

Assembly and Operating Manual

GM-L

2-Finger Parallel Gripper



Imprint

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Dear Customer,

thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

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1 General

1.1 About this manual

This manual contains important information for a safe and appropriate use of the product.

This manual is an integral part of the product and must be kept accessible for the personnel at all times.

Before starting work, the personnel must have read and understood this operating manual. Prerequisite for safe working is the observance of all safety instructions in this manual.

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under [Applicable documents](#) [► 6] are applicable.

1.1.1 Presentation of Warning Labels

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



⚠ DANGER

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.



⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.



⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

NOTICE

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

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

The documents marked with an asterisk (*) can be downloaded on our homepage **schunk.com**

1.1.3 Sizes

This operating manual applies to the following sizes:

- GM-L 85
- GM-L 105
- GM-L 205

1.1.4 Variants

This operating manual applies to the following variations:

- GM-L without gripping force maintenance
- GM-L with gripping force maintenance O.D. gripping (...-K)
- GM-L with gripping force maintenance I.D. gripping (...-S)

1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the ex-works delivery date under the following conditions:

- Observe the specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions

Parts touching the workpiece and wear parts are not included in the warranty.

1.3 Scope of delivery

The scope of delivery includes

- 2-Finger Parallel Gripper GM-L in the version ordered
- Assembly and Operating Manual
- Accessory pack

1.4 Accessories

A wide range of accessories are available for this product
For information regarding which accessory articles can be used
with the corresponding product variants, see catalog data sheet.

1.4.1 Seal kit

Seal kits are available as standardized wearing parts sets. All the
seals are included in their scope of delivery.

ID.-No. of the seal kit

Seal kit for	Designation	ID number
GM 85	GMDI 085	0313449
GM 105	GMDI 105	0313451
GM 205	GMDI 205	0313453

2 Basic safety notes

2.1 Intended use

The product is designed exclusively for gripping and temporarily holding workpieces or objects.

- The product may only be used within the scope of its technical data, [Technical data](#) [▶ 17].
- When implementing and operating components in safety-related parts of the control systems, the basic safety principles in accordance with DIN EN ISO 13849-2 apply. The proven safety principles in accordance with DIN EN ISO 13849-2 also apply to categories 1, 2, 3 and 4.
- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

2.2 Not intended use

It is not intended use if the product is used, for example, as a pressing tool, stamping tool, lifting gear, guide for tools, cutting tool, clamping device or a drilling tool.

- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

2.3 Constructional changes

Implementation of structural changes

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- Structural changes should only be made with the written approval of SCHUNK.

2.4 Spare parts

Use of unauthorized spare parts

Using unauthorized spare parts can endanger personnel and damage the product or cause it to malfunction.

- Use only original spare parts or spares authorized by SCHUNK.

2.5 Gripper fingers

Requirements for the gripper fingers

Stored energy within the product creates the risk of serious injuries and significant property damage.

- Arrange the gripper fingers in a way that the product reaches either the position "open" or "closed" in a de-energized state.
- Only exchange the gripper fingers when no residual energy remains in the product.
- Make sure that the product and the top jaws are a sufficient size for the application.

2.6 Environmental and operating conditions

Required ambient conditions and operating conditions

Incorrect ambient and operating conditions can make the product unsafe, leading to the risk of serious injuries, considerable material damage and/or a significant reduction to the product's life span.

- Make sure that the product and the top jaws are a sufficient size for the application.
- Ensure that maintenance and lubrication intervals are observed, [Maintenance](#) [▶ 26].
- 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.
- Make sure that the product is not exposed to excessive vibrations and/or strokes.
- Ensure that no strong magnetic fields impair the function of the product.

Contact your SCHUNK partner if the product is to be used in strong magnetic fields.

2.7 Personnel qualification

Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

- All work may only be performed by qualified personnel.
- Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
- Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

Trained electrician

Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.

Qualified personnel

Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.

Instructed person

Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.

Service personnel of the manufacturer

Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.8 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.
- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

2.9 Notes on safe operation

Incorrect handling of the personnel

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

2.10 Transport

Handling during transport

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

2.11 Malfunctions

Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

2.12 Disposal

Handling of disposal

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.

2.13 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or movement area of the product during operation.

2.13.1 Protection during handling and assembly

Incorrect handling and assembly

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

2.13.2 Protection during commissioning and operation

Falling or violently ejected components

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

2.13.3 Protection against dangerous movements

Unexpected movements

Residual energy in the system may cause serious injuries while working with the product.

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Limit/prevent accidental access for people in this area due through technical safety measures. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

2.13.4 Protection against electric shock

Possible electrostatic energy

Components or assembly groups may become electrostatically charged. When the electrostatic charge is touched, the discharge may trigger a shock reaction leading to injuries.

- The operator must ensure that all components and assembly groups are included in the local potential equalisation in accordance with the applicable regulations.
- While paying attention to the actual conditions of the working environment, the potential equalisation must be implemented by a specialist electrician according to the applicable regulations.
- The effectiveness of the potential equalisation must be verified by executing regular safety measurements.

2.14 Notes on particular risks



⚠ DANGER

Risk of fatal injury from suspended loads!

Falling loads can cause serious injuries and even death.

- Stand clear of suspended loads and do not step within their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.
- Wear suitable protective equipment.



⚠ WARNING

Risk of injury from objects falling and being ejected!

Falling and ejected objects during operation can lead to serious injury or death.

- Take appropriate protective measures to secure the danger zone.



⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.



⚠ WARNING

Risk of injury from crushing and impacts!

Serious injury could occur during the base jaw procedure and when breaking or loosening the gripper fingers.

- Wear suitable protective equipment.
- Do not reach into the open mechanism or the movement area of the product.



⚠ WARNING

Risk of injury from sharp edges and corners!

Sharp edges and corners can cause cuts.

- Use suitable protective equipment.



⚠ WARNING

Risk of injury due to spring forces!

Parts are under spring tension on products which clamp using spring force or which have gripping force maintenance. While disassembling components can move unexpectedly and cause serious injuries.

- Disassemble the product cautiously.
 - Make sure that no residual energy remains in the system.
-



⚠ 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 Technical data

Connection data

Designation	GM ...	GM ... K / S
Pressure medium	Compressed air, compressed air quality according to ISO 8573-1:7 4 4	
Nominal working pressure [bar]	6	
Min. pressure [bar]	3	5.5
Max. pressure [bar]	8	

Designation	GM-L		
	85	105	205
Max. permissible finger length [mm]	100	130	160
Max. permitted weight per finger [kg]	0.25	0.5	1.3

Ambient conditions and operating conditions

Designation	GM-L
Ambient temperature [°C]	
min.	+5
max.	+60
Protection class IP *	40
Noise emission [dB(A)]	≤ 70

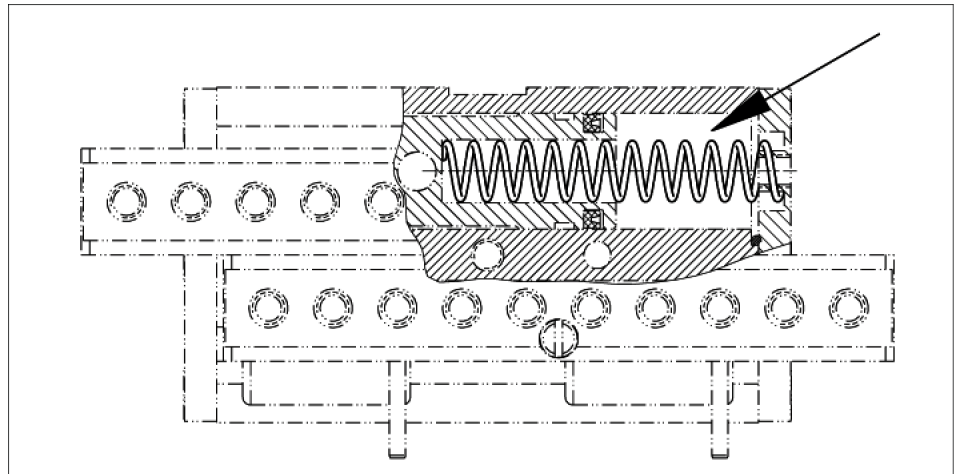
* For use in dirty ambient conditions (e.g. sprayed water, vapors, abrasion or processing dust) SCHUNK offers corresponding product options as standard. SCHUNK also offers customized solutions for special applications in dirty ambient conditions.

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

4 Product description

2-finger parallel grippers with surface-guided base jaws. By the application of pressure to the opposite pistons, each base jaw is moved by a driver on its guiding piston. The synchronization of the jaw stroke is done with a lever.

4.1 Gripping force maintenance



To secure the gripping force in case of a drop in pressure, a spring (arrow) can be integrated without any additional parts. Depending on which side the spring is installed, the gripping force maintenance unit acts in the direction of clamping or spreading.

When ordering a gripping module including a gripping force maintenance unit, the spring will have already been installed by SCHUNK.

For variants with gripping force maintenance, both pistons must be pressurized with compressed air.

5 Assembly and installation

5.1 Installing and connecting



⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

NOTICE

Damage to the gripper is possible!

If the maximum permissible finger weight or the permissible mass moment of inertia of the fingers is exceeded, the gripper can be damaged.

- A jaw movement always has to be without jerks and bounce.
- You must therefore implement sufficient reduction and/or damping.
- Observe the diagrams and information in the catalog data sheet.

- Check the evenness of the mounting surface, [Mechanical connection](#) [▶ 20].
- Connect compressed air lines to the main air connections "A" and "B".
 - ✓ Remove the locking screws.
 - ✓ Screw in air connections (plug connections).
OR: Screw on throttle valve in order to be able to perform sufficient throttling and/or dampening.
- Screw the product to the machine/system, [Mechanical connection](#) [▶ 20].
 - ✓ If necessary, use appropriate connection elements (adapter plates).
- Connect the sensor, see assembly and operating manual of the sensor.
- Mount the sensor, [End position monitoring](#) [▶ 23].

5.2 Connections

5.2.1 Mechanical connection

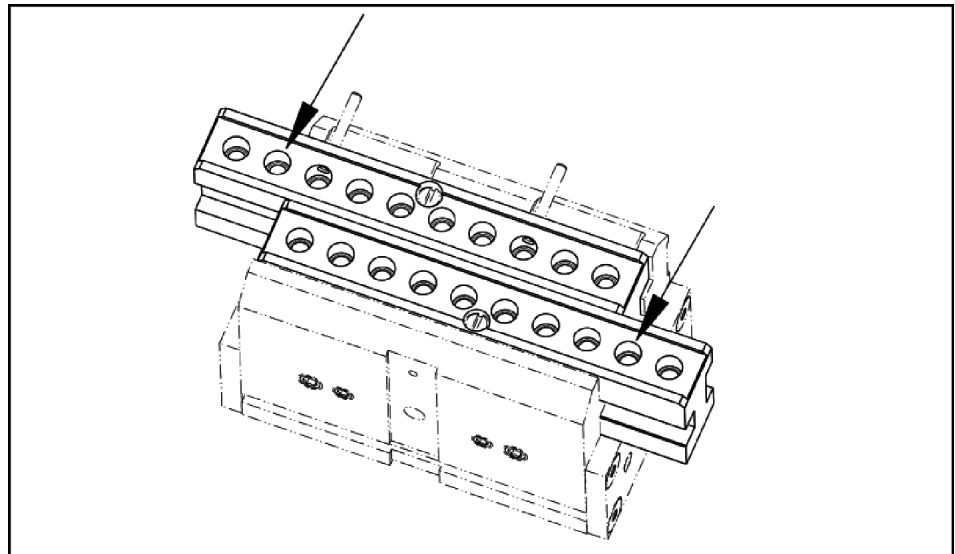
Evenness of the mounting surface

The values apply to the whole mounting surface to which the product is mounted.

Requirements for evenness of the mounting surface (Dimensions in mm)

Edge length	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

Connections at the base jaws

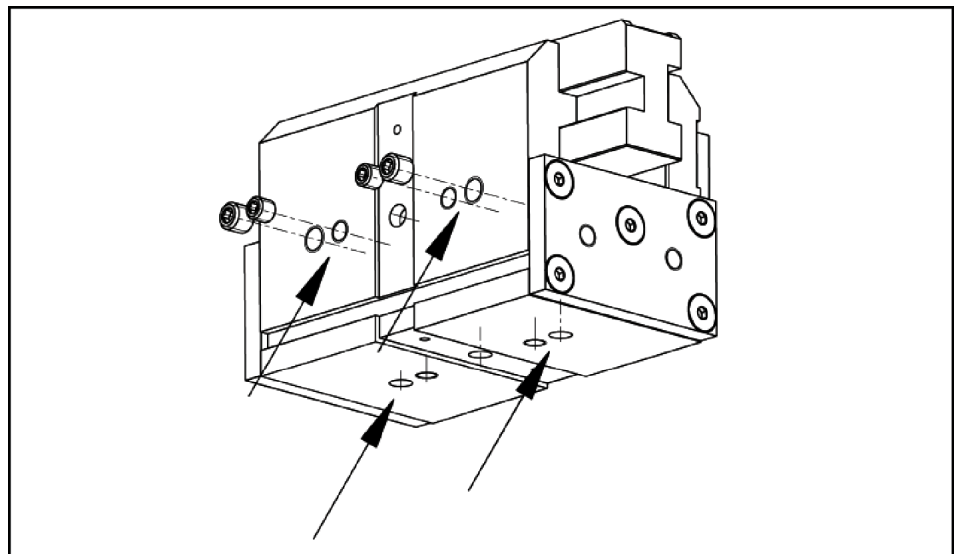


Connection geometries for the top jaws can be found on the base jaws.

➤ Attach the top jaws using the mounting bores provided.

Connections at the housing

The gripping module can be attached to the base side or to the side.



NOTICE**Threads which are not used for mounting, may not be used for other purposes**

Tension can occur, which can lead to jamming of the base jaws.

For side mounting, the factory mounted stud screws must be removed

- Mount the module using the fixing bores provided
- Mount the modules using the fixing bores provided.

Dimensions for the position and size of the connection geometries, Catalog data sheet of the product.

5.2.2 Pneumatic connection**NOTICE****Pressure medium:**

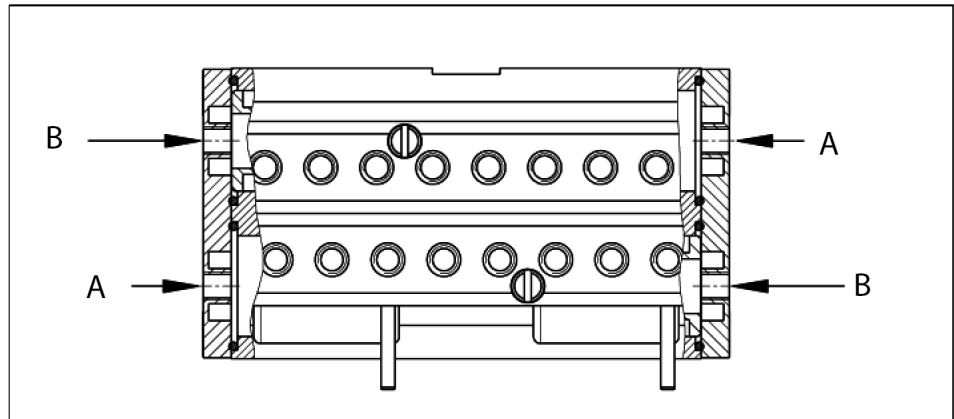
The unit must not under any circumstances be operated with oiled air before operation with unoiled air (washing out of factory lubrication).

NOTICE**Risk of damage to the product!**

- One-way flow control valves must be installed at the air connections for operation.
- Alternatively, hose throttles can also be used.

NOTE

- Observe the requirements for the compressed air supply, [Technical data](#) [▶ 17].
- In case of compressed air loss (cutting off the energy line), the components lose their dynamic effects and do not remain in a secure position. However, the use of a SDV-P pressure maintenance valve is recommended in this case in order to maintain the dynamic effect for some time. Product variants are also offered with mechanical gripping force via springs, which also ensure a minimum clamping force in the event of a pressure drop.



Air connections (A = open, B = close)

Dimensions for the position and size of the connection geometries, Catalog data sheet of the product .

The gripping module has two pistons which are synchronized via a lever.

- The gripping forces specified in the catalog apply to both pistons with 6 bar when pressure is applied.
- When connecting the two pistons, make sure that the pistons are connected crosswise (see Fig.) so that the pistons move in opposite directions.
- For variants with maintenance of gripping force, both pistons must be pressurized with compressed air.
- By connecting only one piston, the gripping force can be halved. In doing so, observe the following:
 - De-aerate piston chambers that are not pressurized with compressed air.
 - Protect piston chambers that are not pressurized with compressed air from dirt with filters or sound absorbers.

5.3 End position monitoring

To monitor the end positions, standardized monitoring sets for direct installation are available.

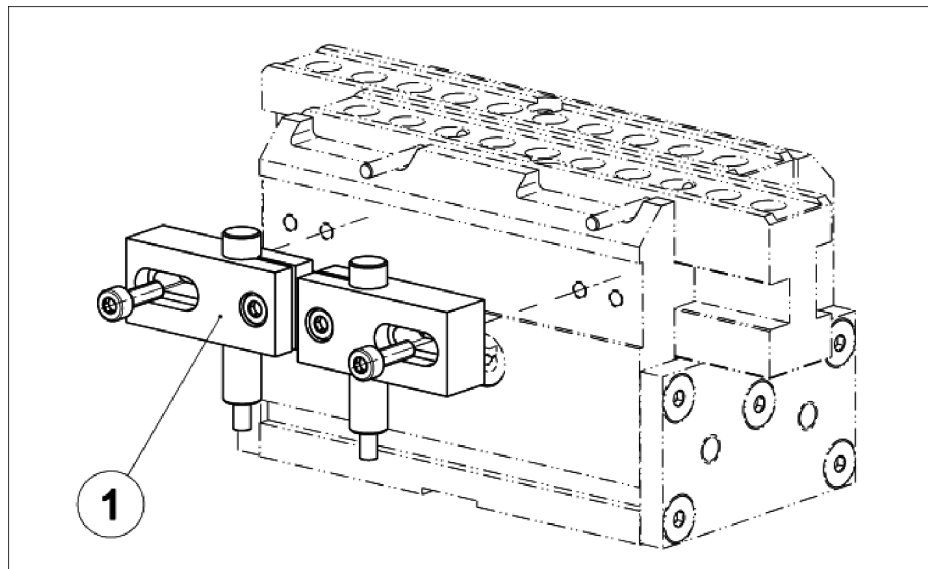
The installation of the monitoring set is possible on both sides of the module, whereby both end positions can be monitored.

The switch bolt that is integrated in the gripper jaws is directly monitored.

Scope of delivery of the monitoring set:

- 1 x retaining plate
- 1 x Inductive proximity switch
- 1 x connection cable

Proximity switch -
monitoring set:
GMNS-...



Position of the proximity switches

1	Proximity switch (GMNS-...)
---	-----------------------------

Setting the
monitoring

- Undo the attachment screw.
- Set the sensor via the retainer plate.
- Fix the sensor via the attachment screw.

5.4 Start-up

- Check technical specifications [Technical data](#) [▶ 17].
- Check the permissible loading specifications (catalog).
- Do not use the module until trouble-free operation has been checked taking all permissible operating parameters into account.
- The movement speed is ideally regulated via throttle check valves [Pneumatic connection](#) [▶ 21].

The speed is always set so that it starts at a low speed, and increases to a higher speed until the desired operating speed is reached

NOTICE

Risk of mechanical damage!

The module should always be adjusted appropriately to prevent mechanical shocks during operation.

6 Troubleshooting

6.1 Modul does not move?

Possible cause	Corrective action
Base jaws jam in housing, e.g. mounting surface is not sufficiently even.	Check the evenness of the mounting surface. Mechanical connection [▶ 20]. Loosen the mounting screws of the product and actuate the product again.
Pressure drops below minimum.	Check air supply. Pneumatic connection [▶ 21]
Compressed air lines switched.	Check compressed air lines.
Proximity switch defective or set incorrect.	Readjust or change sensor.
Component part defective.	Replace component or send it to SCHUNK for repair.

6.2 The module does not travel through the entire stroke?

Possible cause	Corrective action
Dirt deposits in the mechanical elements.	Clean and lubricate product. Maintenance [▶ 26]
Pressure drops below minimum.	Check air supply. Pneumatic connection [▶ 21]
Pistons that are not connected are closed.	
Mounting surface is not sufficiently flat.	Check the evenness of the mounting surface. Mechanical connection [▶ 20]
Component part defective.	Send product with a SCHUNK repair order or dismantle product.

6.3 Module opens or closes abruptly?

Possible cause	Corrective action
Too little grease in the mechanical guiding areas.	Clean and lubricate product. Maintenance [▶ 26]
Compressed air lines blocked.	Check compressed air lines of damage.
Mounting surface is not sufficiently flat.	Check the evenness of the mounting surface. Mechanical connection [▶ 20]
Pressure drops below minimum.	Check air supply. Pneumatic connection [▶ 21]

6.4 Module opens / does it grip the workpiece hard?

Possible cause	Corrective action
Exhaust throttle defective.	Replacing the exhaust air throttle.
Stroke speed too high.	Setting the exhaust air throttle.

6.5 Gripping force is dropping

Possible cause	Corrective action
Compressed air can escape.	Check seals, if necessary, disassemble the product and replace seals.
Too much grease in the mechanical movement space.	Clean and lubricate product.
Pressure drops below minimum.	Check air supply. Pneumatic connection [► 21]
Component part defective.	Replace component or send it to SCHUNK for repair.

6.6 Is the gripper not able to grip or hold on to the workpiece?

Possible cause	Corrective action
Mass of the workpiece too large	Use a larger gripping module
The gripper jaws are too long	Place the gripping point further inside
Design is not optimum	Adapt the design – form-fit gripping
Only one piston was pressurized with compressed air.	Pressurize both pistons with compressed air.

6.7 Module does not achieve the opening and closing times?

Possible cause	Corrective action
Compressed air lines are not installed optimally.	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.

6.8 End position signal not present?

Possible cause	Corrective action
Precisely adjust the sensor for the stop	Readjust the sensor
Proximity switch defective or set incorrect.	Replace sensor
Cable breakage	Replacing the sensor cable

7 Maintenance

7.1 Maintenance and lubrication intervals

NOTICE

Material damage due to hardening lubricants!

Lubricants harden more quickly at temperatures above 60°C, leading to possible product damage.

- Reduce the lubricant intervals accordingly.

Interval [Mio. cycles]	2
------------------------	---

7.2 Schmierstoffe/Schmierstellen

SCHUNK recommends the lubricants listed.

During maintenance, treat all greased areas with lubricant. Thinly apply lubricant with a lint-free cloth.

Lubricant point	Lubricant
Metallic sliding surfaces	Isoflex-Topas NCA 52 (from Klüber)
All seals *	
Bore hole at the piston *	

* Only after disassembling the module for repairs

7.3 Disassembly of the module

NOTICE

A high degree of expertise is required for the disassembly and assembly of the module, [Personnel qualification](#) [▶ 10].

The repair or elimination of defects by the customer on the module results in the termination of the warranty and liability for all resulting warranty and subsequent damage.

It is recommended to have damaged or defective modules repaired at the production facility. Consult a SCHUNK contact person for this purpose.



⚠ WARNING

Risk of injury due to spring forces!

The side cover plates are under spring tension.

Carefully clamp the module between the cover plates and release the screw connection. Slowly unclamp the springs and remove the cover plates.

Disassemble the module as shown in the "Assembly drawing", [Assembly drawing](#) [▶ 28].

7.4 Servicing and assembling the module



⚠ WARNING

Risk of injury due to spring forces!

Use suitable devices and aids for assembly of the springs for version AS.

NOTICE

Material damage due to improper assembly!

- When mounting loads, do not allow impermissible forces and moments to be exerted (see catalog data sheet).
- Select a suitable tightening torque when assembling the product or loads on the product in accordance with the generally accepted guidelines for screw connections.
- Secure all screws using a suitable chemical screw lock.

Maintenance

- Clean all parts thoroughly and check for damage and wear.
- Clean and re-lubricate the accessible mechanism of the gripping module at the prescribed intervals.
[Schmierstoffe/Schmierstellen](#) [► 26]
- Oil or grease bare external steel parts.
- Disassemble the gripping module only for repairs [Disassembly of the module](#) [► 26]

Assembly

Assembly takes place in the opposite order to disassembly. Observe the following:

- Unless otherwise specified, secure all screws and nuts with Loctite no. 243 and tighten with the appropriate tightening torque.
- Select suitable tightening torque values for screws when assembling the module in accordance with the generally accepted guidelines for screw connections.

7.5 Assembly drawing

The following figure is an example image.
It serves for illustration and assignment of the spare parts.
Variations are possible depending on size and variant.

All other wearing parts and individual components are available individually according to the following sectional drawings.

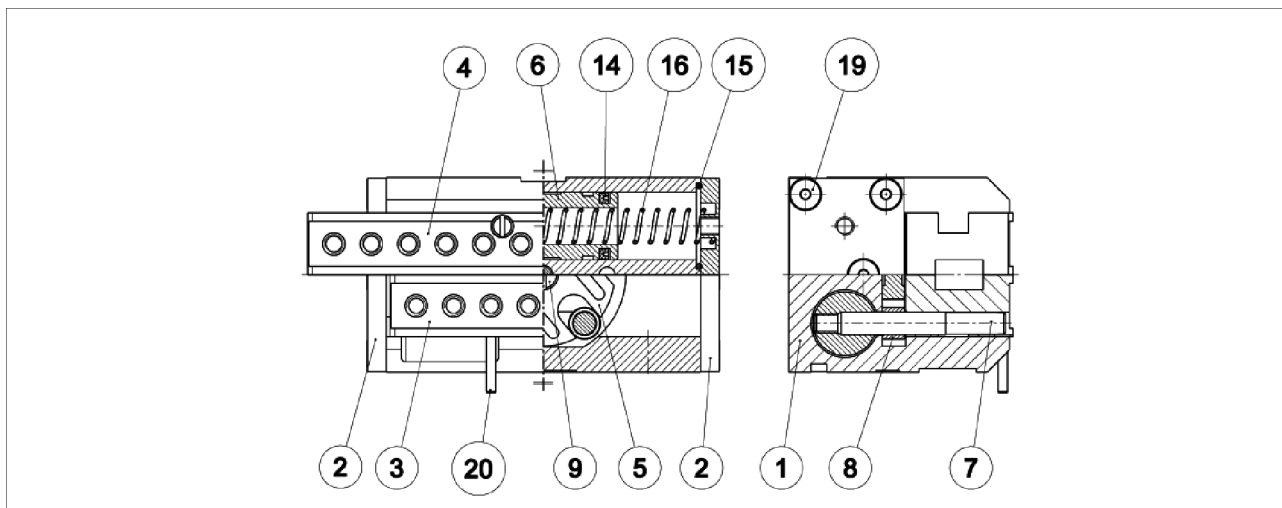
Order numbers are composed as in the following example:

- Part-No. 2 GM 105-02

NOTICE

Items 1, 3 and 4 are aligned to each other and can not be ordered as spare parts.

If these components are defective, then the repair has to be done in the production facility.



Assembly of the GM series

8.1 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1. Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	2-Finger Parallel Gripper
Type designation	GM-L
ID number	0313066, 0313075, 0313076 , 0313077, 0313084, 0313085, 0313086

To be provided by the System Integrator for the overall machine	↓
Fulfilled for the scope of the partly completed machine	↓
Not relevant	↓

1.1	Essential Requirements			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting		X	
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics		X	
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	Control Systems			
1.2.1	Safety and reliability of control systems		X	
1.2.2	Control devices		X	
1.2.3	Starting		X	
1.2.4	Stopping		X	
1.2.4.1	Normal stop		X	
1.2.4.2	Operational stop		X	
1.2.4.3	Emergency stop		X	
1.2.4.4	Assembly of machinery		X	
1.2.5	Selection of control or operating modes		X	
1.2.6	Failure of the power supply			X

1.3	Protection against mechanical hazards			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X

1.3	Protection against mechanical hazards			
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X
1.4	Required characteristics of guards and protective devices			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X
1.5	Risks due to other hazards			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X
1.6	Maintenance			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

Translation of original declaration of incorporation

1.7	Information			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		
	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	