

Correct use

Precision single limit switches are used for positioning and control applications in mechanical and systems engineering. Correct use includes compliance with the relevant requirements for installation and operation, in particular

- ▶ EN 60 204-1, 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 C
- ▶ EN 1050, Safety of machinery. Principles for risk assessment

Incorrect use

Precision single limit switches with snap-action contact elements without positive opening must not be used in safety circuits.

⚠ Safety precautions ⚠

Only precision single limit switches with switching element ES 588 and switch types that are marked with the positive opening symbol ⊕ may be used in safety circuits. These precision single limit switches fulfill a personal protection function. Incorrect installation or tampering can lead to severe injuries to personnel.

⚠ Precision single limit switches with a safety function must **not** be bypassed (bridging of contacts), removed or otherwise rendered ineffective.

The year of manufacture of the switch is indicated in the production code.

Function

The switching elements are actuated by means of plungers. Different plunger types are used depending on the application (switching point accuracy and approach speed) (see Figure 1).

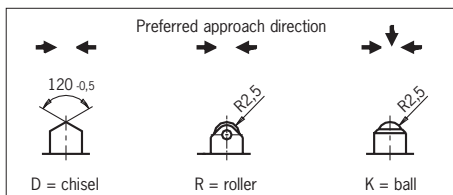


Figure 1: Plunger types and approach directions

Adjustability of the plunger

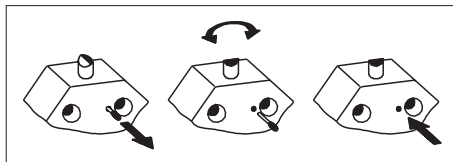


Figure 2: Changing the plunger approach direction

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).

Mounting

- ⚠ This unit is to be assembled by authorized personnel only.
- ⚠ Precision single limit switches and trip dogs must not be used as an end stop.
- ⚠ Precision single limit switches and trip dogs must be arranged such that they are adequately secured against movement.
- ⚠ When used in safety circuits, trip dogs must be positively mounted on the machine/safety guard so that they cannot be detached.

Due attention must be paid to the arrangement and shape of the trip dogs during mounting (see Figure 3).

Protection against environmental influences

Safety venting valves (see Figure 3) are used to compensate for the pumping action of the plunger. They must not be sealed.

Mask plunger, plunger guides, safety venting 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 as per the requirements of cULus, 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.

- ▶ With cable entry
- ▶ Open switch cover.
- ▶ For conductor cross-section, see tech. data.
- ▶ For pin assignments, see dimension drawings.
- ▶ Fit suitable cable gland with captive O-ring. Seal cable carefully. Sealing ring must be matched to the diameter of the cable.
- ▶ Tighten screws for the connections to the switching elements to the appropriate tightening torque (see tech. data).
- ▶ Close switch cover and tighten cover screws to 0.5 Nm.
- ▶ With plug connector
- ▶ For pin assignments, see dimension drawings.

Function test

- ▶ Mechanical function test
- ▶ Actuate plunger and check the switching function.
- ▶ Electrical function test
- ▶ Check correct function.

⚠ In safety circuits, check the safety function.

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 case of damage or wear, safety single limit switches must be replaced as a complete unit with a switch of the same type.

Exclusion of liability under the following circumstances

- ▶ 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.

Technical data

Parameter	Value
Housing material	Die-cast aluminum, anodized
Plunger material	Stainless steel
Degree of protection according to IEC 60529	IP 67
Mech. operating cycles	30 x 10 ⁶
Ambient temperature with switching element	
ES 550/553/556/558/562	-5 ... +80 °C
ES 572 (high temp. version)	-5 ... +180 °C
ES 588 ⊖	-5 ... +70 °C
Installation position	Any
Approach speed, max.	
Plunger Chisel D	20 m/min
Roller R (slide bearing)	50 m/min
Ball K	8 m/min

Approach speed, min.	0.01 m/min
Actuating force with switching element	≥ 15 N
Switching element	
ES 550/553/556/562/572	1 changeover contact
ES 558	1 NC contact + 1 NO contact
ES 588 ⊖	1 positively driven contact
Switching principle	
ES 550/553/556/558/562/572	Snap-action switching element
ES 588 ⊖	Slow-action switching element
	Positively driven
Switching hysteresis	
ES 550/553/556/562/572	max. 0.1 mm
ES 558	0.5 mm
Connection type	
ES 550/558/562/572	Soldered connection
ES 553/556/588	Screw terminal
Tightening torque screw terminal	
ES 553/556 (Hexagon socket head screw AF 1.27 mm)	0.2 Nm
ES 588 (Slot head screw)	0.4 Nm
Conductor cross-section	
ES 553/556	0.14 ... 1.0 mm ²
ES 588	Max. 1.5 mm ²
Contact material	
ES 550/553/556/558/572/588	Silver
ES 562	Gold insulation displacement contacts
Rated impulse withstand voltage	U _{imp} = 2.5 kV
Rated insulation voltage	
with cable entry	U _i = 250 V
with plug connector	U _i = 50 V
with B-coded plug connector	U _i = 250 V

Rated data for the switching elements

ES 558	
Conv. thermal current I _{th}	10 A
Utilization category AC-15	230 V / 4 A
Utilization category DC-13	24 V / 3 A
Switching current, min. at	10 mA
Switching voltage	DC 5 V
Short circuit protection	10 A gG
Mechanical life	up to 10 x 10 ⁶ operating cycles
ES 550/553/556	
Conv. thermal current I _{th}	6 A
Utilization category AC-15	230 V / 2 A
Utilization category DC-13	24 V / 2 A
Switching current, min. at	10 mA
Switching voltage	DC 24 V
Short circuit protection	6 A gG
Mechanical life	up to 10 x 10 ⁶ operating cycles
ES 562	
Conv. thermal current I _{th}	0.1 A
Utilization category AC-12	30 V / 0.1 A
Utilization category DC-13	30 V / 0.1 A
Switching current, min. at	5 mA
Switching voltage	DC 5 V
Short circuit protection	0.125 A gG
Mechanical life	up to 15 x 10 ⁶ operating cycles
ES 572 (high temperature version)	
Conv. thermal current I _{th}	5 A
Utilization category AC-15	230 V / 4 A
Utilization category DC-13	24 V / 1 A
Switching current, min. at	10 mA
Switching voltage	DC 12 V
Short circuit protection	5 A gG
Mechanical life	up to 10 x 10 ⁶ operating cycles or 100 h at 204 °C

ES 588 ⊖	
Conv. thermal current I _{th}	10 A
Utilization category AC-15	230 V / 4 A
Utilization category DC-13	24 V / 3 A
Switching current, min. at	1 mA
Switching voltage	DC 5 V
Short circuit protection	10 A gG
Mechanical life	up to 10 x 10 ⁶ operating cycles
Rated data with plug connector	
NO1.550SVM5	
Utilization category AC-15	30 V / 2 A
Utilization category DC-13	24 V / 2 A
NO1.550C1526	
Utilization category DC-13	24 V / 2 A
SNO1.558SVM5	
Utilization category AC-15	30 V / 4 A
Utilization category DC-13	24 V / 3 A

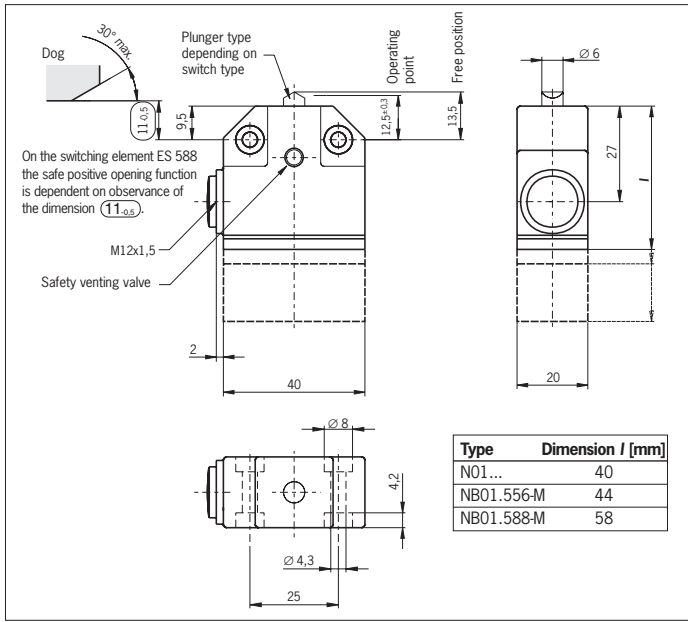


Figure 3: Dimension drawing NO1.../NB01... with cable entry

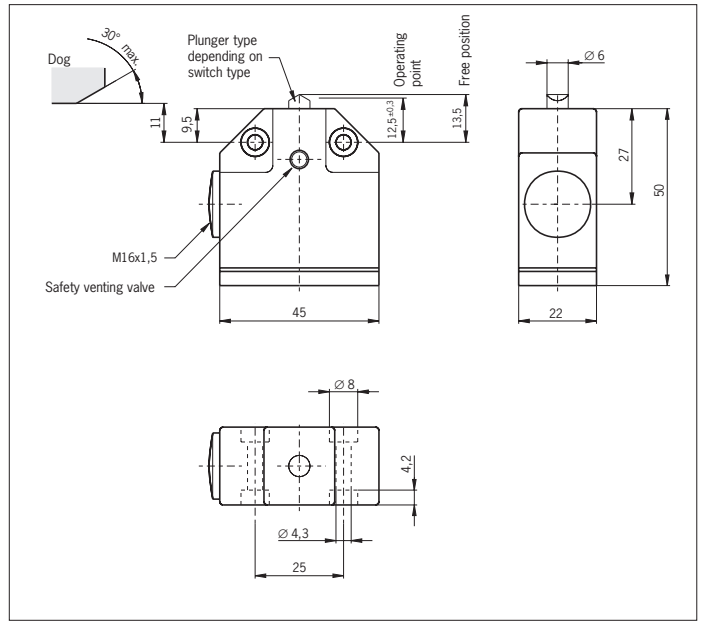


Figure 8: Dimension drawing SN01... with cable entry

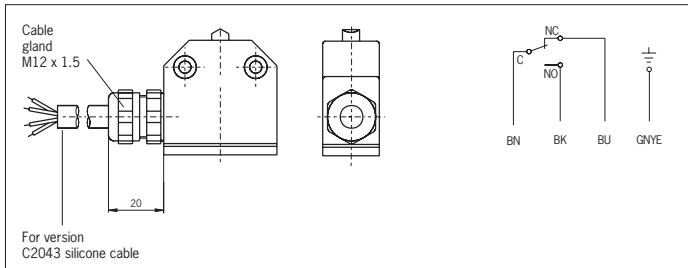


Figure 4: Dimension drawing/connection diagram NO1.550X... with connection cable (PUR cable, 4x0.5 mm²)

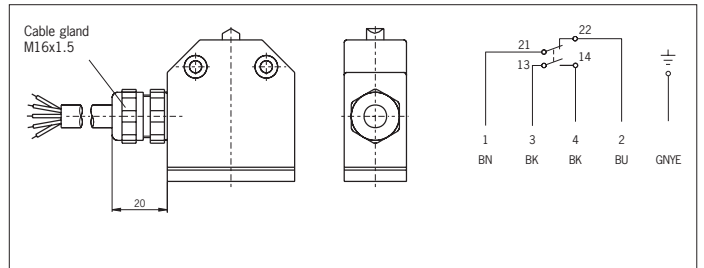


Figure 9: Dimension drawing/connection diagram SN01.558X... with connection cable (PUR cable, 5x0.5 mm²)

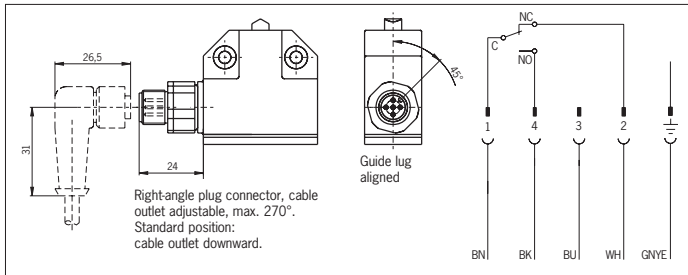


Figure 5: Dimension drawing/connection diagram NO1.550SVM5 with plug connector M12 (SVM5, 5-pin)

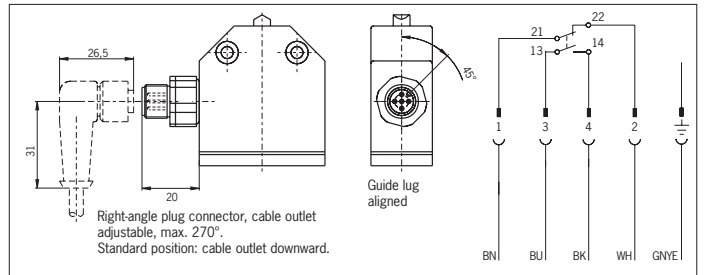


Figure 10: Dimension drawing/connection diagram SN01.558SVM5 with plug connector M12 (SVM5, 5-pin)

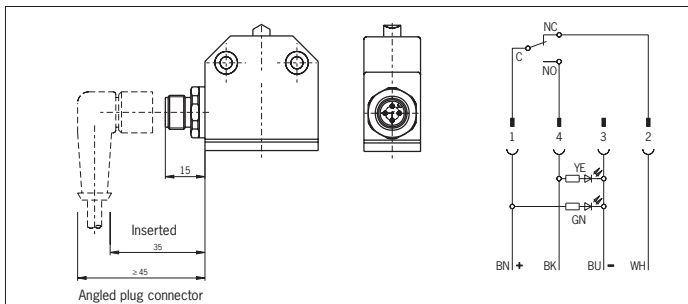


Figure 6: Dimension drawing/connection diagram NO1.550C1526 with plug connector M12 (4-pin)

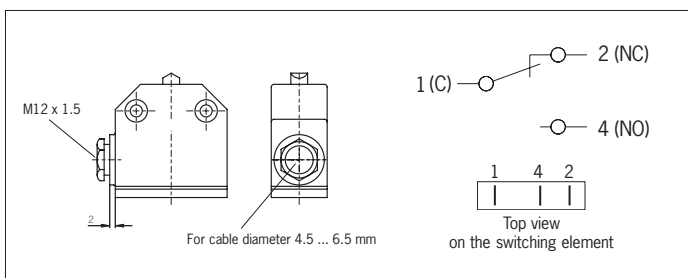


Figure 7: Dimension drawing/connection diagram NO1.550MC2018 with special cable gland

Switching element	Wiring diagram	Pin assignment
ES 550		1 4 2
ES 553		1 4 2
ES 556	1 (C) — 2 (NC)	
ES 562	— 4 (NO)	
ES 572		1 4 2
ES 558	1 (NC) — 2 (NC) 3 (NO) — 4 (NO)	4 1 2 3
ES 588	1 (C) — 2 (NC)	

Figure 11: Switching elements, wiring diagrams and pin assignment NO1.../NB01.../SN01... with cable entry