

Correct use

Precision single limit switches according to DIN 43 693 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 NC contacts are allowed.

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

- ▶ EN 60204-1, Safety of machinery. Electrical equipment of machines. General requirements
- ▶ EN 954-1, Safety of machinery. Safety related parts of control systems. General principles for design, Annex B
- ▶ EN 1050, Safety of machinery. Principles for risk assessment.

Incorrect use

Precision single limit switches with switching element ES 502 E (snap-action contact 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 NC contacts are allowed.

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

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

⚠ On the use of precision single 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

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) (see Figure 6).

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

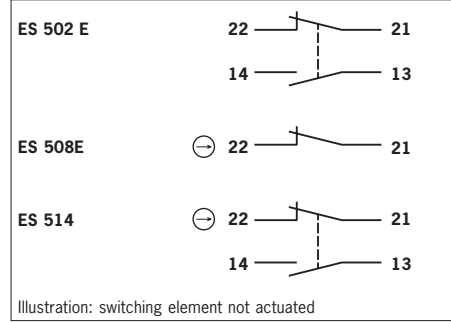


Figure 1: Switching elements and pin assignment

Changing the approach direction

The approach direction can be adjusted by 90° on chisel and roller plungers.

After unscrewing the locking screw, the plunger can be changed easily to the required direction.

After changing the direction, the locking screw must be refitted (see Figure 2).

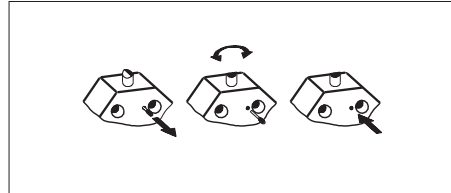


Figure 2: Changing the approach direction

Mounting

⚠ Mounting must be performed only by authorized personnel.

⚠ Precision single 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 (12.45) (distance from switch reference surface to trip dog, see Figure 4) is maintained in safety circuits to ensure safe contact opening.

Fit precision single 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 us, a class 2 power supply or a class 2 transformer according to UL1310 or UL1585 must be used.

Connection cables for precision single 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.

- ▶ Version N1A...M (cable entry)
- ▶ Open switch cover
- ▶ Conductor cross-section 0.34 ... 1.5 mm²
- ▶ For pin assignment see Figure 1
- ▶ Fit EUCHNER cable gland M20x1.5 or similar quality cable gland with captive O-ring. The thread on the gland must not be longer than 6.5 mm.
- ▶ 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 0.5 Nm.
- ▶ Version N1A...SVM5 (plug connector M12)
- ▶ For pin assignment see Figure 7.

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 precision single limit switch
- ▶ dirt and wear
- ▶ sealing of cable entry
- ▶ loose cable connections.

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

The precision single 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.

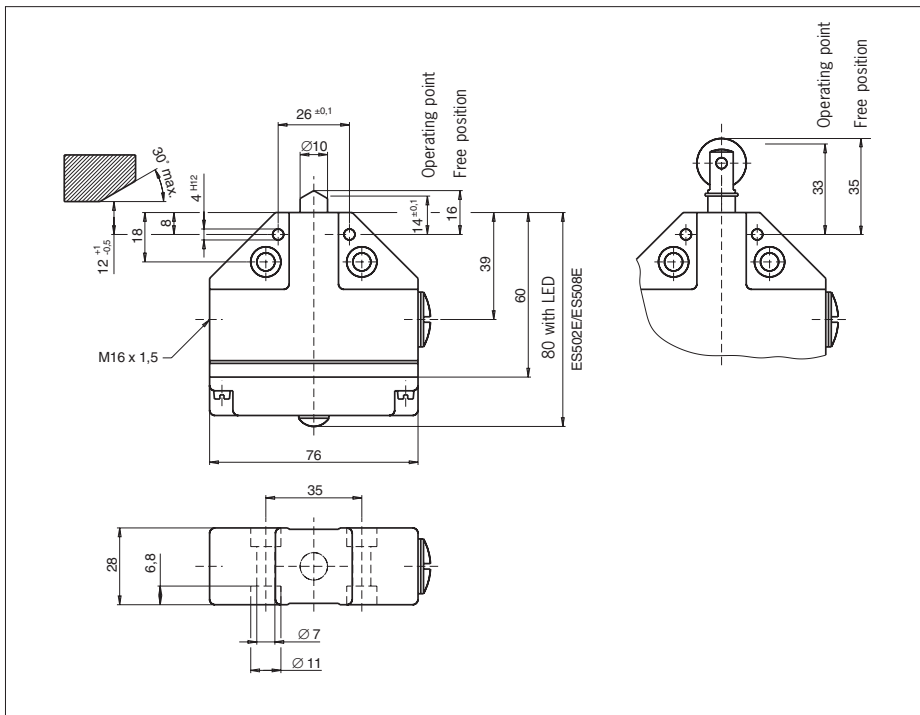


Figure 3: Dimension drawing N1A.502

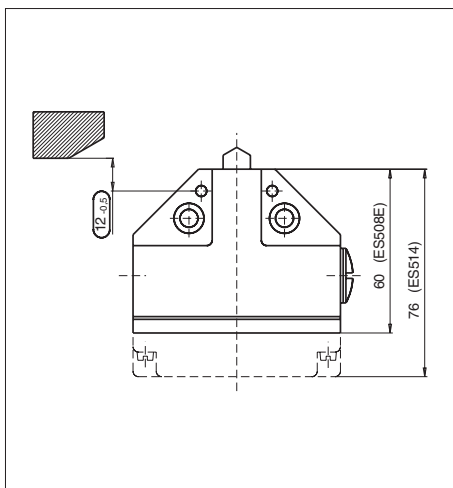


Figure 4: Dimension drawing N1A.508/...514

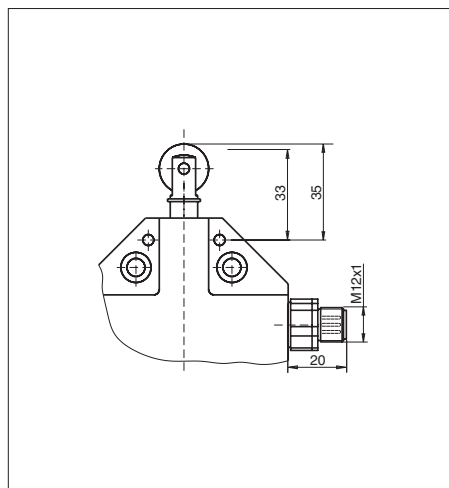


Figure 5: Dimension drawing N1A... with plug connector M12

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	ES502E -5 ... + 80 °C ES 508E / ES514 -25 ... + 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 Extended roller 20 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 contact element
Differential travel	ES502E 0.8 mm ES514 0.6 mm
Contact material	ES502E / ES508E / ES 514 Silver alloy, gold flashed
Connection type	N1A...M Screw terminals N1A...SVM5... Plug connector M12
Conductor cross-section	0.34 ... 1.5 mm ²
Rated insulation voltage	
with cable entry	U _i = 250 V
with plug connector	U _i = 50 V
Rated impulse withstand voltage	
with cable entry	U _{imp} = 4 kV
with plug connector	U _{imp} = 2.5 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 24 V DC	ES514 5 mA ES508E 10 mA ES502E 10 mA
Conventional thermal current I _n	10 A
Short circuit protection according to IEC 60269-1 (control circuit fuse)	10 A gG
Indicator LED	LE060 AC/DC 12 - 60 V (only with ES502E / ES508E) LE110 AC 110 V ± 15% LE220 AC 220 V ± 15%

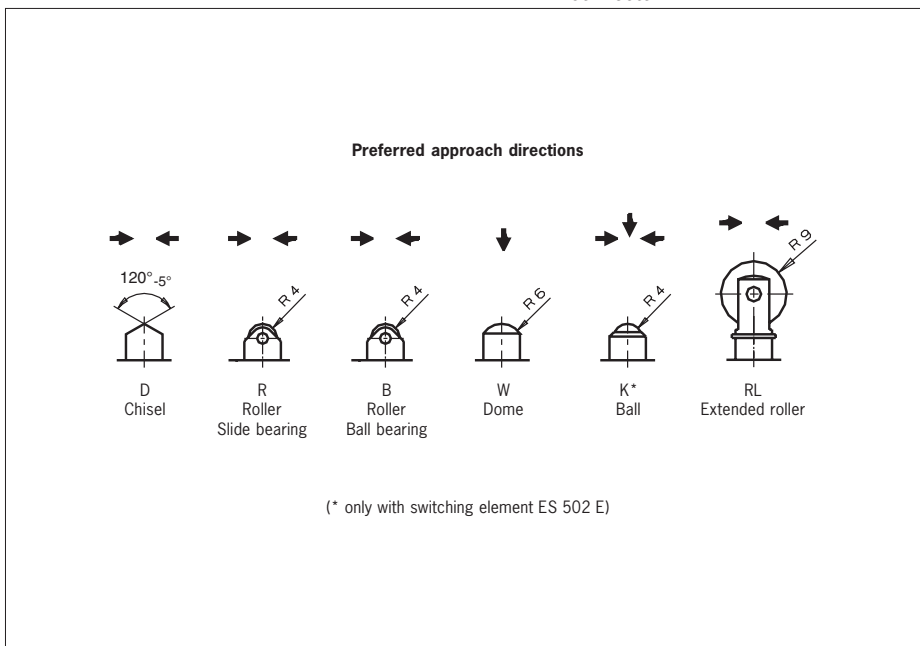


Figure 6: Plungers and approach directions

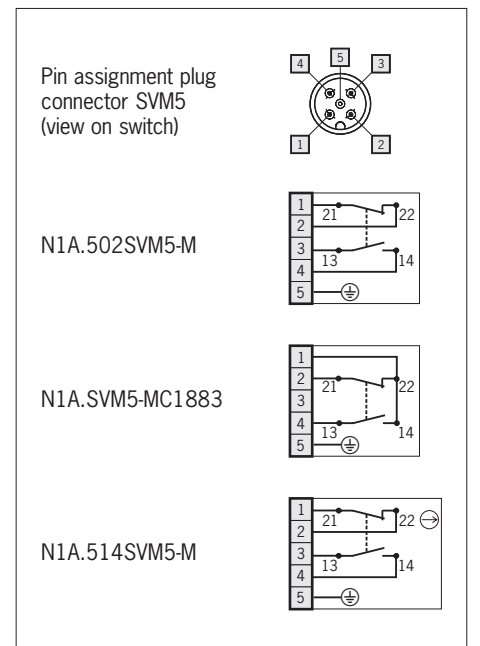


Figure 7: Pin assignment plug connector M12