

Operating instructions

Magnetic Gripper SGM-SV 46

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.

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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

1.3 Type Plate

The type plate is permanently attached to the product and must always be clearly legible. It contains product identification data and important technical information.

The QR code on the nameplate enables access to the digital technical documentation for the product.

- ▶ For spare parts orders, warranty claims or other inquiries, have the information on the type plate to hand.

1.4 Other Applicable Documents

The following operating instructions must also be observed when operating the magnetic gripper with accessories:

- The operating instructions 30.30.01.01624 for the proximity switch

1.5 Symbols



This symbol indicates useful and important information.

- ✓ This symbol represents a prerequisite that must be met before an action is performed.
- ▶ 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.

Indication of correct / incorrect action:



Correct action



Incorrect action

2 Fundamental Safety Instructions

2.1 Intended Use

The magnetic gripper is used to handle ferromagnetic workpieces of a cylindrical shape.

The operator is required to document the static strength and holding force and to adhere to safety factors.

For system designs, a safety factor of $S=3$ should be applied.

The load to be lifted must be sufficiently rigid so that it is not damaged during gripping and handling.

The magnetic gripper is built in accordance with the latest standards of technology and is shipped in safe condition. However, hazards can arise during use. Observe the warnings in these operating instructions.

The product is intended for industrial and commercial applications.

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

The maximum lift capacity must not be exceeded (> See ch. Technical Data).

2.2 Non-Intended Use

Schmalz accepts no liability for damage caused by the use of the gripper SGM-SV for purposes other than those described under Intended Use. Use of the gripper SGM-SV for loads that are not specified in the order confirmation or that have different physical properties than those specified in the order confirmation shall be considered non-intended use. In particular, the following are considered non-intended use:

- Use in potentially explosive atmospheres
- Storing loads when active

2.3 Personnel Qualification

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



1. Only instruct qualified personnel to perform the tasks described in these operating instructions.
2. The product may only be operated by persons who have undergone appropriate training.
3. Assembly and maintenance work must only be carried out by qualified personnel.

The following target groups are addressed in these operating instructions:

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

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
 WARNING	Indicates a medium-risk hazard that could result in death or serious injury if not avoided.
 CAUTION	Indicates a low-risk hazard that could result in minor or moderate injury if not avoided.
NOTE	Indicates a danger that leads to property damage.

2.5 Residual Risks

The system integrator must carry out a risk assessment of the entire system for all operating modes and define the danger zone precisely. In doing so, country-specific provisions and regulations must be observed.



WARNING

The product contains a permanent magnet that generates a continuous magnetic field.

Danger for persons with pacemakers. Devices and data carriers can be damaged.

- ▶ Keep persons with pacemakers away from the product.
- ▶ Keep sensitive electrical devices and data carriers away from the product.



CAUTION

Risk of crushing if workpiece is abruptly attached

- ▶ Do not activate the magnet until the gripper is on the load.
- ▶ Do not place any body parts between the gripping surface and load.



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

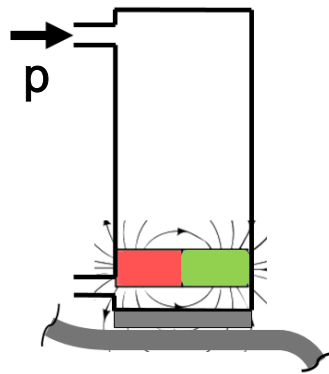
3.1 Description of the Function

The magnetic gripper powered by compressed air lifts ferromagnetic workpieces using a magnetic force. To control the magnet, the system alternately supplies the two gripper connections with compressed air while venting the non-actuated connection.

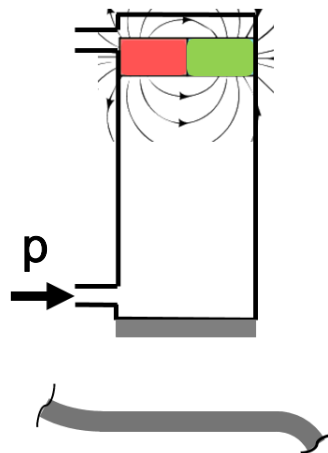
By applying the compressed air p , the permanent magnet is moved toward the gripping surface (when gripping the workpiece) or away from the gripping surface (when releasing the workpiece).

The compressed air must be applied for at least one second to ensure reliable switching.

Gripping the workpiece

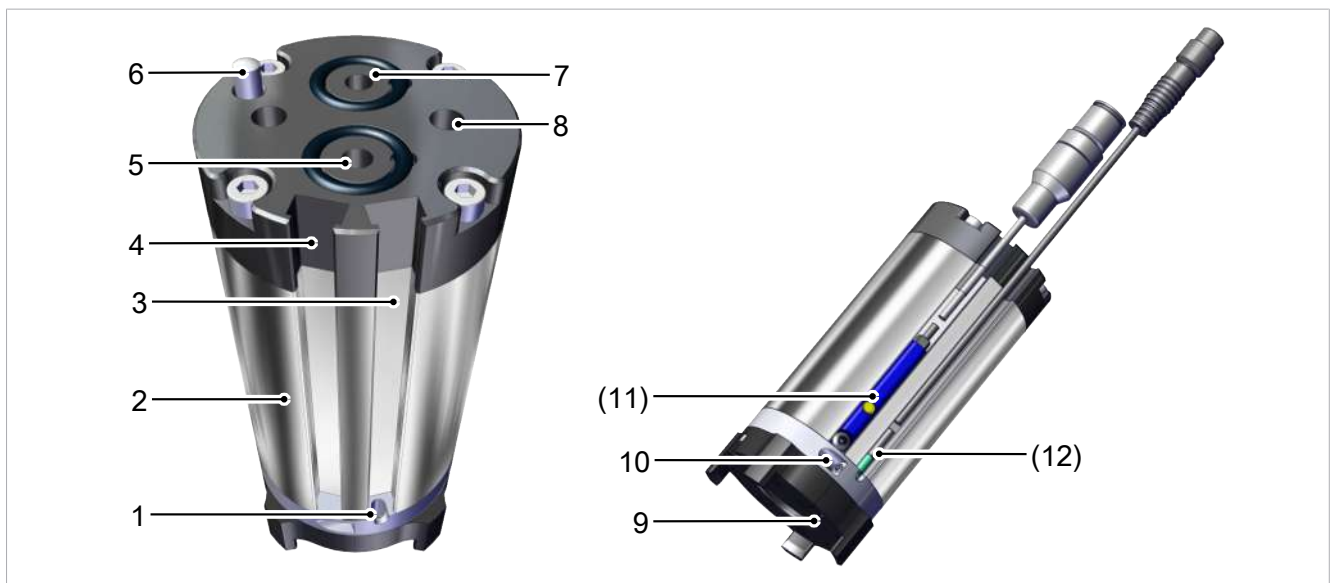


Depositing the workpiece



The bistable mode of operation allows safe gripping even during a power failure.

3.2 Product Design



1	Borehole for "parts present" check sensor	7	Compressed air connection via flange or M5 internal thread (depositing the work-piece)
2	Housing	8	Mounting thread, M6-7.5/depth Y, x2
3	Support nut for "parts present" check sensor	9	Gripping element
4	Support nut for condition detection sensor	10	Grub screw for mounting the sensor (12)
5	Compressed air connection via flange or M5 internal thread (gripping the work-piece)	11	Optional: Condition detection sensor ¹⁾
6	Positioning pin	12	Optional: "Parts present" check sensor ¹⁾

¹⁾ For the sensors (11) and (12) to function, they must only be installed in the slots provided as shown. The sensors cannot be installed in just any slot.

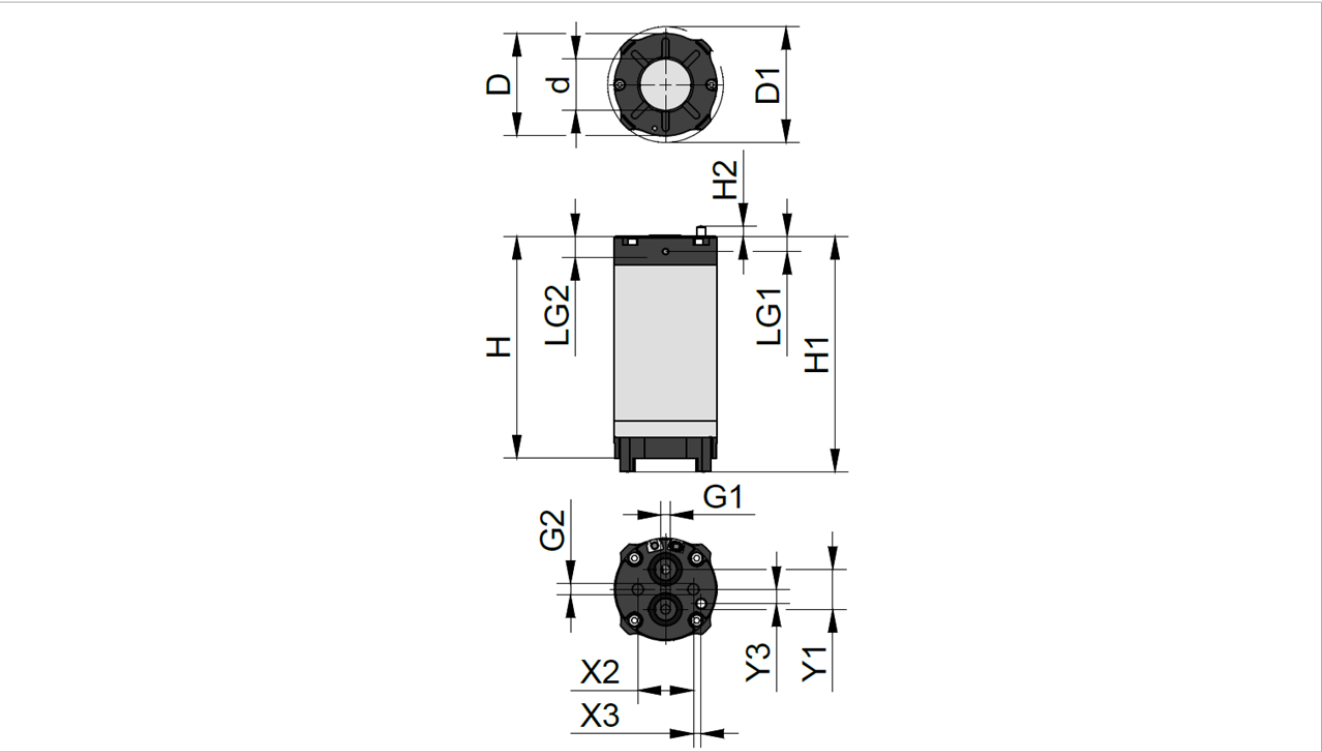
4 Technical Data

4.1 General Parameters

Parameter	SGM-SV 46
Opt. operating pressure	3.5 to 6.0 bar
Operating medium	Air or neutral gas, 40 µm filtered, with or without oil, class 7-4-4 compressed air quality acc. to ISO 8573-1
Ambient temperature	+5° C to 70° C
Contact temperature	Max. 70° C
Operating principle	Bistable
Mounting position	Any
Max. holding force	72 N
Holding force ¹⁾	32 N
Residual holding force	≤ 0.5 N
Weight (with sensor system)	440 g (460 g)

¹⁾ Example of holding force measured on a round battery cell; value varies depending on the thickness of the wall of the round cell.

4.2 Dimensions



G1	G2	d	D	D1	H	H1	H2	X2	X3	Y1	Y3	LG1	LG2
M5-IG	M6-IG	23	46	52	100	106	5	25	3.5	18	6.5	6	7.5

All specifications are in mm.

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



⚠ WARNING

The product contains a permanent magnet that generates a continuous magnetic field.

Danger for persons with pacemakers. Devices and data carriers can be damaged.

- ▶ Keep persons with pacemakers away from the product.
- ▶ Keep sensitive electrical devices and data carriers away from the product.



⚠ CAUTION

Improper installation or maintenance

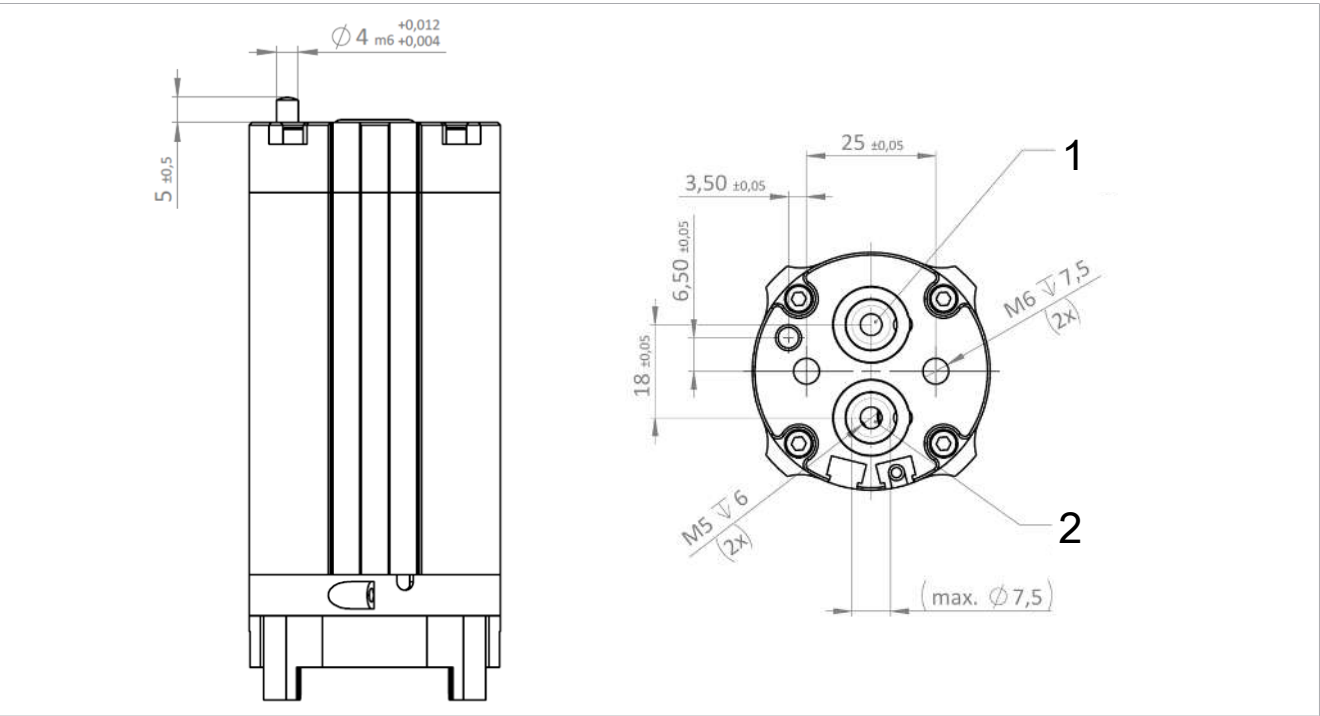
Personal injury or damage to property

- ▶ Prior to installation and before maintenance work, the product must be disconnected from the power supply, depressurized (vented to the atmosphere) and secured against unauthorized restart.

6.2 Mounting

The product can be mounted in any position.

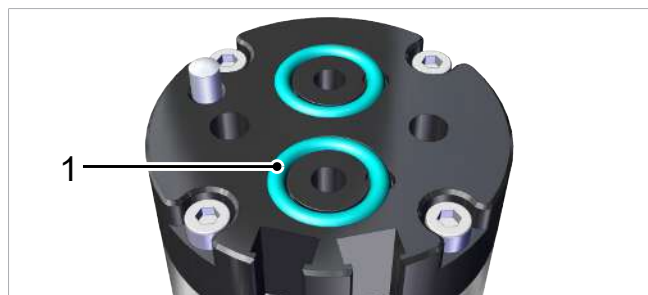
The gripper is adapted directly to a handling system.



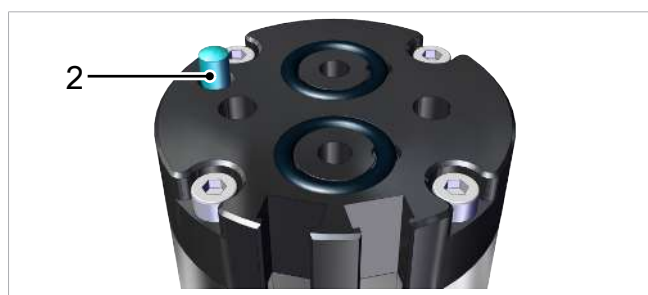
1	Compressed air connection; depositing the workpiece	2	Compressed air connection; gripping the workpiece
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- ✓ The holder is specially designed to support the gripper. The exact position of the boreholes for the compressed air channels in the holder can be seen in the connection diagram. For the surface quality of the (flange) area, R_a must be $\leq 1.6 \mu\text{m}$ to ensure that the O-rings seal.
- ✓ In the customer-supplied holder, make the appropriate borehole for the positioning pin (2) with $\varnothing 4$ (M6; $+0.012/+0.004$).

1. Check that the two O-rings (1) are present and positioned correctly.

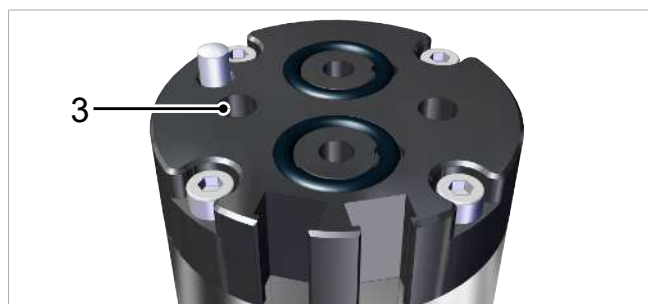


2. Position the positioning pin (2) in the bore-hole for the holder.



3. Push the device flush against the holder.

4. Attach the gripper to the holder using the two M6 threads (3). Observe the thread depth of 7.5 mm.



- ⇒ Ideally, such a mounting is also used to establish the pneumatic supply of the magnetic gripper via the O-ring at the top. This requires an internal compressed air supply in the holder or flange.

Alternatively, the pneumatic supply can be established using the plug-in screw unions, which are connected through the M5 tapped holes G1 ([> See ch. 4.2 Dimensions, p. 10](#)).

6.3 Optional: Sensor for Monitoring the Switching State of the Gripper (through the Piston Position)

Observe document 30.30.01.01624 Operating Instructions for Proximity Switch (Optional: Accessories) for Magnetic Grippers.

After installation, always teach the sensor with the workpiece/part to be gripped ([> See ch. 6.3.4 Mounting the Sensor, p. 15](#)).

6.3.1 Preventing Sensor Malfunctions

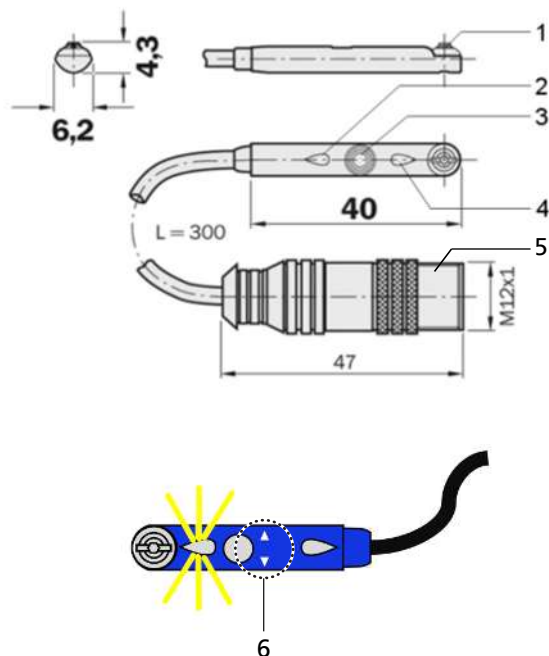
The sensor may be installed in any position.

To ensure that the gripper functions properly and to prevent faults in the sensor function, observe the following installation instructions:

- **Use mounting elements or similar made of non-magnetizable material (aluminum, plastic, etc.)**
- Check on a regular basis that the sensor is securely installed in the slot – in particular when it is used in fast handling processes or ones that are exposed to vibration.
- Strong magnetic fields can impair the functionality of the sensor. As a result, the suitability of the sensor for use, for example in close proximity to welding plants, must be checked separately in each individual case.
- Keep magnetizable objects away from the sensor or place them at a sufficient distance. Observe the minimum distances specified below.
- The sensor, sensor slot, and gripper(s) must be regularly inspected and any ferromagnetic pollutants (such as iron shavings) removed.

6.3.2 Dimensions and designations

1	Fastening screw
2	LED 2 – setting down
3	Teach button
4	LED 1 – gripping
5	Electrical connection M12x1
6	Center of sensor



6.3.3 Technical data

Power supply U_V PNP	15 to 30V DC
Power supply U_V NPN	12 to 30V DC
Power consumption (inactive) I	≤ 15 mA
Continuous current I_a	≤ 100 mA
Switching output	PNP/NPN
Output function	Normally open contact
Connection cable	M12x1 L=0.3 m
EMC	EN 60 947-5-2
Degree of protection	IP 67
Ambient temperature	-20 to +75

6.3.4 Mounting the Sensor

Commissioning the sensor for first-time installation or resetting if necessary

1. Place sensor centrally in the T-slot.



2. Push the sensor to the stop of the T-slot, or in the case of variants with **open T-slot**, fix the sensor flush with the lower end of the slot (towards the gripping surface).



- Fix the sensor with a screwdriver (torque: 0.2 +/- 0.05 Nm).

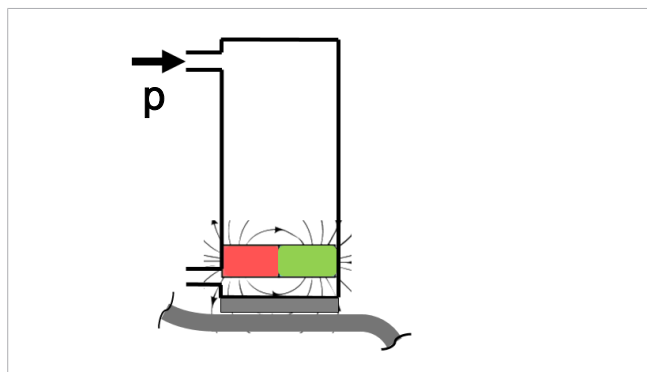


- Connect plug M12x1 and apply operating voltage.

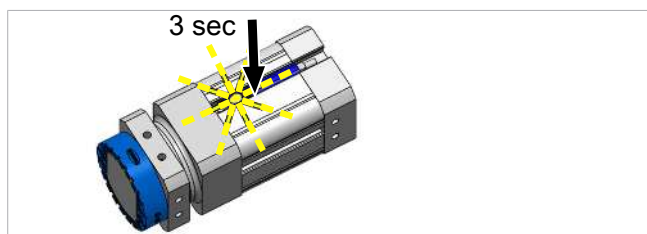
Teaching in the switching points

- ✓ Use the supplied teach-in tool or a plastic pin for the teach-in process; do not use magnetic tools (screwdriver, steel hexagonal socket wrench, etc.).
- ✓ The gripping apparatus/gripper tool is in the workpiece pick-up position.

1. Check sensor position: At the end of the T-slot or flush with the slot end.
With the sheet clamped, set/actuate the piston position for the first switching point (front piston in operating position).

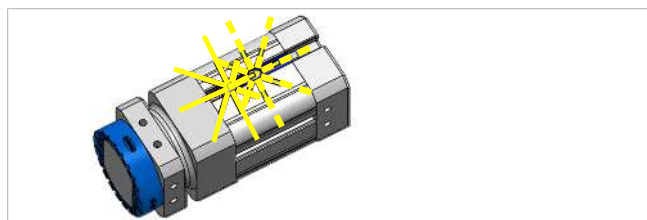


2. Press and hold the Teach button for 3 seconds.



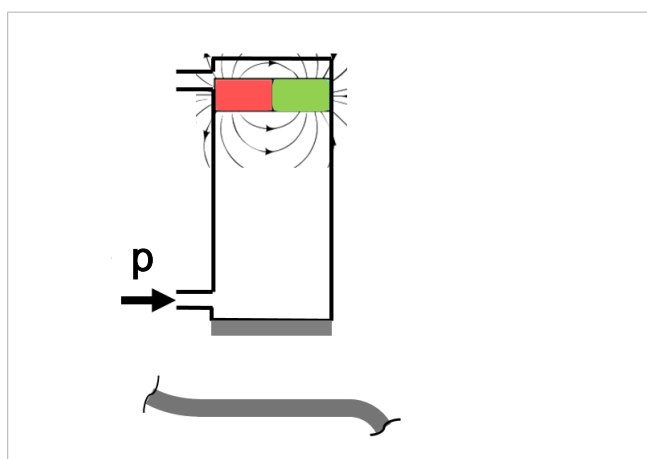
⇒ LED 1 flashes

3. Release the Teach button.

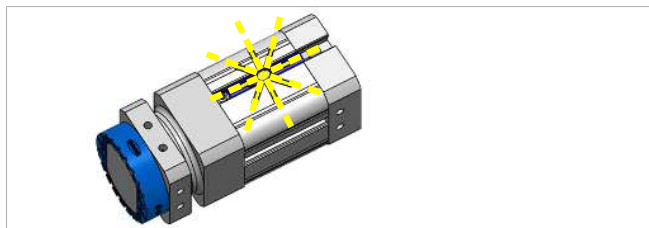


⇒ First switching point is stored (LED 1 lights up and LED 2 flashes)

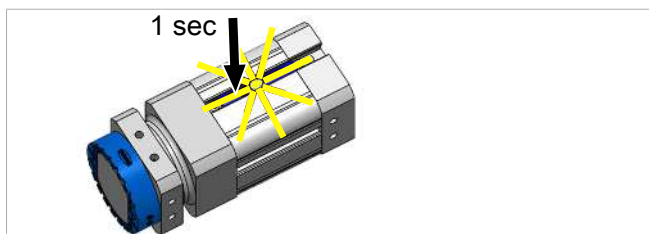
4. (Put the gripping apparatus/gripper tool in the workpiece depositing position.)
Set/actuate the piston position for the second switching point (rear piston in idle state).



⇒ LED 1 is extinguished and LED 2 flashes.



5. Press the Teach button briefly.



⇒ The second switching point is stored (LED 2 lights up).



Alternatively, teach the sensor via the IO-Link if, for example, teaching with the pin is not possible due to inaccessibility.

Inspection of first switching point

1. Move the piston to the position for the first switching point.
⇒ LED 1 illuminated
2. LED 1 not illuminated.
⇒ Check the operating conditions and adjust accordingly.

Inspection of second switching point

1. Move the piston to the position for the second switching point.
⇒ LED 1 is extinguished and LED 2 lights up.
2. If LED 1 does not turn off or LED 2 does not light up,
⇒ check the operating conditions and adjust accordingly.

6.3.5 Electrical connection

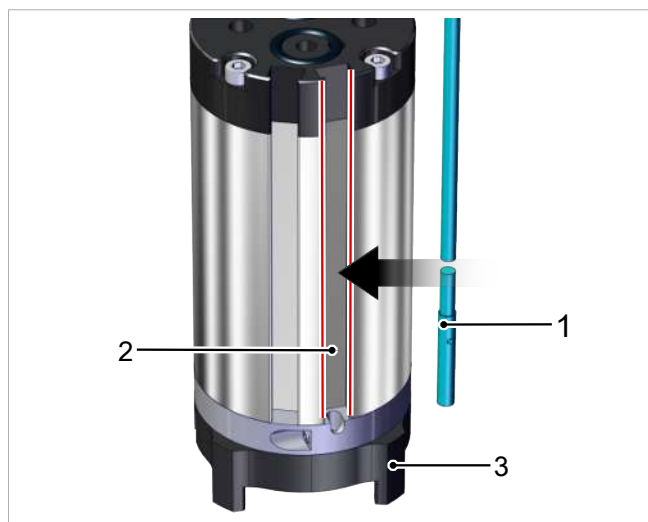
Variant	PNP				NPN			
Circuit diagram								
Plug M12-1	Pin	Litz wire color	Symbol	PNP function	NPN function			
	1	Brown	U_s	Supply voltage				
	2	White	Q1	Signal output 2 (LED 2)	Signal output 1 (LED 1)			
	3	Blue	GND_s	Ground				
	4	Black	Q2	Signal output 1 (LED 1)	Signal output 2 (LED 2)			

6.4 Optional: Proximity Sensor for Workpiece Detection

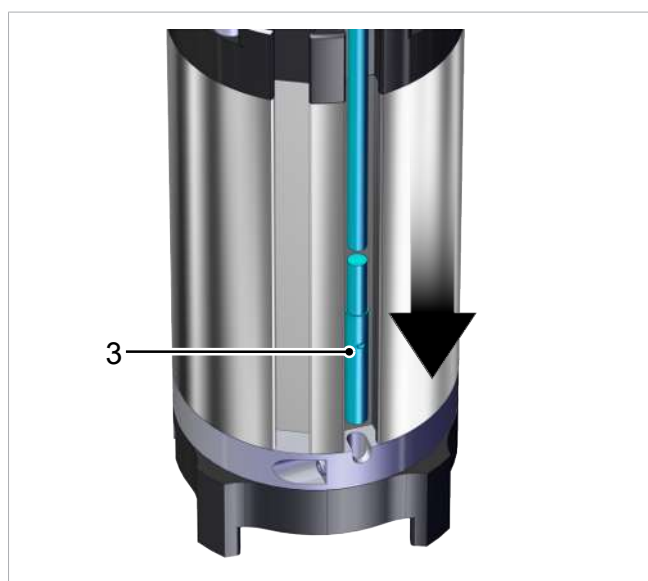
6.4.1 Mounting the Sensor

- ✓ A gripping element (3) is mounted on the gripper.

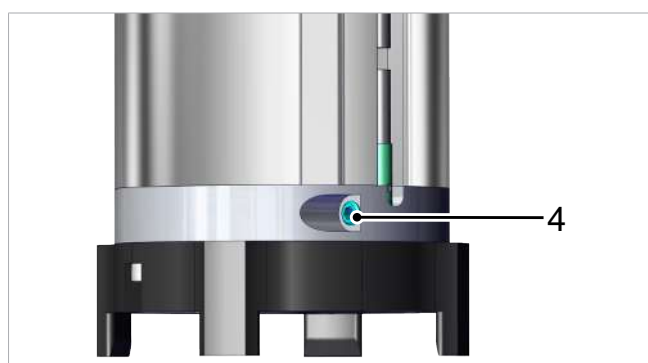
1. Insert the sensor (1) into the designated T-slot (2).



2. Push the sensor (1) into the borehole until it stops.
Important: Before mounting, align the sensor (1) so that the LED (3) is visible.



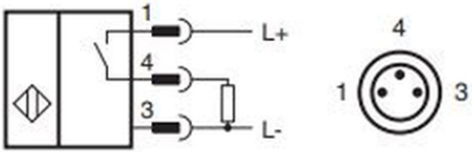
3. Apply Loctite 243 thread lock to the thread of the grub screw (4). Tighten the grub screw (4) with a size 1.5 Allen key: max. tightening torque of 0.16 Nm.



After replacing the gripping element, the sensor function must be checked again and, if necessary, the sensor must be refastened.

6.4.2 Electrical Connection

- ▶ Connect the sensor to the power supply using the connection cable with M8, class-A plug and check that it is functioning using a sample workpiece.

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



The sensor features overload protection. Once the overload is removed, the sensor is functional again.

6.4.3 Starting Up the System



⚠ WARNING

During the start of operations and if the sensor is part of a control system for which the parameters have not yet been set, the system performs uncontrolled movements.

Danger to persons and damage to property

- ▶ People must stay away from the danger areas of the system.
- ▶ Start of operations must be carried out only by trained specialists.
- ▶ Observe the safety instructions of the plant or system manufacturer.

Check the function of the sensor before starting work.

1. Check the connections for tight fit and correct polarity. Replace damaged connectors.
2. Power on the system.
3. Check the function of the sensor using a sample workpiece.
 - ⇒ When the sample contacts the gripper, the LED lights up and the sensor reports it (signal on the "parts present" check output).

7 Operation

7.1 Before Initial Start of Operations

Before the initial start of operations following installation, repair, servicing or maintenance work, you must check the following:

- All mechanical connectors are properly attached and secured.
- All screws and nuts are tightened to specified torques.
- All components are installed.
- The safety distances have been maintained.
- The supply hoses are properly routed.
- The EMERGENCY STOP switch for the overall system is working.
- The type plate and "Warning of Magnetic Field" sign are present and easy to read.



CAUTION

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

Hearing damage

- ▶ Correct installation.
- ▶ Wear ear protectors.



CAUTION

Risk of crushing if workpiece is abruptly attached

- ▶ Do not place any body parts between the gripping surface and the workpiece.

7.2 Preparations

- ▶ The product must be operated only by persons who have undergone appropriate training.



WARNING

The product contains a permanent magnet that generates a continuous magnetic field.

Danger for persons with pacemakers. Devices and data carriers can be damaged.

- ▶ Keep persons with pacemakers away from the product.
- ▶ Keep sensitive electrical devices and data carriers away from the product.

To avoid injury, always use appropriate protective equipment that is suitable for the situation. The protective equipment must meet the following standards:

- Protective work shoes in safety class S1 or higher
- Eye protection class F

Before each activation of the gripping system, the following measures must be taken:

1. Check the device for visible damage. Correct any faults or report them to the supervising personnel.
2. Ensure that only authorized persons are present in the working area of the machine or system in order to prevent any hazard from switching on the machine.
3. Ensure that the danger zone of the machine or system is free of persons during automatic operation.


8 Faults, Causes, Solutions


Error	Cause	Solution
Workpiece is not gripped	Magnets are not in the corresponding end position	<ul style="list-style-type: none"> ▶ Check compressed air supply Check hose connections and plug-in screw unions
	Pressure too low	
Magnetic gripper leaks when compressed air is applied	Sealing elements damaged; use at too high contact or ambient temperature	<ul style="list-style-type: none"> ▶ Adhere to the defined temperature ranges.
Workpiece is only gripped with reduced holding force	The workpiece to be handled does not completely cover the gripping surface.	<ul style="list-style-type: none"> ▶ Make sure that the workpiece to be handled completely covers the gripping surface.
	Gripping element damaged	<ul style="list-style-type: none"> ▶ Replace damaged gripping element.
	Ferromagnetic pollutants on the gripping surface (e.g. iron shavings).	<ul style="list-style-type: none"> ▶ Clean the gripping surface.
	Gripping element is not correctly mounted or aligned.	<ul style="list-style-type: none"> ▶ Check that the gripping element is correctly mounted and secured with the specified torque.
	The workpiece to be gripped has a dirty and/or rough surface or is highly alloyed.	<ul style="list-style-type: none"> ▶ If possible, only handle low-carbon workpieces (round cells) with a clean and smooth surface.
	The operating or ambient temperature is too high.	<ul style="list-style-type: none"> ▶ Adhere to the defined temperature ranges; if necessary, tests should be performed before continuous use.

9 Maintenance

9.1 Safety Instructions for Maintenance


Personnel must have read and understood the instructions.




 **WARNING**

Risk of injury due to incorrect maintenance or troubleshooting

- ▶ Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.




 **CAUTION**

Improper installation or maintenance

Personal injury or damage to property

- ▶ Prior to installation and before maintenance work, the product must be disconnected from the power supply, depressurized (vented to the atmosphere) and secured against unauthorized restart.

9.2 Maintenance Schedule



Schmalz stipulates the following checks and check intervals. The operator must comply with the legal regulations and safety regulations applicable at the location of use. These intervals apply to single-shift operation. For heavier use, such as multi-shift operation, the intervals must be shortened accordingly.

Maintenance task	Daily	Weekly	Monthly	Every six months	Yearly
Check the level of wear on the gripping elements		X			

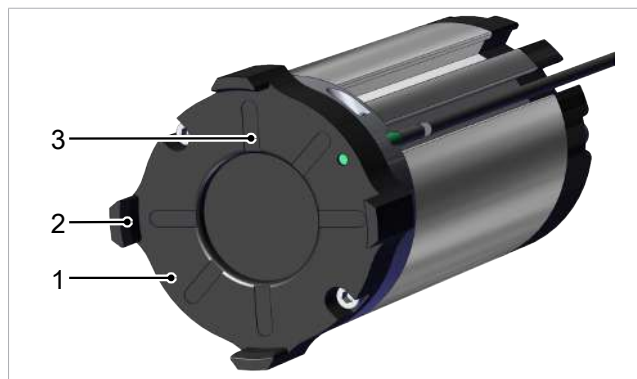
9.3 Cleaning the Magnetic Gripper

1. For cleaning, do not use aggressive cleaning agents such as industrial alcohol, white spirit or thinners. Only use cleaning agents with a pH between 7 and 12.
2. Remove dirt on the exterior of the device with a soft cloth and soap suds.
3. If using sensors, make sure that no moisture gets into the sensors.

9.4 Replacing the Gripping Element

Replace the gripping element (1) if:

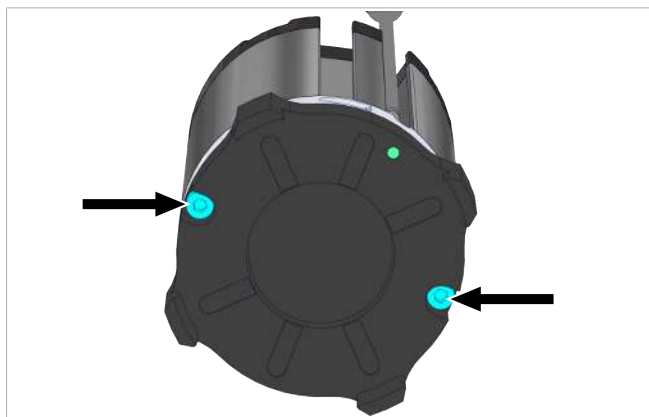
- It is damaged
- The internal radius of the guides (2) for the round cell are worn through the contact surface
- The slot (3) is no longer visible (wear limit reached)



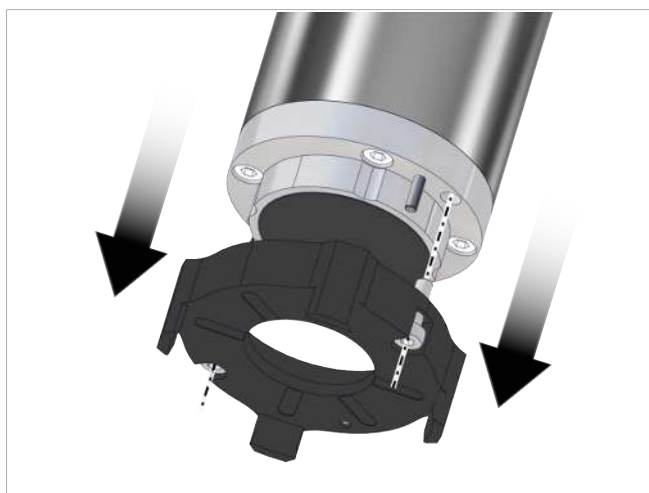
In the case of the standard gripping element with four guide pins, it is no longer possible to ensure that the device can pick up and set down accurately when the wear limit is exceeded. The degree of wear can be determined through the six slots (3) on the underside.

Removing the Gripping Element

1. Release the two size 2 bolts and separate the gripping element from the housing. Secure the screws against falling out.



2. Remove the gripping element from the housing.

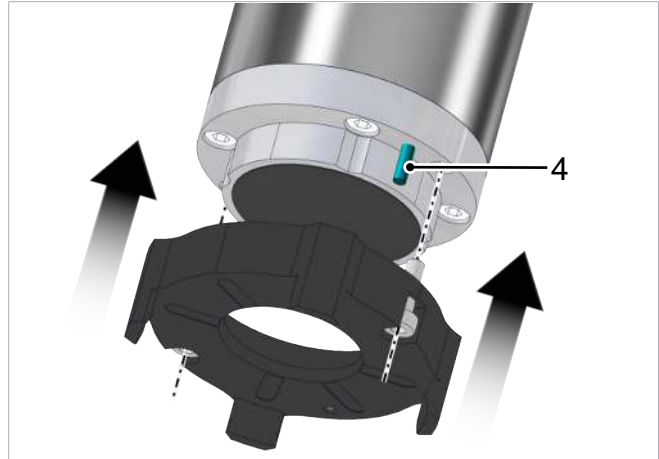


Mounting the Gripping Element

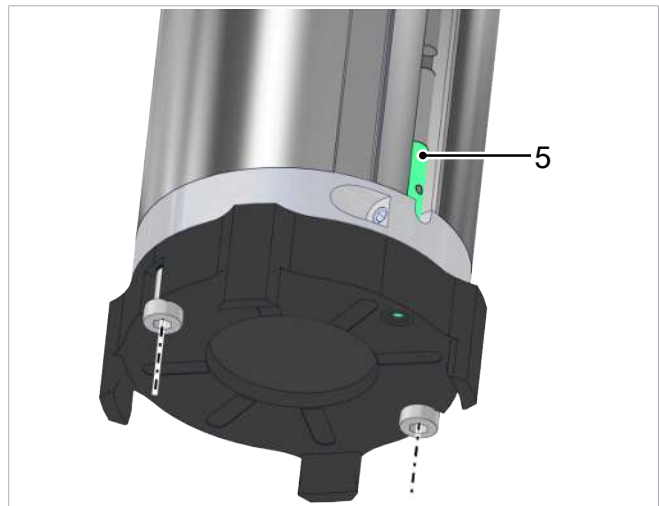
In their delivered condition, the screws of the wearing part sets are coated with adhesive locking compound to screw them in the first time.

1. If the adhesive locking compound is damaged or if the gripping element is refitted with identical screws following disassembly, coat the threads of the screws with Loctite 243 thread lock before use.

2. Place the gripping element in the correct position on the mounting surface, taking into account the Poka-Yoke pin (4).



3. Screw in both screws with a size 2 Allen key and tighten with a tightening torque of 1.0 Nm.



4. Check that the “parts present” check control sensor (5) is working after mounting the gripping element and reposition the sensor if necessary ([> See ch. 6.4 Optional: Proximity Sensor for Workpiece Detection, p. 19](#)).

10 Spare and Wearing Parts

Maintenance work may only be carried out by qualified personnel.

- **WARNING! Risk of injury due to improper maintenance!** After performing any maintenance or repair work, check that the system is functioning correctly, particularly the safety features.

The following list contains the most important spare and wearing parts.

Part no.		Description	Type
10.01.17.00740		Gripping element SGM GR-E SGM-SV46 4BY (standard)	Wearing part set
10.01.17.00741		Gripping element SGM GR-E SGM-SV46 2BY	Wearing part set
10.01.17.00755		Gripping element SGM GR-E SGM-SV46 0BY	Wearing part set

11 Accessories

Proximity sensor 10.01.17.00199

The proximity sensor monitors the position of the piston.

Proximity sensor 21.01.09.00195

With the sensor, the workpiece can be checked independently of the gripping elements used.

Part no.	Description	Note
10.01.17.00199	NAEH-SCHA SMAGN-PNP	Proximity switch
21.01.09.00195	NAEH-SCHA SIND 1 10-30V-DC	Proximity switch

12 Disposing of the Product

Recover the disassembled parts for recycling or reuse (provided no agreement on return or disposal has been made).

1. Dispose of the product properly after replacement or decommissioning.
2. Observe the country-specific guidelines and legal obligations for waste prevention and disposal.

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