

# **3-Finger centric gripper**

## **GSP-Z 16 - 50**

### **Assembly and Operating Manual**



## Imprint

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You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

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Do you have further questions? You may contact us at any time – even after purchase.

Kindest Regards

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## 1 About this manual

This instruction is an integral part of the product and contains important information for a safe and proper assembly, commissioning, operation, maintenance and help for easier trouble shooting.

Before using the product, read and note the instructions, especially the chapter "Basic safety notes".

### 1.1 Warnings

To make risks clear, the following signal words and symbols are used for safety notes.

	<b>⚠ DANGER</b> <b>Danger for persons.</b> Non-compliance will inevitably cause irreversible injury or death.
	<b>⚠ WARNING</b> <b>Dangers for persons.</b> Ignoring a safety note like this can lead to irreversible injury and even death.
	<b>⚠ CAUTION</b> <b>Dangers for persons.</b> Non-observance can cause minor injuries.
	<b>NOTICE</b> <b>Material damage</b> Information about avoiding material damage.

## 1.2 Applicable documents

- General terms of business
- Catalog data sheet of the purchased product
- Assembly and Operating manuals of the accessories

The documents listed here, can be downloaded on our homepage [www.schunk.com](http://www.schunk.com)

## 1.3 Variants

This operating manual applies for the following variations

- GSP-Z without gripping force maintenance
- GSP-Z with gripping force maintenance device "Außengreifend" (AS or NC)
- GSP-Z with gripping force maintenance device "Innengreifend" (IS or NO)

## 2 Basic safety notes

### 2.1 Intended use

The product was designed to grip and to temporarily and securely hold workpieces and objects.

The product is intended for installation in a machine/system. The requirements of the applicable guidelines must be observed and complied with.

The product may be used only in the context of its defined application parameters ([👉 6, Page 12](#)).

The product is designed for industrial use.

To use this unit as intended, it is also essential to observe the technical data and installation and operation notes in this manual and to comply with the maintenance intervals.

### 2.2 Not intended use

Use which is not specified as an intended use is for instance when the product is for example used as a pressing tool, stamping tool, lifting tool, guide for tools, cutting tool, tensioning mean, boring tool.

### 2.3 Environmental and operating conditions

- Make sure that the product and the top jaws are a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

## 2.4 Product safety

Dangers arise from the product, if:

- the product is not used in accordance with its intended purpose.
- the product is not installed or maintained properly.
- the safety and installation notes are not observed.

Avoid any manner of working that may interfere with the function and operational safety of the product.

Wear protective equipment.

### NOTE

More information is contained in the relevant chapters.

### 2.4.1 Protective equipment

Provide protective equipment per EC Machinery Directive.

### 2.4.2 Demands on the top jaws

Arrange the top jaws such that when the product is depressurized it can reach one of the end positions either open or closed and therefore no residual energy can be released when changing the top jaws.

### 2.4.3 Constructional changes, attachments, or modifications

Additional drill holes, threads, or attachments that are not offered as accessories by SCHUNK may be attached only with permission from SCHUNK.

## 2.5 Personnel qualification

The assembly, initial commissioning, maintenance, and repair of the product may be performed only by trained personnel. Each person called upon by the operator to work on the product must have read and understood the complete assembly and operating manual, especially the chapter "Basic safety notes" ([👉 2, Page 6](#)). This applies particularly to personnel only used occasionally, such as maintenance personnel.


## 2.6 The use of personal protective equipment

When installing or removing the product, observe the relevant health and safety at work rules and use the required personal protective equipment (protective gloves, safety boots and safety goggles).

## 2.7 Notes on particular risks

### Generally valid:

- Remove the energy supplies before installation, modification, maintenance, or adjustment work.
- Make sure that no residual energy remains in the system.
- Do not move parts by hand when the energy supply is connected.
- Do not reach into the open mechanism or the movement area of the module.
- Perform maintenance, modifications, and additions outside of the danger zone.
- For all work, secure the unit against accidental operation.
- Take a precautionary approach by maintenance and disassembly.
- Only specially trained staff should disassemble the module.

	<b>⚠ CAUTION</b>
	<p><b>Possible risk of injury due to electrostatic energy!</b>                  Components or assembly groups may become electrostatically charged. When touched, the electrostatic discharge can trigger a startle response, which can result in injuries.</p> <ul style="list-style-type: none"> <li>• The operator must ensure that all components and assembly groups are included in the local equipotential bonding in line with the applicable regulations.</li> </ul>

### NOTE

- The equipotential bonding must be installed by a specialist electrician in line with the applicable regulations, paying particular attention to the actual conditions in the working environment.
- The effectiveness of the equipotential bonding must be verified by a specialist electrician through regular safety measurements.



**! WARNING**

**Risk of injury due to squeezing and bumping during movement of the gripper jaws and breaking or loosening of the gripper fingers !**

**! WARNING**

**Risk of injury from objects falling and being ejected**

- The danger zone must be surrounded by a safety fence during operation.

**! WARNING**

**While disassembling uncontrollable moves of parts of the gripper possible!**

**! WARNING**

**Risk of injury from objects falling during energy supply failure**

Products with a mechanical gripping force maintenance can, during energy supply failure, still move independently in the direction specified by the mechanical gripping force maintenance.

- Secure the end positions of the product with SCHUNK SDV-P pressure maintenance valves.

### 3 Warranty

If the product is used as intended, the warranty is valid for 24 months from the date of delivery from the production facility under the following conditions:

- Intended use in 1-shift operation
- Observe the mandatory maintenance and lubrication intervals
- Observe the environmental and operating conditions

Parts touching the work piece and wear parts are not part of the warranty.

## 4 Scope of delivery

The scope of delivery includes

- 3-Finger Centric Gripper GSP-Z in the ordered model
- Accessory pack

## 5 Accessories

A wide range of accessories are available for this product

For information about which accessories can be used with the appropriate product version see catalog.


## 6 Technical data

Size	16	32	50
<b>Mechanical operating data</b>			
Stroke per jaw [mm]	3	4	7
Weight [kg]	0,1	0,32	0,95
Recommended workpiece weight [kg]	0,6	2,25	5,7
Max. permissible finger length [mm]	30	60	80
Max. permitted weight per finger [kg]	0,03	0,08	0,25
Ambient temperature [°C]			
Min.	+5		
Max.	+60		
Min. spring force [N]			
with gripping force maintenance AS/IS	30	150	330
Closing force [N]			
without gripping force maintenance	120	450	1140
with gripping force maintenance AS	150	600	1470
with gripping force maintenance IS	-	-	-
Opening force [N]			
without gripping force maintenance	144	540	1320
with gripping force maintenance AS	-	-	-
with gripping force maintenance IS	174	590	1650
IP rating	40		
<b>Operating data for compressed air connection</b>			
Pressure medium	Compressed air, compressed air quality according to ISO 8573-1:7 4 4		
Noise emission [dB(A)]	≤ 72		
Min. pressure [bar]			
without gripping force maintenance	2		
with gripping force maintenance	4		
Max. pressure [bar]			
without gripping force maintenance	8		
with gripping force maintenance	6,5		

More technical data are included in the catalog data sheet. Whichever is the latest version.

## 7 Assembly

### 7.1 Mechanical connection

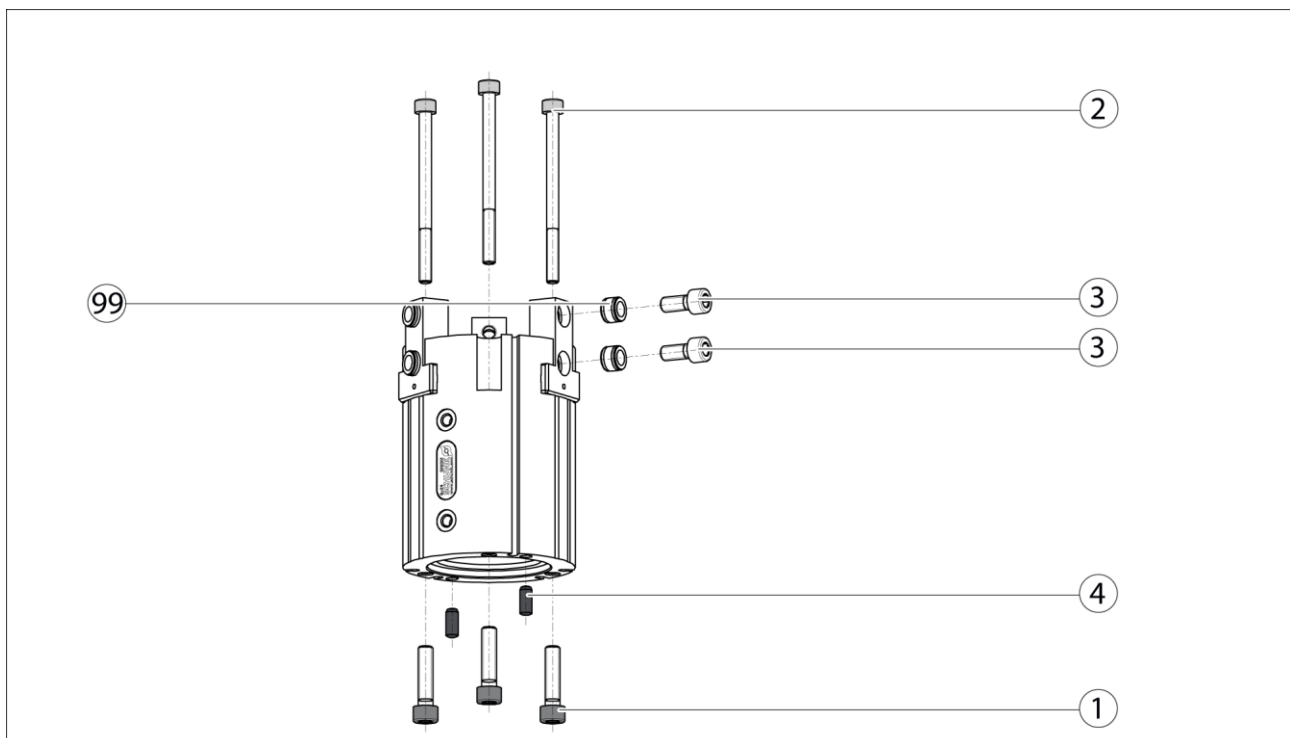
	<b>! WARNING</b>
	<p><b>Risk of injury due to unexpected movement of the machine/system!</b></p> <p>Components may move unexpectedly and cause injuries if the power supply is still on or if there is residual energy in the system left.</p> <ul style="list-style-type: none"> <li>• Switch off power supply.</li> <li>• Ensure that no residual energy remains in the system.</li> </ul>

**Check the evenness of the bolting surface** The values relate to the entire bolting surface.

Requirements for levelness of the bolting surface (Dimensions in mm)

Diameter	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

**Mounting** The module can be mounted from the front or the rear.



Assembly options


Mounting material(provided by customer)


Item	Mounting	16	32	50
1	Rear module	M4 x 6 deep	M5 x 8.5 deep	M6 x 12 deep
2	Module from the front	M4 x 6 deep	M5 x 8.5 deep	M6 x 12 deep
3	Top jaws	M4 x 6 deep	M5 x 8.5 deep	M6 x 12 deep
4	Centering pin	Ø3M6	Ø4M6	Ø5M6
99	Centering sleeve	Ø5K6	Ø7K6 / 4,35	Ø9h6 / 5,35

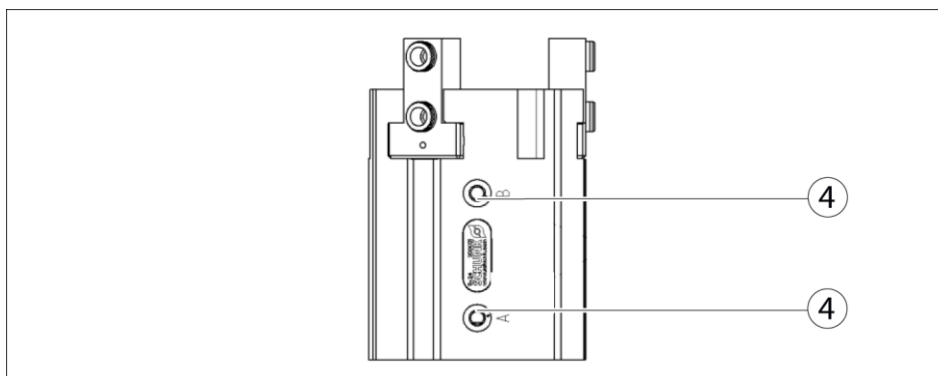
**NOTE**

- For mounting from the rear, fix the module using the provided centering pins (4).
- Mount the module using the provided mounting bores.
- Mount the top jaws using the provided mounting bores . Use centering sleeves (99).

**7.2 Air connection**

	<b>NOTICE</b>
	<p><b>Damage to the gripper is possible!</b>                  If the maximum permissible finger weight or the permissible mass moment of inertia of the fingers is exceeded, the gripper can be damaged.</p> <ul style="list-style-type: none"> <li>• A jaw movement always has to be without jerks and bounce.</li> <li>• You must therefore implement sufficient reduction and/or damping.</li> <li>• Observe the diagrams and information in the catalog data sheet.</li> </ul>

	<b>NOTICE</b>
	<p>Observe the requirements for the air supply <a href="#">(☞ 6, Page 12)</a>.</p>



Air connections

Thread diameter of the air connections

Item	Connection	16 - 50
4	Thread diameter of the air connections (A= open, B = closed)	2 x M5

- Only open the air connections required.
- Seal air connections not required using the locking screws from the enclosed pack.
- For hose-free direct connections use the two O-rings from the enclosed pack.

Further information on the hose-free direct connection contains the catalog data sheet.

### 7.3 Sensors

The gripper is ready to be used with the following sensors:

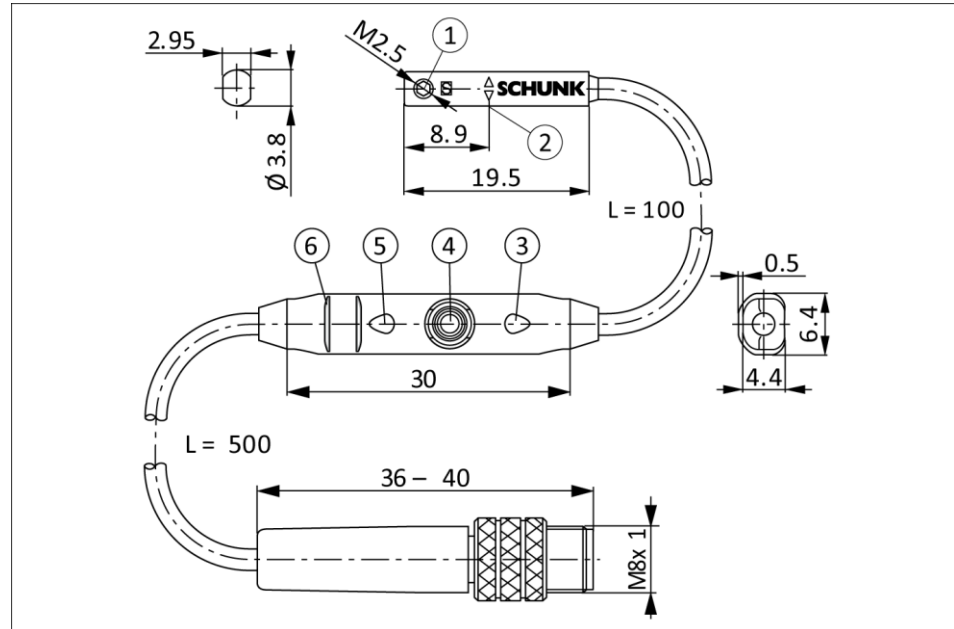
MMS-P sensors and ST4/ST4-2P.

- Sensor MMS-P
  - If you require further information on sensor operation, contact your SCHUNK contact person or download information from [www.schunk.com](http://www.schunk.com).
  - Technical data of the sensors can be found in the data sheets (included in the scope of delivery or on [www.schunk.com](http://www.schunk.com)).
- Sensor ST4/ST4-2P
  - Information about the operation of sensors is provided by Aventics.
  - Technical data of the sensors can be found in the data sheets.

### 7.3.1 Programmable magnetic switch (MMS-P)

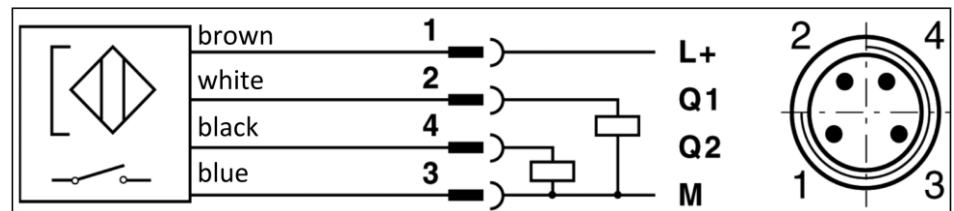
**NOTE**

The MMS-P can be used for sizes GSP-Z 16 to GSP-Z 50.



Magnetic switch MMS-P 22

1	Mounting screw	4	Teach-button
2	Center sensor elements	5	LED display
3	LED display	6	Ribs for cable tires



Connection diagram PNP-4 conductor (MMS-P 22)

Types available for order (see catalog):

- MMS-P 22-S-M8-PNP
- MMSK-P 22-S-PNP
- V2-M8-4-2XM8-3

The MMSK-P 22-S-PNP features a cable with open strands so that it can be connected via terminal contacts.

The V2-M8-4-2XM8-3 distributor is used to convert the 4-pin connector plug of the MMS-P 22-S-M8-PNP sensor to two standard M8 plugs with 3 pins each.



### Mounting of the sensor



#### NOTICE

**Sensor can be damaged during assembly.**

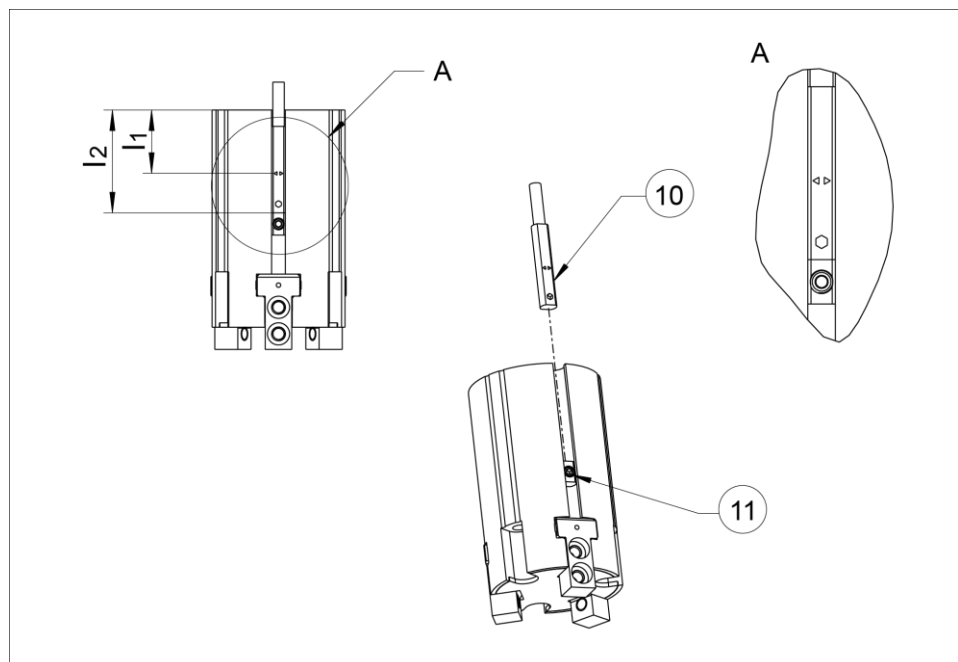
- Do not exceed the maximum tightening torque of 10 Ncm for the set screws!

#### NOTE

Ferromagnetic material changes the switching positions of the sensor (e.g. Adapter plate made of ordinary steel).

For ferromagnetic adapter plates:

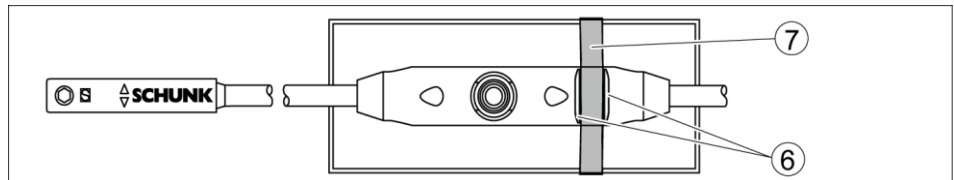
- The module must be first mounted on the adapter plate.
- Then, the position of the magnetic switches has to be set.



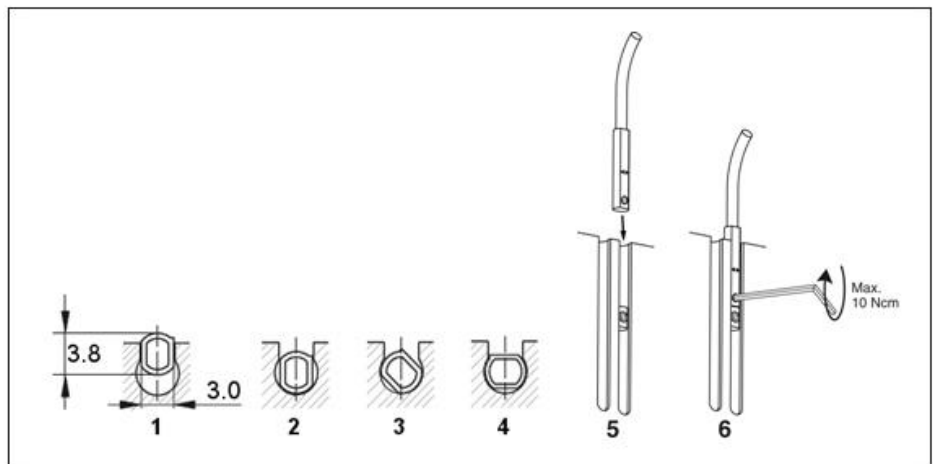
- 1 Push the magnetic switch (10) into the groove until it rests on the back stop (11) (if present).
- 2 If no clamping stop is available, push in the magnetic switch in accordance with dimension  $l_2$  (lower edge gripper up to front side sensor) or with dimension  $l_1$  (lower edge gripper up to the double arrow on the sensor) and then clamp.

Type	Dimension	Dimension	Type	Dimension	Dimension
GSP-Z 16	14,3 mm	23,2 mm	GSP-Z 50	33,1 mm	42,0 mm
GSP-Z 16-AS	14,3 mm	23,2 mm	GSP-Z 50-AS	33,1 mm	42,0 mm

Type	Dimension	Dimension	Type	Dimension	Dimension
GSP-Z 16-IS	12,8 mm	21,7 mm	GSP-Z 50-IS	26,1 mm	35,0 mm
GSP-Z 32	23,0 mm	31,9 mm			
GSP-Z 32-AS	23,0 mm	31,9 mm			
GSP-Z 32-IS	18,0 mm	26,9 mm			

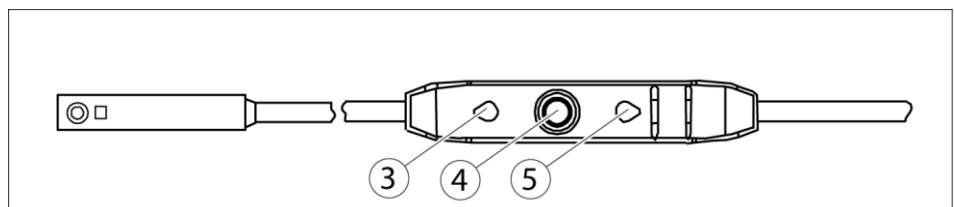


- 1 To relieve the cable, the electronics have to be fixed in place using cable ties (7).  
There are ribs (6) in place on the electronics for mounting purposes.



- 2 Turn in the sensor (1 - 4).  
OR  
Push the sensor axially into the slot until it contacts the stop (5).
- 3 Fix the sensor with an Allen wrench (6).

### Adjustment of the switching points



- 1 Press the "Teach" button (4) for 2 seconds.  
After 2 seconds, LED 1 (3) flashes.
- 2 Move the gripper to position 1 (e.g. "Open").

- 3 Briefly press the "Teach" button (4).  
LED 1 (3) lights up and LED 2 (5) flashes.
- 4 Put the gripper in position 2.  
LED 1 (3) should go out as soon as switching point 1 is left.
- 5 Briefly press the "Teach" button (4).  
LED 2 (5) lights up.

The switching points are set.

**Adjusting the hysteresis**

The hysteresis to both switching points will be adjusted automatically corresponding to the characteristics of the magnetic field. The user can set the switching and triggering points of each position a little bit closer than for the automatic mode. The triggering point is closer to the switching point. At the same time the susceptibility to trouble and damage increases. In the mode of the lowest hysteresis, an error signal (such as jitter or untimely switch off) can be avoided, if the sensor is protected against all types of disturbances (i.e. by shielding). Frequent types of disturbances are change in temperature and electro-magnetic influences.

Within the closest fine-teach mode, SCHUNK cannot guarantee EMC-compatibility any more.

The hysteresis adjustment is used for the manual adjustment of the switching points (if necessary).

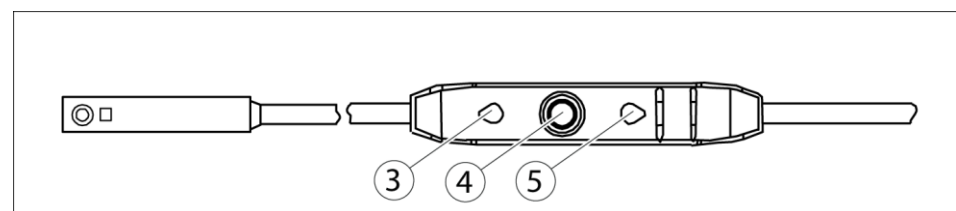
In case that the hysteresis automatically determined by the sensor should be too high or too low after "the adjustment of the switching points", you may correct the value as follows.

The sensor avoids a too small hysteresis during hysteresis adjustment.

The smallest detectable difference in stroke is defined in the following table:

The smallest detectable difference in stroke based on the nominal stroke

For Grippers with X mm nominal stroke per jaw	Min. query range per jaw / min. queried stroke difference per jaw
$X \leq 5\text{mm}$	30% of the nominal stroke per jaw
$X = 5 \text{ to } 10\text{mm}$	20% of the nominal stroke per jaw
$X \geq 10\text{mm}$	10% of the nominal stroke per jaw



- 1 Press the "Teach" button (4) for 5 seconds.  
LED 1 (3) flashes from the second to the fifth second.  
LED 1 goes out after 5 seconds.
- 2 Release the "Teach" button.
- 3 Move the gripper to the "switch off point for switching point 1" position.
- 4 Briefly press the "Teach" button (4).  
LED 1 (3) flashes twice.
- 5 Move the gripper to the "switch off point for switching point 2" position.
- 6 Briefly press the "Teach" button (4).  
LED 2 (5) flashes twice.

The assembly of the MMS-P sensor is completed.

### 7.3.2 Proximity switch ST4 and ST4-2P

The proximity switch ST4 or ST4-2 P by Aventics can be mounted on the gripper. The proximity switches have to be ordered directly from Aventics.

#### **NOTE**

If the sensor is mounted on the gripper GSP-Z 16 or GSP-Z 32 with a magnetic through bolt M3x45 or M4x55, the proximity switch might no longer operate safely.

- For mounting using through bolts, V2A stainless steel bolts must be used instead of ferromagnetic bolts.

Fix the proximity switch ST4 or ST4-2P with the provided centering rings in the intended position, see documentation of the sensors.

## 8 Trouble shooting

### 8.1 Product does not move

Possible cause	Corrective action
Base jaws jam in housing, possible cause: bolting surface not sufficiently level.	Check the evenness of the bolting surface ( <a href="#">☞ 7.1, Page 13</a> ) Loosen the mounting screws of the product and actuate the product again.
Pressure drops below minimum.	Check air supply ( <a href="#">☞ 7.2, Page 14</a> )
Compressed air lines switched	Check compressed air lines
Proximity switch defective or set incorrect.	Readjust or change sensor
Unused air connections open	Close unused air connections
Flow control valve closed.	Open the flow control valve.
Component part defective	Exchange product
The aperture angle is limited to 0°.	Check opening angle limitation

### 8.2 Product does not travel through the entire stroke?

Possible cause	Corrective action
Dirt deposits between basic jaws and guidance	Disassemble and clean the product
Pressure drops below minimum.	Check air supply, ( <a href="#">☞ 7.2, Page 14</a> )
Screw-on surface is not sufficiently flat	Check the evenness of the bolting surface, ( <a href="#">☞ 7.1, Page 13</a> )
Component part defective	Exchange product

### 8.3 Product opens or closes abruptly

Possible cause	Corrective action
Compressed air lines blocked	Check compressed air lines of damage
Screw-on surface is not sufficiently flat	Check the evenness of the bolting surface
One-way flow control valve is missing or adjusted incorrectly	Install and adjust one-way flow control valve
Loading too large	Check the permissible weight and length of the top jaws ( <a href="#">☞ 7.1, Page 13</a> )

### 8.4 Magnetic switch does not work

Possible cause	Corrective action
Steel screws were used to mount the gripper	Use VA-screws
Mounting plates, brackets, etc. from non-magnetic materials	If possible, use aluminium or plastic

### 8.5 The gripping force drops?

Possible cause	Corrective action
Compressed air can escape	Test seals and, if need be, disassemble the module and replace seals
Too much grease in the mechanical movement space	Clean and lubricate product, ( <a href="#">👉 9, Page 23</a> )
Pressure drops below minimum.	Check air supply, ( <a href="#">👉 7.2, Page 14</a> )

## 8.6 Module does not achieve the opening and closing times?

Possible cause	Corrective action
Compressed air lines are not installed optimally	If present: Open the flow control couplings on the module to the maximum that the movement of the jaws occurs without bouncing and hitting.
	Check compressed air lines
	Inner diameters of compressed air lines are of sufficient size in relation to compressed air consumption
	Keep compressed air lines between the product and directional control valve as short as possible
	Flow rate of valve is sufficiently large relative to the compressed air consumption.
	<b>NOTICE! Das Drosselrückschlagventil muss nicht entfernt werden, selbst wenn der Greifer die Öffnungs- und Schließzeiten nicht erreicht.</b>
	If you still cannot achieve the open and close times mentioned in the latest catalog, we recommend the use of quick-air-vent-valves directly at the gripper.
Loading too large	Check the permissible weight and length of the top jaws

## 9 Maintenance and Care

The product is not intended for maintenance.

Disassembly for maintenance or repair purposes is not possible.

A damaged product has to be replaced completely.

## 10 Translation of original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1.B of the European Parliament and of the Council on machinery.

Manufacturer/ SCHUNK GmbH & Co. KG Spann- und Greiftechnik  
Distributor Bahnhofstr. 106 – 134  
D-74348 Lauffen/Neckar

We hereby declare that on the date of the declaration the following incomplete machine complied with all basic safety and health regulations found in the directive 2006/42/EC of the European Parliament and of the Council on machinery. The declaration is rendered invalid if modifications are made to the product.

Product designation: 3-Finger Centric Gripper / GSP-Z 16 - 50 /  
ID number 311140; 311141; 311142; 311170; 311171; 311172; 311190;  
311191; 311192

The incomplete machine may not be put into operation until conformity of the machine into which the incomplete machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

EN ISO Safety of machinery - General principles for design - Risk assessment  
12100:2011-03 and risk reduction

The manufacturer agrees to forward on demand the relevant technical documentation for the partly completed machinery to state offices.

The special technical documents according to Appendix VII, Part B belonging to the incomplete machine have been compiled.

Person authorized to compile the technical documentation:  
Robert Leuthner, Address: see manufacturer's address

*Signature: see original declaration*

Lauffen/Neckar, September 2015

p.p. Ralf Winkler,  
Head of Gripping Systems Development