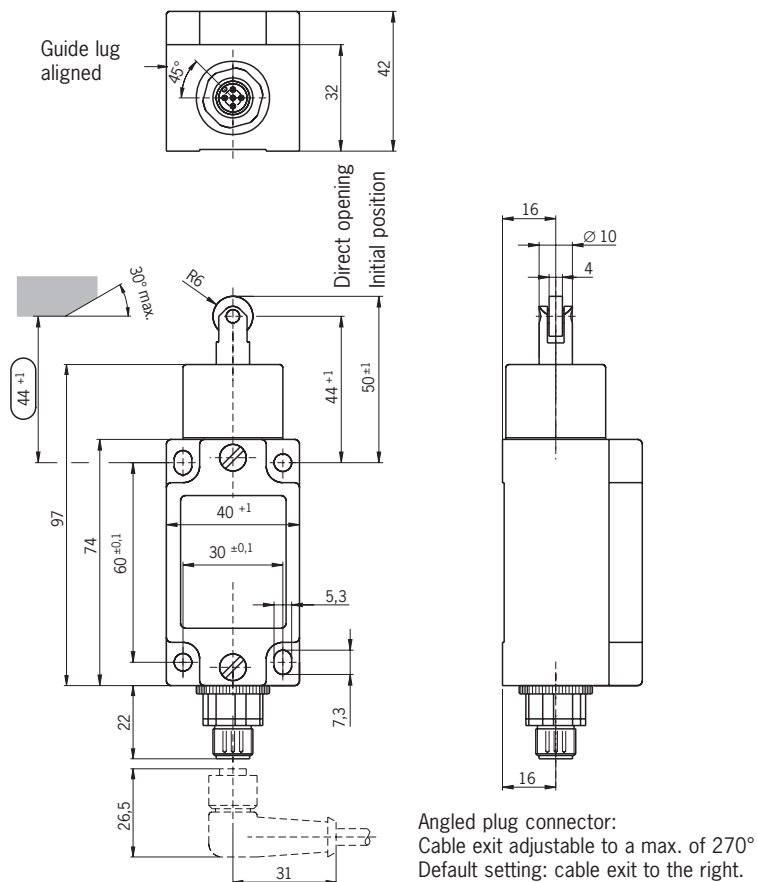
## Limit switch type series NG2.../NZ2...

- ▶ **Plunger actuator** **RG** (Roller plunger - plastic roller)  
**RS** (Roller plunger - steel roller)  
**RL** (Extended roller plunger)
- ▶ **M12 plug connector**

NZ...



## Dimension drawing



## Switching elements

- ES 510** Snap-action contact element  
1 NC contact + 1 NO contact
- ES 511** Snap-action contact element  
1 direct opening action contact  
+ 1 NO contact
- ES 528H** Slow-action contact element  
1 direct opening action contact  
+ 1 NO contact
- ES 538H** Slow-action contact element  
2 direct opening action contacts  
(for further details see page 9)

## LED function display

Available on request

## Adjustment options

Horizontal 4 x 90° (see page 8).

⚠ If damaged or worn, safety switches should be replaced as a unit.

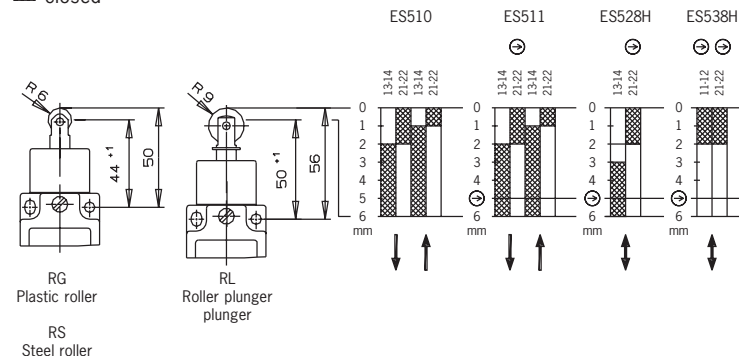
### ⚠ Notes on installation for limit switches with safety switching elements

To obtain the direct opening travel, the switching cam gap shown in the dimension  $44 \pm 1$  must be complied with. Actuation elements such as cam approach guides must be firmly mounted in accordance EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.

## Switch travel diagrams

### Contacts

- open
- ▨ closed





## Technical data

Parameters	Value				Unit
Housing material	Anodized die-cast alloy				
Degree of protection according to IEC 60529	IP 67				
Installation position	Optional				
Mechanical service life	30 x 10 <sup>6</sup> switching cycles				
Ambient temperature	-25 to +80				°C
Weight	Approx. 0.3				kg
Actuator	Roller plunger Plastic roller (RG)	Roller plunger Steel (RS)	Roller plunger Extended (RL)		
Approach speed, max. <sup>1)</sup>	20				m/min
Approach speed, min.	0.1				m/min
Repeat accuracy <sup>3)</sup>	± 0.1				mm
Direct opening action contact according to IEC 60947-5-1, appendix K	See symbol ⊖ in switch travel diagram				mm
Actuating force, min.	15				N
Switching elements	ES 510 1 NC + 1 NO	ES 528H 1 NC ⊖ + 1 NO	ES 538H 2 NC ⊖		
	ES 511 1 NC ⊖ + 1 NO				
Switching principle	Snap-action contact element	Slow-action contact element with H-contact bridge			
Contact material	Silver alloy, gold flashed				
Contact closing time	< 4				ms
Contact bounce time	< 3				ms
Rated impulse withstand voltage U <sub>imp</sub>	2.0				kV
Rated insulation voltage U <sub>i</sub>	50				V
Utilization category according to IEC 60947-5-1 with SVM5 plug connector	AC15	I <sub>e</sub> 4 A U <sub>e</sub> 30 V	I <sub>e</sub> 4 A U <sub>e</sub> 30 V		
	DC13	I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 24 V		
Switching current min. at	10	1	10	1	10
Switching voltage	24	24	12	24	12
Conventional thermal current I <sub>th</sub>	4				A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	4				A gG
Type of connection	M12 plug connector <sup>2)</sup>				

1) The approach speed specified applies in conjunction with EUCHNER control cams is in accordance with DIN 69639.

2) For wiring diagram see page 10.

3) The reproducible repeat accuracy refers to the plunger's axial travel, after a run-in of approx. 2000 switching cycles

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Plug Connector SVM5	
NG2...	RG Roller plunger Plastic roller	-510	090 960	
		-511	090 026	
NZ2...		-528	090 961	
		-538	090 962	
NG2...	RS Roller plunger Steel roller	-510	088 632	
		-511	090 027	
NZ2...		-528	090 963	
		-538	090 964	
NG2...	RL Extended roller plunger	-510	on request	
		-511	090 028	
NZ2...		-528		
		-538	on request	

**Ordering example:** Limit switch with safety function **NZ**, plug connector **2**,  
Roller plunger with plastic roller **RG**, snap-action contact element **511**,  
M12 plug with PE connection **SVM5**  
**NZ2RG-511SVM5**

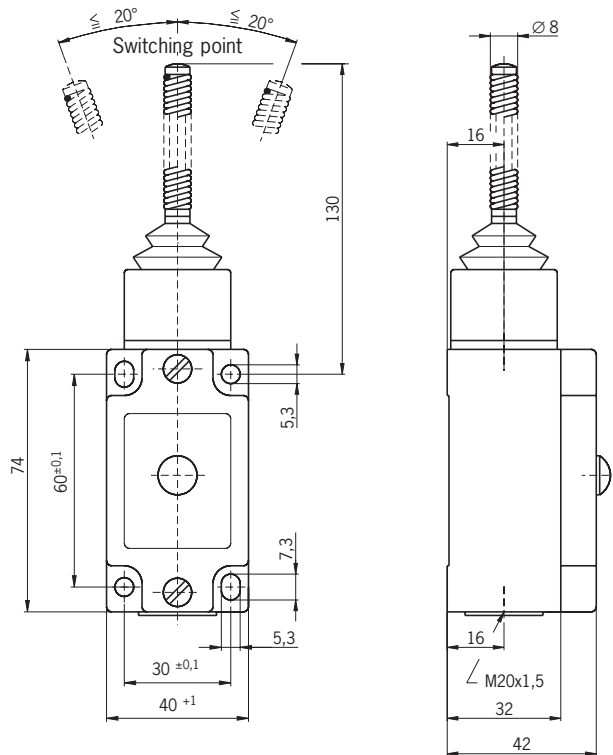
**Order No. 090 026**

## Limit switch type series NG1...



- ▶ Spring actuator FO
- ▶ Cable entry M20 x 1.5 (plug connector on request)

### Dimension drawing



### Switching elements

**ES 510** Snap-action contact element  
 1 NC contact + 1 NO contact  
 (for further details see page 9)

### LED function display

A red function display LED is available for the following voltage ranges:

- ▶ 12-60 V AC/DC (as standard) L060
- ▶ 110 V AC ±15% (on request) L110
- ▶ 230 V AC ±15% (on request) L220

### Adjustment options

Horizontal 4 x 90° (see page 8).

## Technical data

Parameters	Value	Unit
Housing material	Anodized die-cast alloy	
Degree of protection according to IEC 60529	IP 67	
Installation position	Optional	
Mechanical service life	30 x 10 <sup>6</sup> switching cycles	
Ambient temperature	-25 to +80	°C
Weight	Approx. 0.35	kg
Actuator	Spring actuator made of spring steel wire (FO)	
Approach speed, max.	20	m/min
Approach speed, min.	0.5	m/min
Actuating force, min.	5	N
Switching elements	ES 510 1 NC + 1 NO	
Switching principle	Snap-action contact element	
Contact material	Silver alloy, gold flashed	
Contact closing time	< 4	ms
Contact bounce time	< 3	ms
Rated impulse withstand voltage U <sub>imp</sub>	2.5	kV
Rated insulation voltage U <sub>i</sub>	250	V
Utilization category according to IEC 60947-5-1		
	AC12	I <sub>e</sub> 10 A U <sub>e</sub> 230 V
	AC15	I <sub>e</sub> 6 A U <sub>e</sub> 230 V
	DC13	I <sub>e</sub> 6 A U <sub>e</sub> 24 V
Switching current min. at	10	mA
Switching voltage	24	V DC
Conventional thermal current I <sub>th</sub>	6	A
Short-circuit protection according to IEC 60269-1 (control circuit fuse)	10/6	A gG
Type of connection	Screw terminal <sup>1)</sup>	
Conductor cross-section, max.	2 x 1.5	mm <sup>2</sup>

1) For wiring diagram see page 9.

## Ordering table

Type Series	Roller	Switching Element	Order No.	
			Function Display None	L060
<b>NG1...-M</b>	<b>FO</b> Spring actuator	-510	079 911	090 029

**Ordering example:** Limit switch without safety function **NG**, cable entry **1**,  
Spring actuator made of spring steel wire **FO**, snap-action contact element **510**,  
function display **L060** 10 - 60 V, metric thread M20 x 1.5 **M**  
**NG1FO-510L060-M**

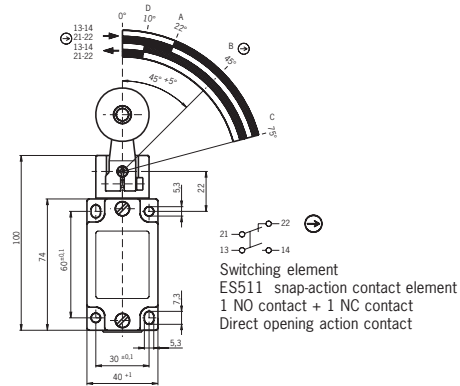
**Order No. 090 029**

## Customized versions (other customized designs available on request)

### Limit switch with large plastic roller

Diameter 30 mm

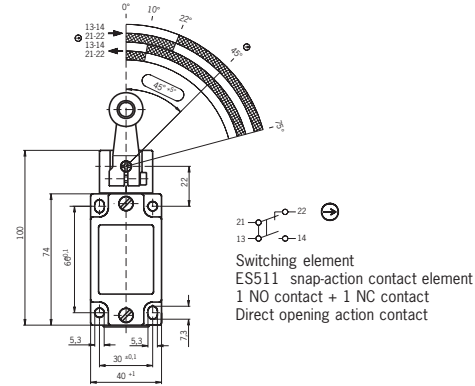
Article	Order No.
NZ1HB-511-MC569	079 965



### Limit switch with sealed ball bearings

Diameter 19 mm

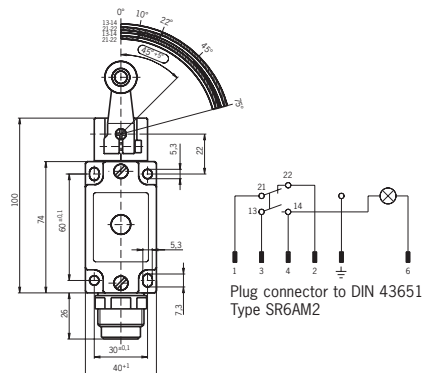
Article	Order No.
NZ1HS-511-MC1833	091 312



### Limit switch with plug connector to DIN 43651

VW/Audi, VW mat. no. 2348

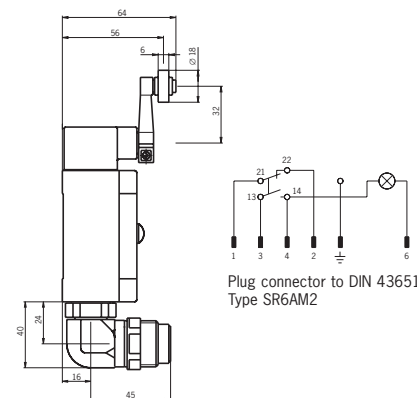
Article	Order No.
NZ2HB-511L060C1630	054 121



### Limit switch with plug connector and angled piece to DIN 43651

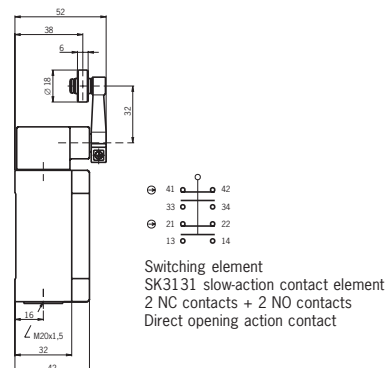
VW/Audi, VW mat. no. 2349

Article	Order No.
NZ2HB-511L060C1631	054 122



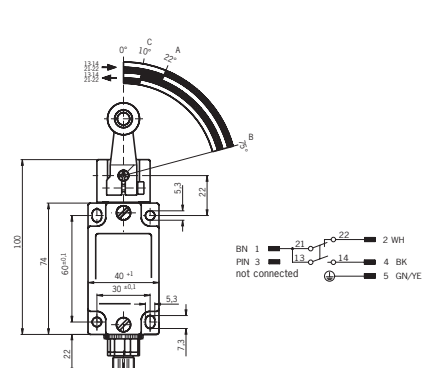
### Limit switch with steel roller on the inside of the lever

Article	Order No.
NZ1HS-3131-MC1779	079 996



### Limit switch with M12 plug connector and pin assignment for LED display (pin 3 not used)

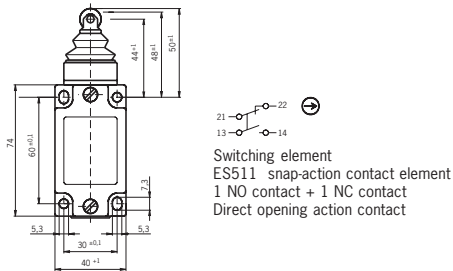
Article	Order No.
NG2HB-510SVM5C1883	086 561



## Limit switch with protective NBR bellows on the plunger guide

Protection against serious contamination and aggressive coolants

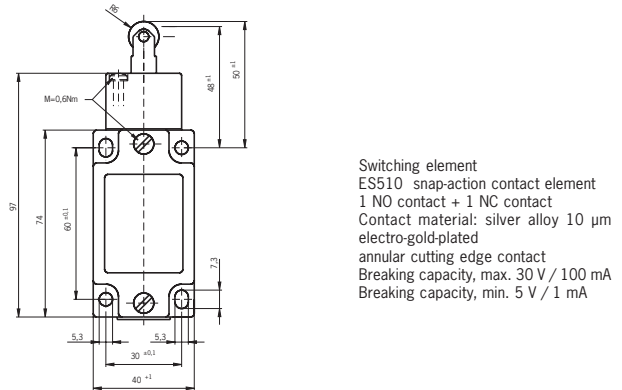
Article	Order No.
NZ1RS-511-MC1588	091 352



## Limit switch with gold plated contacts

For switching low currents of at least 1 mA

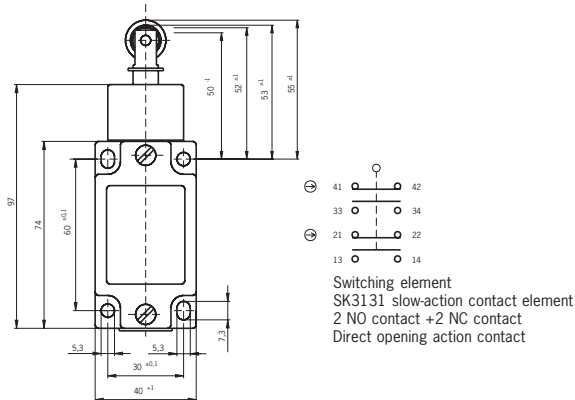
Article	Order No.
NZ1RS-510AU-M	090 416



## Limit switch with sealed ball bearings

Diameter 16 mm

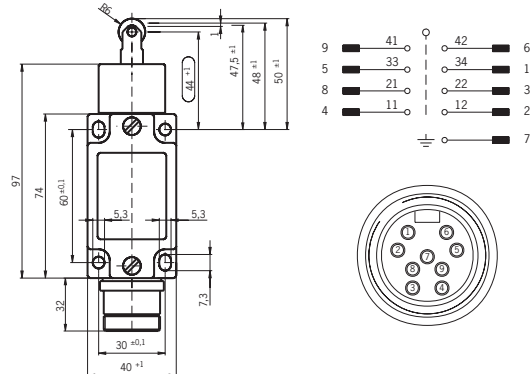
Article	Order No.
NZ1RL-3131-MC1831	089 082



## Limit switch with MENCOM plug connector

MIN-9MR-1-18

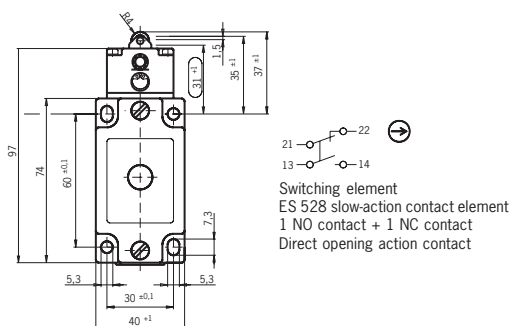
Article	Order No.
NZ1RS-2131-9C-GMMF	077 362



## Limit switch with small ball bearing

For high approach speeds and long travel distances

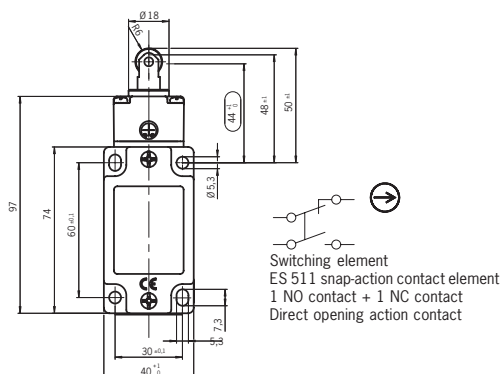
Article	Order No.
NZ1RK-528-MC1912	090 572



## Limit switch with steel bush

For high approach speed

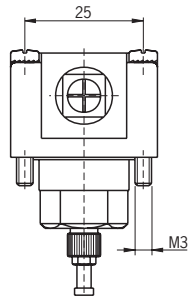
Artikel	Best. Nr.
NZ1RS-511-MC782	093 141



## Accessories

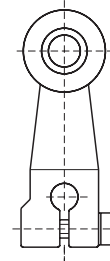
### Lever-arm actuation

Article	Order No.
NSA	012 051



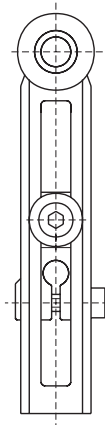
### Roller arm

Article	Order No.
NHB (plastic roller)	012 042
NHS (steel roller)	012 043
NHSC1834 (ball bearing Ø 19 mm)	077 349



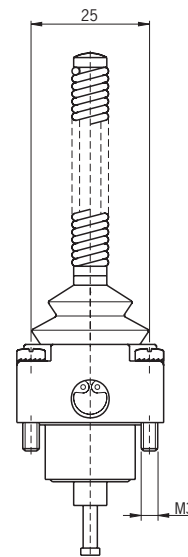
### Adjustable roller lever

Article	Order No.
NVB (plastic roller)	012 064
NVS (steel roller)	012 065



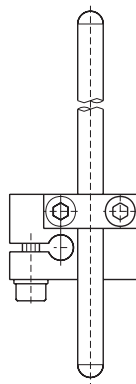
### Spring actuator

Article	Order No.
NFO (spring steel wire)	011 909



### Rod lever

Article	Order No.
NSB (plastic rod)	012 052
NSM (aluminum rod)	012 053

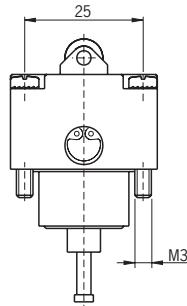


## Note

The actuator heads shown are spare parts for limit switches without safety function. They do not fit limit switches with safety function and must not be operated with these switches!

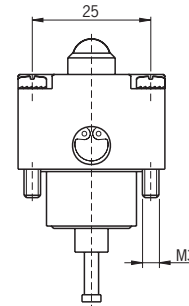
## Actuator with small roller plunger

Article	Order No.
NRK (small steel roller)	012 049



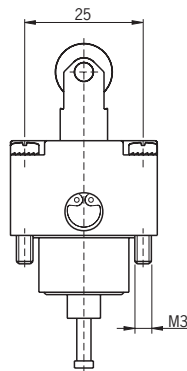
## Actuator with ball plunger

Article	Order No.
NKO (steel ball)	012 045



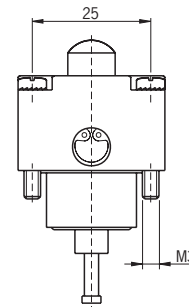
## Actuator with roller plunger Ø 12 mm

Article	Order No.
NRG (plastic roller)	012 046
NRS (steel roller)	012 047



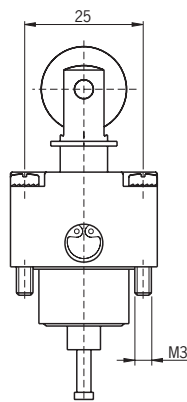
## Actuator with domed plunger

Article	Order No.
NWO (polish-ground dome)	012 066



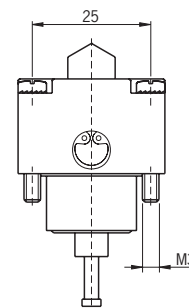
## Actuator with extended roller plunger Ø 18 mm

Article	Order No.
NRL (large steel roller)	012 050



## Actuator with chisel plunger

Article	Order No.
NDO (polish-ground chisel plunger)	011 908

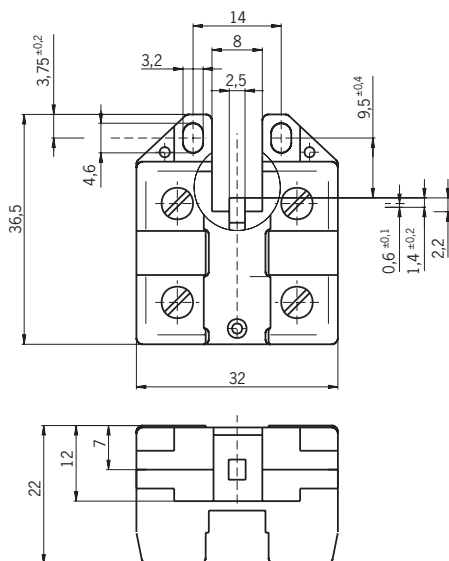


## Note

The actuator heads shown are spare parts for limit switches without safety function. They do not fit limit switches with safety function and must not be operated with these switches!

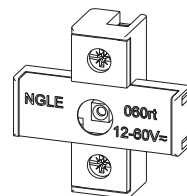
## Switching element ES 510 for type series NG...

Article	Order No.
ES 510	010 422



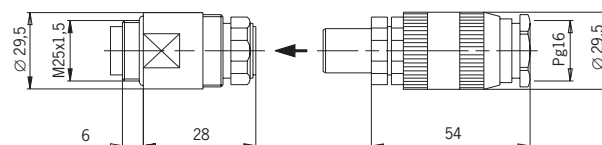
## LED function display for type series NG.../NZ...

Article	Voltage [V]	Current [mA]	Order No.
NGLE 060 rt	12 -60 AC/DC	≤ 6.5	029 220
NGLE 110 rt	110 ±15% AC	≤ 3.5	045 822
NGLE 220 rt	230 ±15% AC	≤ 3.5	045 825



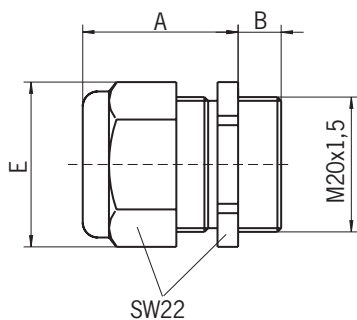
## Plug / socket plug 12-pole

Article	Order No.
Plug SD 12-M	085 648
Socket plug BS 12	002 763



## Cable gland M20 x 1.5

Article	Outer cable diameter [mm]	A	B	E	Order No.
EKVM20/06	6.5 - 9.5	20	6	24.5	077 683
EKVM20/09	9 - 13	21	6	24.5	077 684



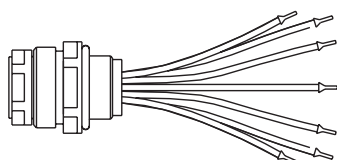
## Technical data

Parameters	Value
Housing material	Metal
Number of poles	11 + PE
Nominal voltage	250 V <sub>≐</sub>
Level of contamination VDE 0110	2
Type of connection	Soldered connections
Conductor cross-section, max.	1 mm <sup>2</sup>
Contact material / surface	CuZn 1μ hard gold-plated
Clamping for cable	12 - 14 mm
Degree of protection according to IEC 60 529	IP65 /inserted
Ambient temperature range	-20 °C to +80 °C

## Appliance socket 7-pole

for type series NG.../NZ... with plug connector SR6

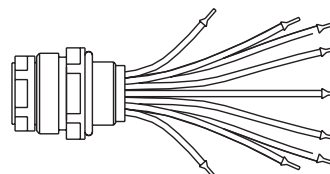
Article	Order No.
Appliance socket 7-pole NG/NZ-SR6	093 342



## Appliance socket 12-pole

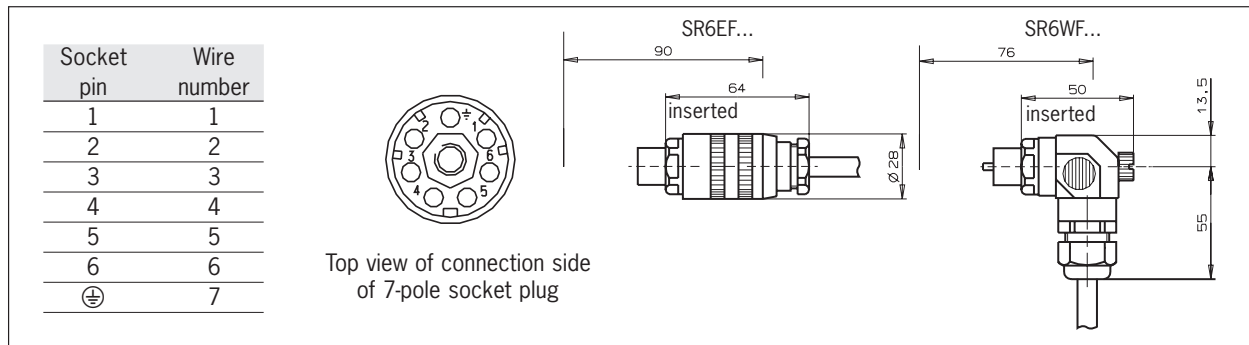
for type series NG.../NZ... with plug connector SR11

Article	Order No.
Appliance socket 12-pole NZ-SR11	093 343





## Plug connector SR6 (socket 6+PE) with / without connection cable



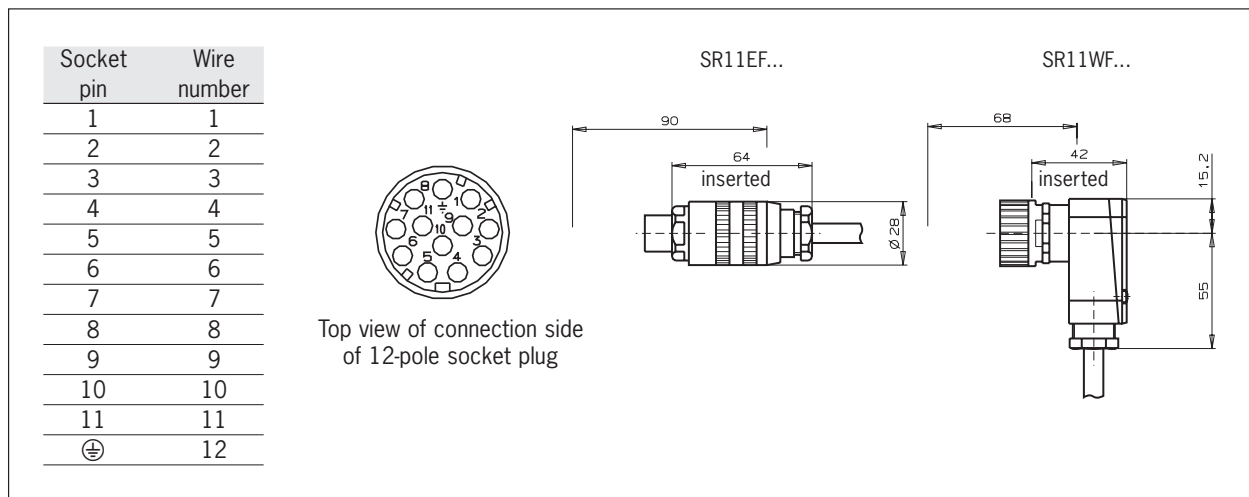
### Technical data

Parameters	Value
Housing material	plastic
Number of poles	6 + PE
Nominal voltage	250 V <sub>≐</sub>
Degree of protection according to IEC 60 529	IP65 /inserted
Connection cable	PUR grey
Outer diameter	∅ 8 mm
Wire cross-section	1.0 mm <sup>2</sup>

### Ordering table

Plug type	Connection cable	Product designation	Order No.
	None	SR6EF	013 176
Socket straight	5 m	SR6EF-5000	077 632
	10 m	SR6EF-10000	077 633
	15 m	SR6EF-15000	077 634
	None	SR6WF	024 999
Socket angled	5 m	SR6WF-5000	077 638
	10 m	SR6WF-10000	077 639
	15 m	SR6WF-15000	077 640

## Plug connector SR11 (socket 11+PE) with / without connection cable



### Technical data

Parameters	Value
Housing material	plastic
Number of poles	11 + PE
Nominal voltage	50 V <sub>≐</sub>
Degree of protection according to IEC 60 529	IP65 /inserted
Connection cable	PUR grey
Outer diameter	∅ 10.5 mm
Wire cross-section	1.0 mm <sup>2</sup>

### Ordering table

Plug type	Connection cable	Product designation	Order No.
	None	SR11EF	070 859
Socket straight	5 m	SR11EF-5000	077 629
	10 m	SR11EF-10000	077 630
	15 m	SR11EF-15000	077 631
	None	SR11WF	054 773
Socket angled	5 m	SR11WF-5000	077 635
	10 m	SR11WF-10000	077 636
	15 m	SR11WF-15000	077 637