



## Operating instructions

# Spring Plunger FST-Lock-HD SFP (with Sensors)

### Note

The Operating instructions were originally written in German. Store in a safe place for future reference. Subject to technical changes without notice. No responsibility is taken for printing or other types of errors.

### Published by

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# 1 Important Information

## 1.1 Note on Using this Document

J. Schmalz GmbH is generally referred to as Schmalz in this document.

The document contains important notes and information about the different operating phases of the product:

- Transport, storage, start of operations and decommissioning
- Safe operation, required maintenance, rectification of any faults

The document describes the product at the time of delivery by Schmalz and is aimed at:

- Installers who are trained in handling the product and can operate and install it
- Technically trained service personnel performing the maintenance work
- Technically trained persons who work on electrical equipment

## 1.2 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
3. Pass on the technical documentation to subsequent users.
  - ⇒ Failure to follow the instructions in these Operating instructions may result in injuries!
  - ⇒ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

If you still have questions after reading the technical documentation, contact Schmalz Service at:

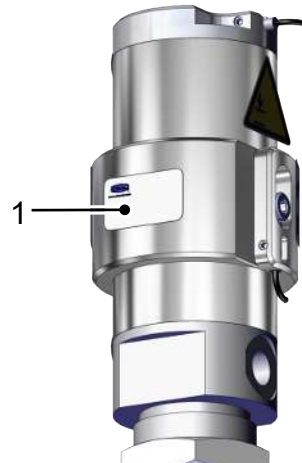
[www.schmalz.com/services](http://www.schmalz.com/services)

## 1.3 Type Plate

The type plate (1) is permanently attached to the product at the location shown and must always be clearly legible.

It contains important information about the product:

- QR code
- CE label
- Part sales designation/type
- Part number
- Serial number
- Coded date of manufacture
- Permitted pressure range



Please specify all the information above when ordering replacement parts, making warranty claims or for any other inquiries.

## 1.4 Symbols



This symbol indicates useful and important information.

- ✓ This symbol represents a prerequisite that must be met prior to an operational step.
- ▶ This symbol represents an action to be performed.
- ⇒ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

1. First action to be performed.
2. Second action to be performed.

## 2 Fundamental Safety Instructions

### 2.1 Intended Use

The locking spring plunger FST-LOCK-HD SFP with sensors is used to compensate for height differences in component contours on the vacuum gripping system. The FST-LOCK-HD SFP can be fixed at the set height by switching off the compressed air. This allows you to hold and transport gripped workpieces without any deformation. Two integrated sensors indicate whether the spring plunger is in the home position and whether it is locked.

The product is built in accordance with the latest standards of technology and is delivered in a safe operating condition; however, hazards may arise during use.

The product is intended for industrial use.

Intended use includes observing the technical data and the installation and operating instructions in this manual.

### 2.2 Non-Intended Use

Schmalz accepts no liability for damages resulting from use other than as intended. In particular, the following are considered non-intended use:

- Use in potentially explosive atmospheres
- Use in medical applications
- Use in food product applications

### 2.3 Personnel Qualifications



Unqualified personnel cannot recognize dangers and are therefore exposed to higher risks!

1. Task only qualified personnel to perform the tasks described in these Operating instructions.
2. The product must be operated only by persons who have undergone appropriate training.

These Operating instructions are intended for fitters who are trained in handling the product and who can operate and install it.

### 2.4 Warnings in This Document

Warnings warn against hazards that may occur when handling the product. The signal word indicates the level of danger.

Signal word	Meaning
 <b>CAUTION</b>	Indicates a low-risk hazard that could result in minor or moderate injury if not avoided.
 <b>NOTE</b>	Indicates a danger that leads to property damage.

### 2.5 Residual Risks



#### **CAUTION**

#### **Noise pollution from leakage**

Hearing damage

- ▶ Correct position.
- ▶ Wear ear protectors.



## ⚠ CAUTION

### Falling product

Risk of injury

- ▶ Securely attach the product at the site of operation.
- ▶ Wear safety shoes (S1) and safety glasses when handling and mounting/dismounting the product.

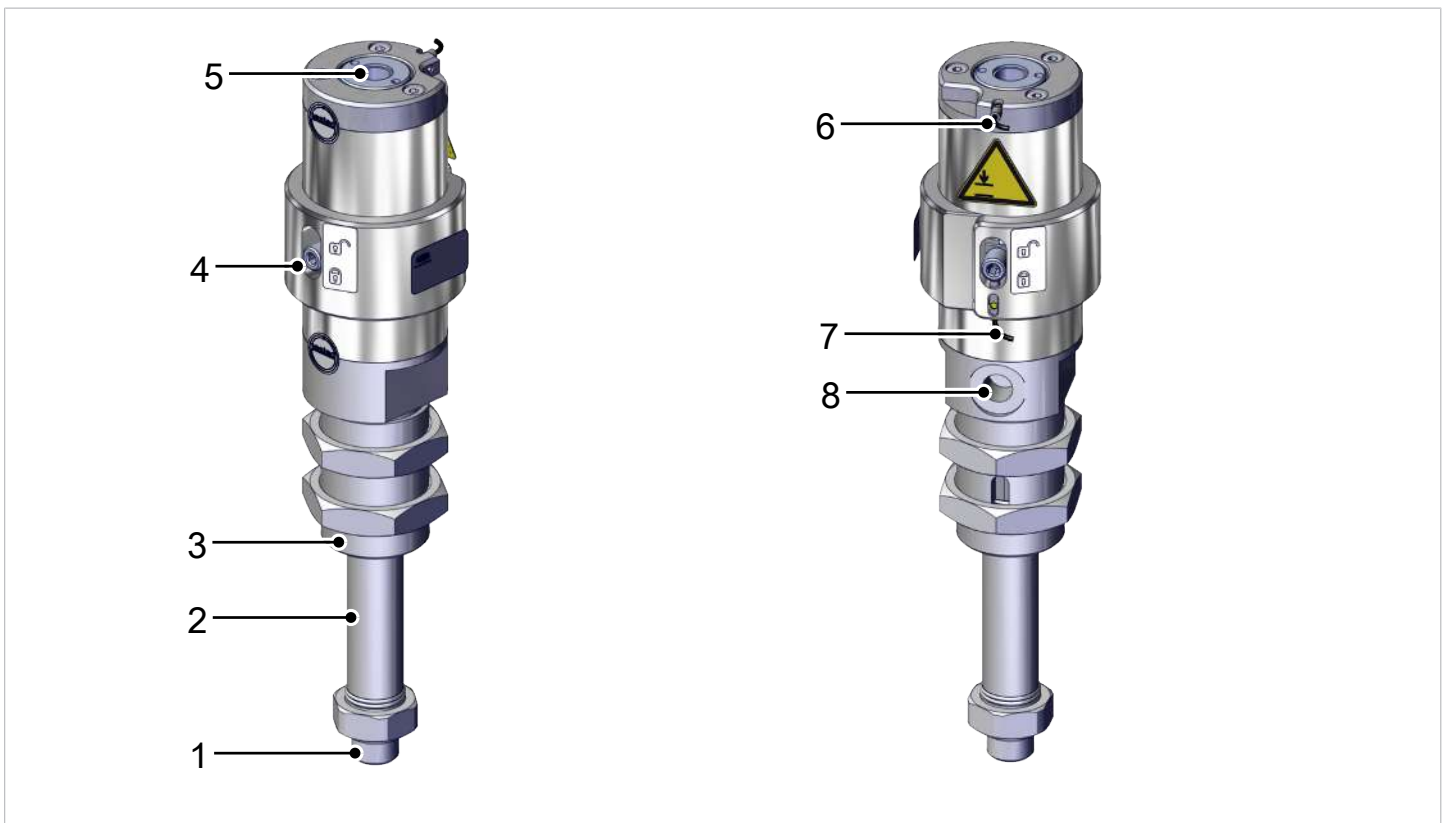
## 2.6 Modifications to the Product

Schmalz assumes no liability for consequences of modifications over which it has no control:

1. The product must be operated only in its original condition as delivered.
2. Use only original spare parts from Schmalz.
3. The product must be operated only in perfect condition.

## 3 Product Description

### 3.1 Design of the FST-Lock-HD SFP with Sensors



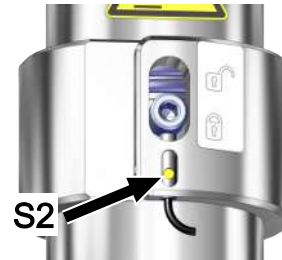
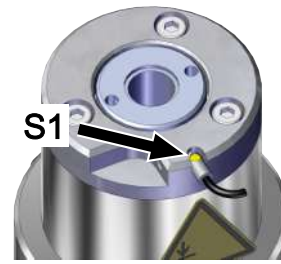
1	Connection thread for suction cup	5	Vacuum connection and axial vacuum feedthrough in the plunger rod
2	Plunger rod with spring (spring not shown)	6	Sensor S1, home position
3	Mounting thread and block protector for spring	7	Sensor S2, locked
4	Locking unit with display window for switching state (locked/movable)	8	Compressed air connection for releasing the lock: <ul style="list-style-type: none"><li>• 0 bar =&gt; plunger rod locked</li><li>• 4 to 7 bar =&gt; plunger rod can move</li></ul>

## 3.2 Sensor Functions

Sensor S1 indicates when the plunger rod is in its home position (extended).

Sensor S2 indicates when the plunger rod is locked in any position ( $p_{\text{compression}} = 0$  bar).

When sensors S1 and S2 are in the active state, an electrical signal is output and the LED lights up.



## 4 Technical Data

### 4.1 General parameters

Parameter	FST-LOCK-HD ... SFP G1/4 50 external thread	FST-LOCK-HD ... SFP G1/4 100 external thread
Spring rate	0.45 N/mm	0.33 N/mm
Spring prestress	1.4 N/mm	3.28 N/mm
Spring force at stroke center	12.7 N	19.7 N
Operating pressure	4 to 7 bar	
Switch function	NC (normally closed)	
Braking force	350 N	
Operating temperature	0 to 50° C	
Max. permissible vertical load (at end stop)	1500 N	
Max. permissible horizontal load	300 N	150 N
Operating medium	Air or neutral gas, filtered to 40 µm, with or without oil, class 7-4-4 compressed air quality according to ISO 8573-1. Neutral gases in accordance with EN 983 are approved as the operating medium. Neutral gases include air, nitrogen and inert gases (e.g. argon, helium and neon). Aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents are not permitted.	
Mass	995 g	1070 g

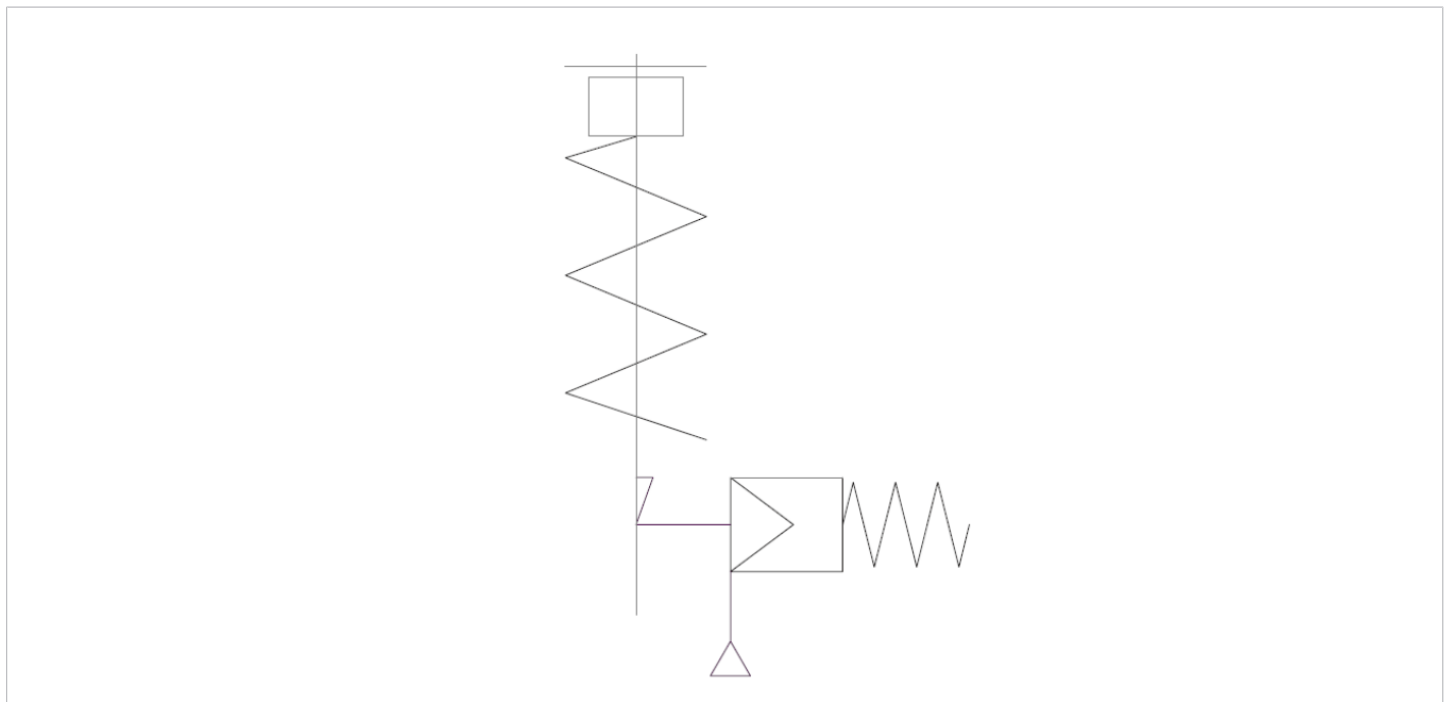
### 4.2 Sensor Parameters

Supply voltage	10 V DC to 30 V DC
Current consumption	10 mA (without load)
Continuous current $I_a$	≤ 100 mA
Connection type	Cable with M8 plug, three-pin, 0.2 m
Switching output	PNP
Output function	Normally open contact
Switching frequency	8,000 Hz
Ripple	≤ 20% of $V_s$
Voltage drop	≤ 2 V at $I_a = 100$ mA
Electrical design	Three-wire DC

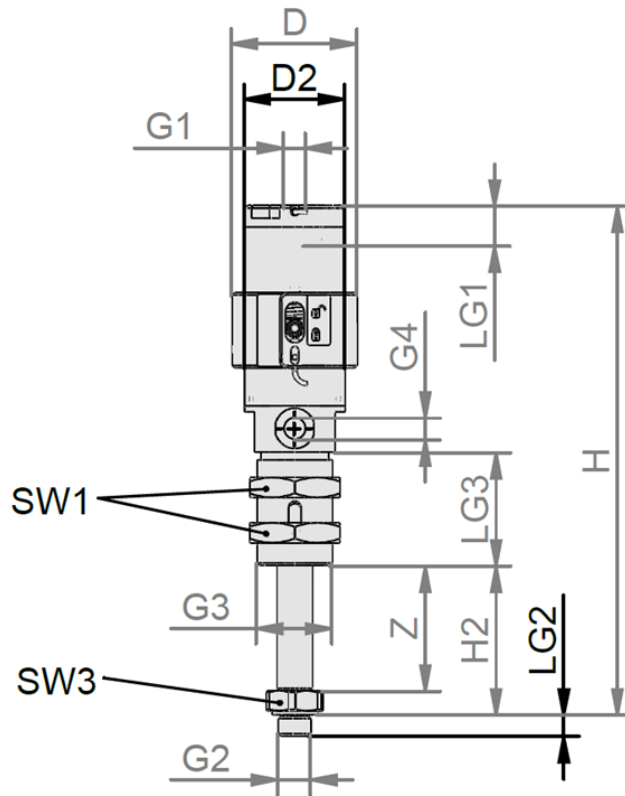
Degree of protection in accordance with EN 60529	IP67
Short circuit protection	✓
Polarity reversal protection	✓
Cable material	PUR

Wiring diagram M8 plug, three-pin	Pin	Function	Cable color
	1	Vs (L+)	Brown
	4	Normally open contact	Black
	3	GNDs (M)	Blue

### 4.3 Pneumatic Circuit Diagram



## 4.4 Dimensions



D	D2	G1	G2	G3	G4	LG1	LG2
50	40	G1/8" internal thread	G1/4" external thread	M30x1.5 external thread	G1/8" internal thread	12	8.5
Part no.	H	H2	LG3	SW1	SW3	Z (stroke)	
10.01.02.01730	202.3	59.3	45	36	22	50	
10.01.02.01798	267.3	109.3	60			100	

## 5 Checking the Delivery

The scope of delivery can be found in the order confirmation. The weights and dimensions are listed in the delivery notes.

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.
2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

## 6 Installation

### 6.1 Installation Instructions



#### ⚠ CAUTION

**Compressed air or vacuum in direct contact with the eye**

Severe eye injury

- ▶ Wear eye protection
- ▶ Do not look into compressed air openings
- ▶ Do not look into vacuum openings, e.g. suction cups





## ⚠ CAUTION

### Noise pollution due to incorrect installation of the pressure and vacuum connections

Hearing damage

- ▶ Correct installation.
- ▶ Wear ear protectors.



## NOTE

### Dropping the product or subjecting it to impacts

Damage to the product and/or malfunctions

- ▶ Do not drop the product or subject it to impacts.

Take note of the following when mounting:

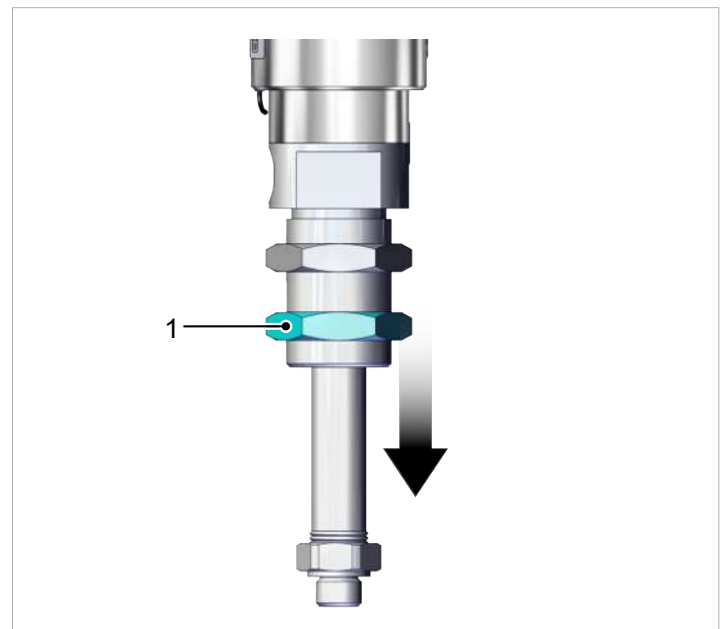
- Dirt particles or foreign bodies in the product's connections, hoses or pipelines can lead to malfunctions or failure.
- Shorten the hoses and pipelines as much as possible.
- Hose lines must be laid without bends or crimps.
- Insufficient compressed air is supplied if the internal diameter on the compressed air side is too small. This prevents the product from performing as specified in its defined performance data.

## 6.2 Mounting

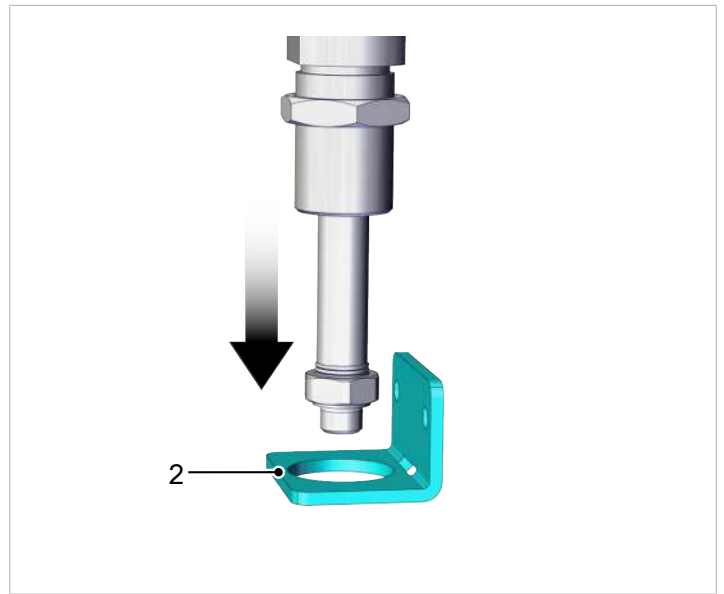
The product may be installed in any position.

- ✓ The customer's gripper holder must be prepared for mounting (clearance hole with  $32 \pm 1$  mm diameter).

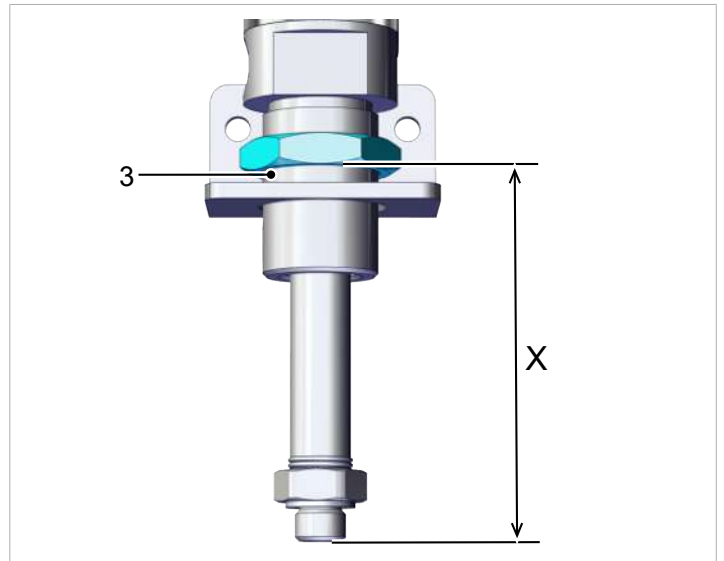
1. Remove the lower nut (1).



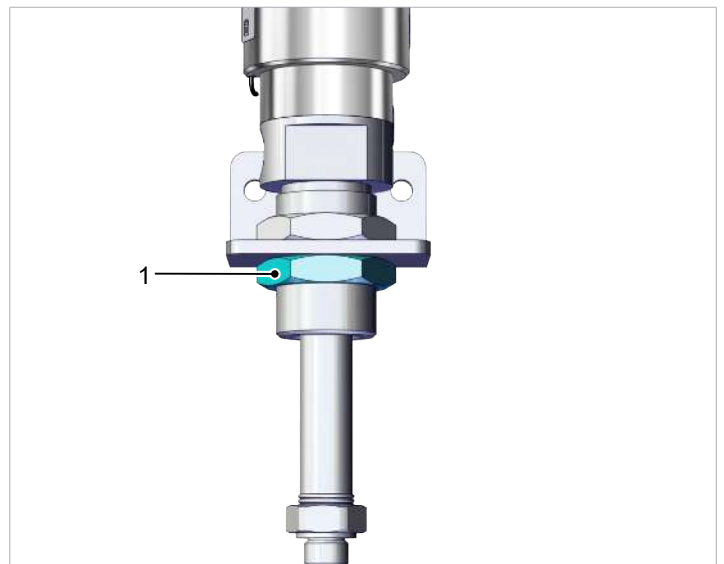
2. Guide the product through the customer's holder (2).



3. Use the nut (3) to set the necessary distance (X) to the workpiece.



4. Mount and fasten the nut (1). The tightening torque is 50 Nm, wrench size (SW) 36.



## 6.3 Pneumatic Connection



### CAUTION

**Uncontrolled movement (whipping) of the compressed air hose when the compressed air supply is activated**

Risk of injury

- ▶ Deactivate the compressed air supply when working on the product.
- ▶ Cut hoses as short as possible and fix in place.
- ▶ Wear eye protection.

1	Vacuum connection
2	Compressed air connection

The vacuum connection (1) supplies the vacuum to the suction cup connected to the plunger rod. It is a 1/8" internal thread connection. The dimensions of the vacuum hose depend on the suction cup used.



The customer is responsible for dimensioning and attaching the vacuum hose; ensure that the hose has enough freedom of movement to compensate for the movements of the plunger rod.

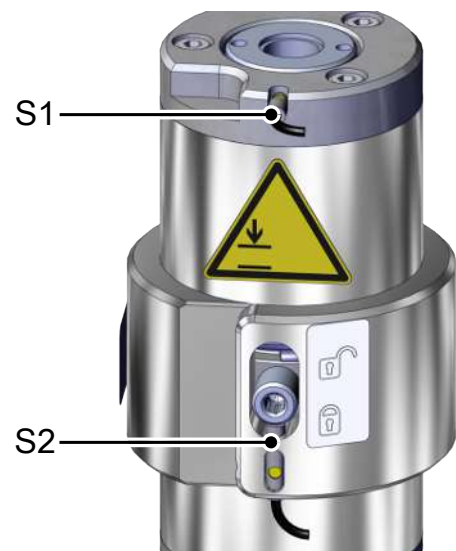
The compressed air connection (2) is used to deactivate clamping and has a 1/8" internal thread. Select a hose with internal diameter  $\geq 4$  mm for the compressed air connection.

You can attach plug-in screw unions, hose sleeves or other connections at the positions shown, observing the specified threads.

## 6.4 Connecting Sensors

Each of the two sensors is equipped with an M8 three-pin plug.

1. Connect the plug on the cable of sensor S1 to the control unit to monitor the position of the plunger rod.
2. Connect the plug on the cable of sensor S2 to the control unit to monitor the locking state.



Wiring diagram M8 plug, three-pin	Pin	Function	Cable color
	1	Vs (L+)	Brown
	4	Normally open contact	Black
	3	GNDs (M)	Blue

## 7 Operation



### ⚠ CAUTION

#### Vacuum close to the eye

Severe eye injury!

- ▶ Wear protective glasses during troubleshooting.
- ▶ Do not look in the suction openings.



### ⚠ CAUTION

#### Moving parts on the product (e.g. exposed spring, driven components)

Hand injuries

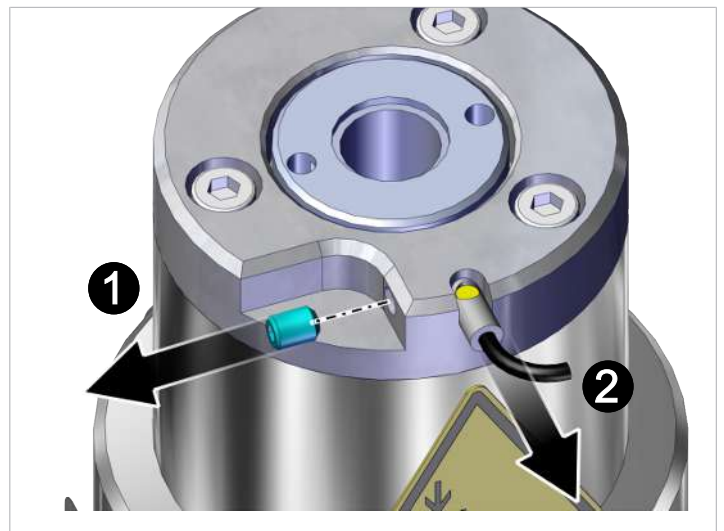
- ▶ Grip the product only when it is deactivated and de-energized.

## 8 Replacing Sensors

### Replacing sensor S1:

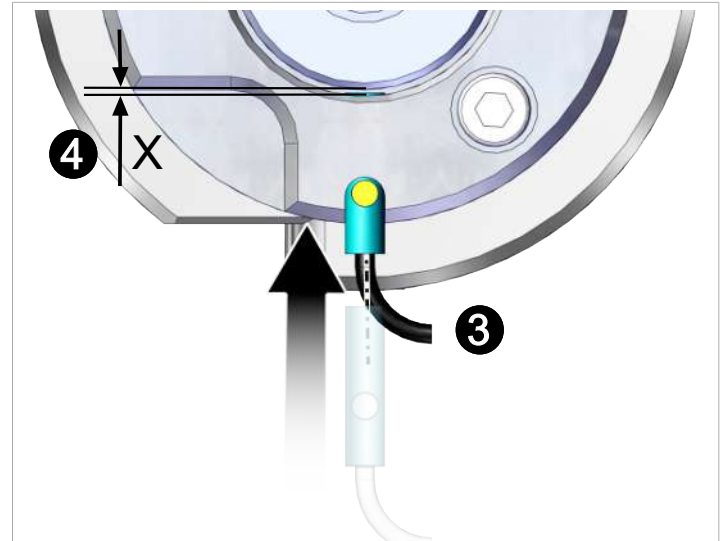
- ✓ The plunger rod must be in the home position (extended).
- ✓ There must be no compressed air supply and the plunger rod must be locked.

1. Unscrew the fastening screw ❶ (wrench size 1.5).



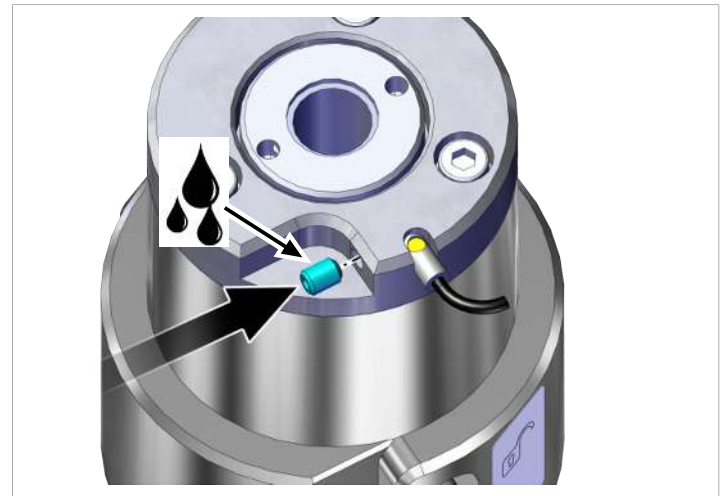
2. Pull out the defective sensor ❷.

3. Insert the replacement sensor and align it **3** so that the LED is visible through the hole. Use a feeler gage to adjust the distance X to the plunger rod to 0.5 mm **4**.



⇒ The LED lights up when voltage is applied.

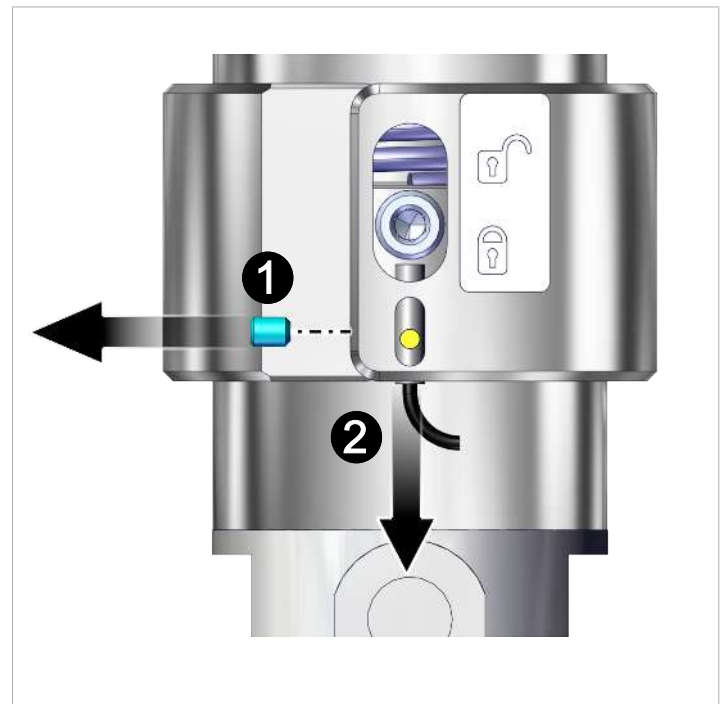
4. Fasten the sensor with a new screw using a tightening torque of 0.1 Nm. Use Loctite 243 thread-locking adhesive.



### Replacing Sensor S2:

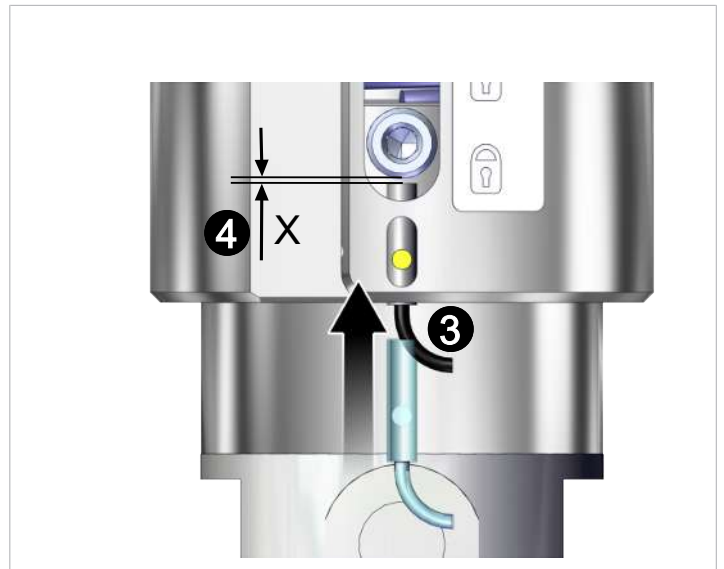
- ✓ There must be no compressed air supply and the plunger rod must be locked.

1. Unscrew the fastening screw **1** (wrench size 1.5).



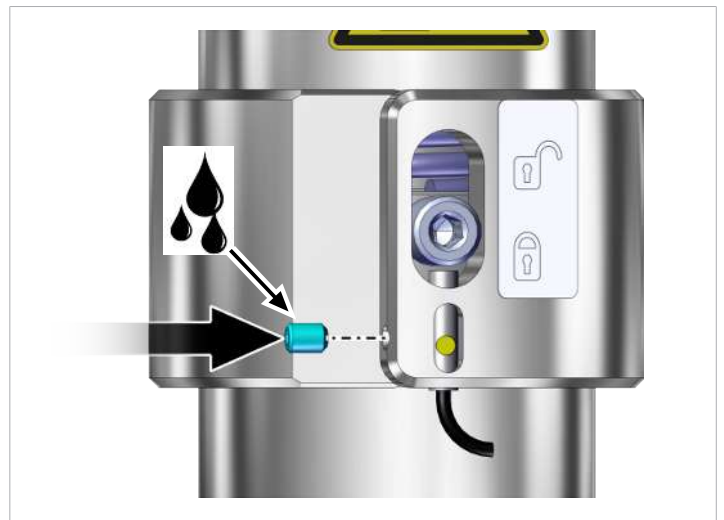
2. Pull out the defective sensor **2**.

3. Insert the replacement sensor and align it so that the LED is visible through the hole **3**. Use a feeler gage to adjust the distance X to the bolt to 0.3 mm **4**.



⇒ The LED lights up when voltage is applied.

4. Fasten the sensor with a new screw using a tightening torque of 0.1 Nm. Use Loctite 243 thread-locking adhesive.



## 9 Spare and Wearing Parts

Part no.	Designation	Part type
21.01.09.00127	Proximity switch NAEH-SCHA SIND 1 10-30V-DC	Spare part
20.05.07.00025	Setscrew GEW-STIF 4026-M3x4-ST-45H	Spare part

# 10 Declarations of Conformity

## 10.1 EC Declaration of Conformity

### EC Declaration of Conformity

The manufacturer Schmalz confirms that the product FST-Lock-HD SFP described in these operating instructions fulfills the following applicable EC directives:

2014/30/EU	Electromagnetic Compatibility
2011/65/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The following harmonized standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for systems and their components
EN 60947-5-2	Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches
EN 61000-4-2	Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measuring procedures
EN 61000-4-4	Electromagnetic Compatibility (EMC) – Part 4-4: Testing and measuring procedures



The EU Declaration of Conformity valid at the time of product delivery is delivered with product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.

## 10.2 UKCA Conformity

The manufacturer Schmalz confirms that the product described in these operating instructions fulfills the following applicable UK regulations:

2016	Electromagnetic Compatibility Regulations
2012	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations

The following designated standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for systems and their components
EN 60947-5-2	Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches
EN 61000-4-2	Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measuring procedures
EN 61000-4-4	Electromagnetic Compatibility (EMC) – Part 4-4: Testing and measuring procedures



The Declaration of Conformity (UKCA) valid at the time of product delivery is delivered with the product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.