

Correct use

Precision multiple limit switches are used for positioning and controlling machines and in industrial installations.

For general applications, snap-action switching elements ES 502 E are used. In safety circuits, only the switching elements ES 508E and ES 514 with positively driven normally closed contacts are allowed.

Correct use includes compliance with the relevant requirements for installation and operation, in particular

- ▶ EN 60204-1, electrical equipment of machines.
- ▶ EN 954-1, safety related parts of control systems, Annex B.
- ▶ EN ISO 14121, Safety of machinery. Principles for risk assessment.

Incorrect use

Precision multiple limit switches with switching element ES 502 E (snap-action switching element not positively driven) must not be used in safety circuits.

⚠ Safety precautions ⚠

In safety circuits, only the switching elements ES 508E or ES 514 with positively driven normally closed contacts are allowed.

Precision multiple limit switches in safety circuits provide a personal protection function. Incorrect installation or tampering can lead to severe injuries to personnel.

⚠ Precision multiple limit switches in safety circuits must **not** be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective.

⚠ On the use of precision multiple limit switches in safety circuits, switches and trip dogs must be arranged such that they are adequately secured against movement.

To meet these requirements:

- ▶ The fixings must be reliable and must also require the use of a tool to undo them.
- ▶ The use of slots must be limited to the initial adjustment.
- ▶ Precautions must be taken to ensure that there is no movement after adjustment (e.g. using bolts or dowel pins).

The letters on the rating plate represent the product's year of manufacture.

Function

Precision multiple limit switches possess several switching elements arranged in a row.

The switching elements are actuated by means of plungers. Different plunger types and trip dogs are used depending on the application (operating point accuracy and approach speed).

In general applications the plunger is actuated by trip dogs in accordance with DIN 69639 which are mounted with an interference fit in trip rails in accordance with DIN 69638.

Switching elements / pin assignment

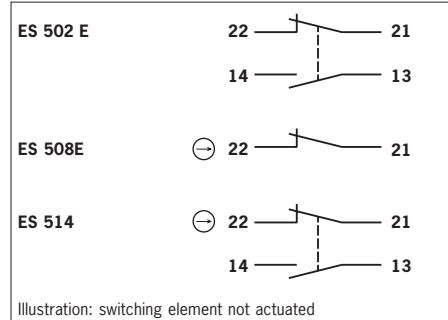


Figure 1: Switching elements and pin assignment

Mounting

- ⚠ Mounting must be performed only by authorized personnel.
- ⚠ Precision multiple limit switches must not be used as an end stop.
- ⚠ When used in safety circuits, positively mount trip dogs on the machine/safety guard so that they cannot be detached.
- ⚠ It is imperative that dimension $\phi_{3.05}$ (distance from switch reference surface to trip dog, see Figure 3) is maintained in safety circuits to ensure safe contact opening.

Fit precision multiple limit switches so that

- ▶ Connection cables and plug connectors are not damaged by moving parts of the machine.

Protection against environmental effects

Safety valves are used to equalize the pressure to protect against the pumping action of the plunger. They must not be sealed with paint.

- ▶ Mask plunger, plunger guide, safety valves and rating plate during painting work!

Electrical connection

- ⚠ Electrical connection must be performed only by authorized personnel

The following applies for switches with UL approval:

For use and applications as per the requirements of ϕ_{UL} , a class 2 power supply or a class 2 transformer according to UL1310 or UL1585 must be used.

Connection cables for precision multiple limit switches installed at the place of use must be separated from all moving and permanently installed cables and un-insulated active elements of other parts of the system which operate at a voltage of over 150 V. A constant clearance of 50.8 mm must be maintained. This does not apply if the moving cables are equipped with suitable insulation materials which possess an identical or higher dielectric strength compared to the other relevant parts of the system.

On the use of indicators, the voltage range printed on the indicator housing must be observed (connection see Figure 5).

- ▶ Open switch cover
- ▶ Conductor cross-section 0.34 ... 1.5 mm²
- ▶ For switch type SN in LED version with switching element ES514 and plunger spacing 12 mm the following applies: Make LED connections to the switching element (connection see Figure 5)
- ▶ For pin assignment see Figure 1

- ▶ Fit EUCHNER cable gland M20x1.5 or similar quality cable gland with captive O-ring
- ▶ Seal cable carefully. Sealing ring must be matched to the diameter of the cable.
- ▶ Tighten screws for connections to the switching element to 0.6 Nm
- ▶ Close switch cover and tighten cover screws to 1.5 Nm.

Setup

- ▶ Mechanical function test
- ▶ Actuate plunger and check the switching function

- ▶ Electrical function test
- ▶ Start the machine
- ▶ Check correct function
- ▶ In safety circuits, check the safety function: Machine must **stop** when the safety switching element is actuated. Machine must **not start** when the safety switching element is actuated.

Service and inspection

No servicing is required, but **regular inspection** of the following is necessary to ensure trouble-free long-term operation:

- ▶ correct switching function
- ▶ secure mounting of components
- ▶ precise adjustment of trip dog in relation to multiple limit switch
- ▶ dirt and wear
- ▶ sealing of cable entry
- ▶ loose cable connections..

- ⚠ In safety circuits, the entire multiple limit switch must be replaced in case of damage or wear. Repairs are only to be made by the manufacturer.

The multiple limit switches in safety circuits must be replaced when the max. number of operating cycles is reached.

Exclusion of liability under the following conditions:

- ▶ if the unit is not used for its intended purpose
- ▶ non-compliance with safety regulations
- ▶ installation and electrical connection not performed by authorized personnel
- ▶ failure to perform functional checks.

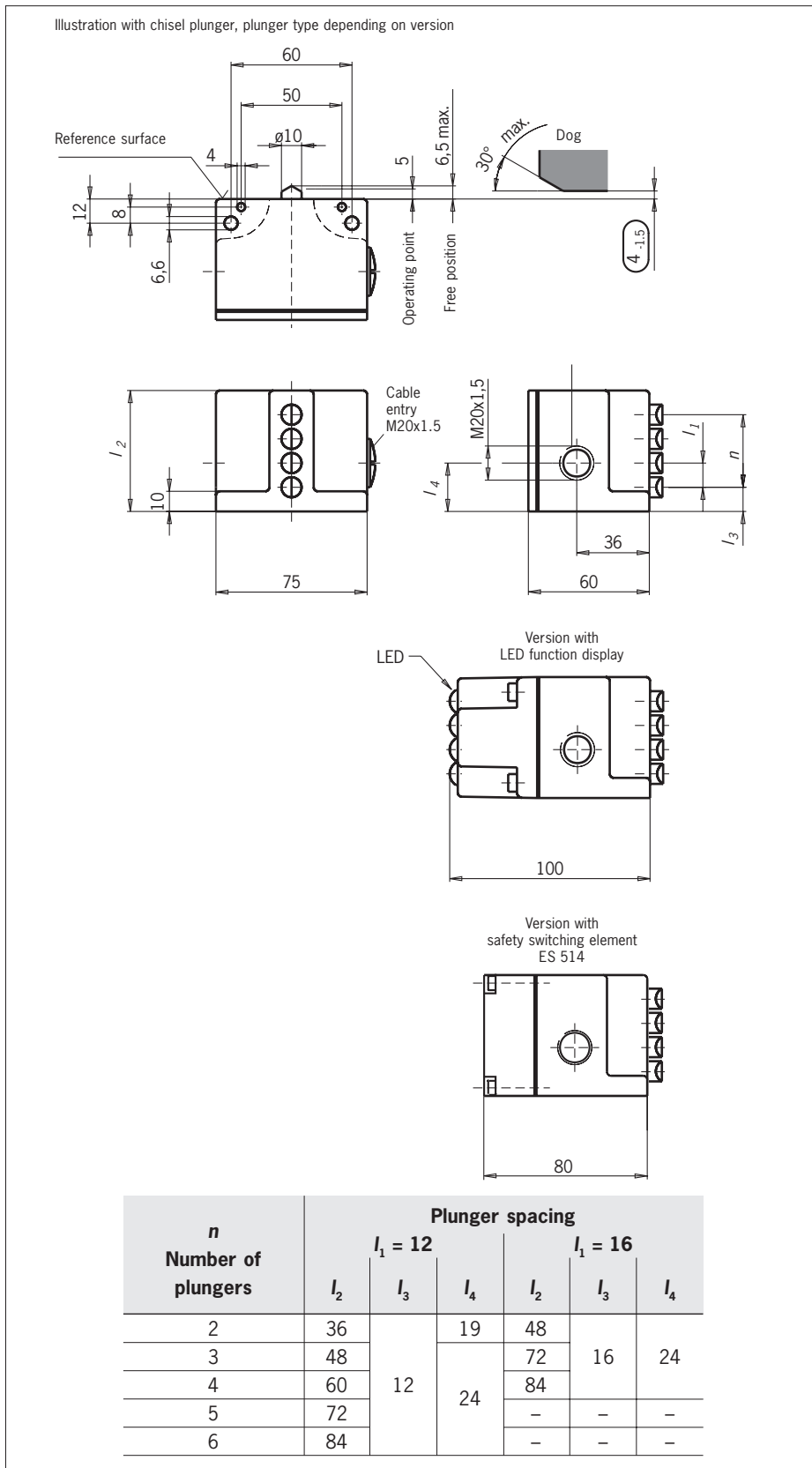


Figure 2: Dimension drawing SN...

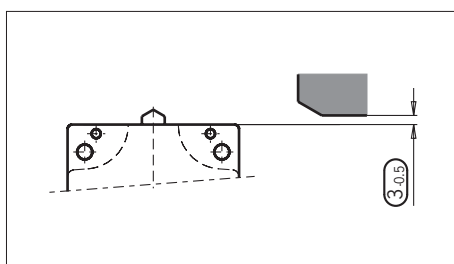


Figure 3: Mounting SN...-508 and SN...-514 for safety circuits

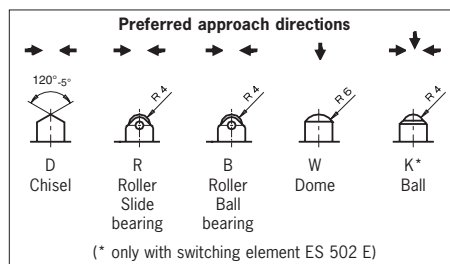


Figure 4: Plungers and approach directions

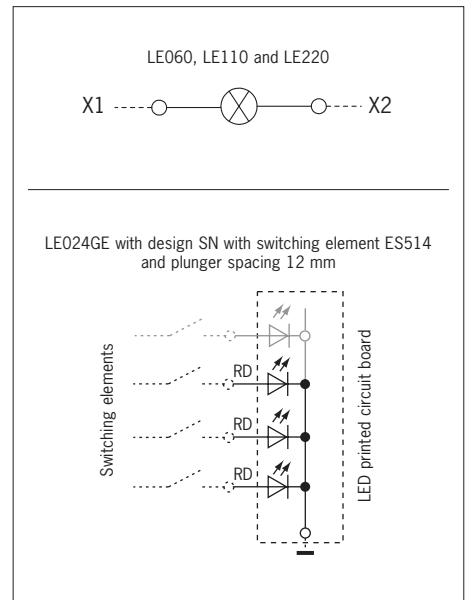


Figure 5: LED connection

Technical data

Parameters	Value
Housing material	Die-cast aluminum, anodized
Plunger material	Stainless steel
Degree of protection according to IEC 60529	IP 67
Mech. operating cycles	ES502E / ES508E 30x10 ⁶ ES514 1x10 ⁶
Switching frequency	ES502E 300 min ⁻¹ ES508E / ES514 50 min ⁻¹
Ambient temperature	-5 ... +80°C
Installation position	Any
Approach speed, max.	
Plunger Chisel D	40 m/min
Roller R (slide bearing)	80 m/min
Roller B (ball bearing)	120 m/min
Dome W/ball K	10 m/min
Approach speed, min.	0,01 m/min
Actuating force with switching element	ES502E ≥ 20 N ES508E ≥ 15 N ES514 ≥ 30 N
Switching element	
ES502E	1 NO contact + 1 NC contact
ES508E	1 positively driven contact
ES514	1 NO + 1 positively driven contact
Switching principle	
ES502E / ES514	Snap-action switching element
ES508E	Slow-action switching element
Differential travel	ES502E 0,8 mm ES514 0,6 mm
Contact material	Silver alloy, gold flashed
ES502E / ES508E / ES 514	
Type of connection	Screw terminals
Conductor cross-section	0,34 ... 1,5 mm ²
Rated insulation voltage	U _i = 250 V
Rated impulse withstand voltage	U _{imp} = 4 kV
Utilization category switching element according to IEC 60947-5-1	
ES502E	AC-12 250 V 10 A
ES502E / ES508E	AC-15 230 V 6 A DC-13 24 V 6 A
ES514	AC-15 230 V 2,5 A DC-13 24 V 6 A
Switching current, min., at DC 12 V	ES514 5 mA ES508E 10 mA ES502E 10 mA
Conventional thermal current I _{th}	10 A
Short circuit protection according to IEC 60269-1 (control circuit fuse)	ES502E / ES508E 10 A gG ES514 6 A gG
Indicator LED with reverse polarity protection	
with ES502E / ES508E	LE060 AC/DC 12 - 60 V LE110 AC 110 V ± 15% LE220 AC 220 V ± 15%
For design SN in LED version with switching element ES514 and plunger spacing 12 mm	LE024GE DC24 V ± 10%