Assembly and operating instructions

Smart Gripper
SGE-40-P-IOL

Translation of the Original Assembly Instructions EN

■ SGE-40-P-IOL ⇨ Order no.: 50578183

Dear Customer

Thank you for choosing our products and placing your trust and confidence in our company!

These assembly and operating instructions contain all essential information you need about your product. Our aim is to provide the required information as concisely and clearly as possible. If, however, you still have any questions on the contents or suggestions, please do not hesitate to contact us. We are always grateful for any feedback.

Our team will also be glad to answer any further question you may have regarding the smart gripper or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The modules have been designed by Afag Automation AG according to the state of the art. Due to the constant technical development and improvement of our products, we reserve the right to make technical changes at any time.

Updates of our documentations

Unlike the printed documents, our digital instructions manuals, product data sheets and catalogues are being continuously updated on our website.

Please keep in mind that the digital documents on our website are always the latest versions.

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1 General

1.1 Contents and purpose of these assembly instructions

These assembly instructions contain important information on assembly, commissioning, functioning and maintenance of the gripper SGE-40--P to ensure safe and efficient handling and operation.

Consistent compliance with these assembly instructions will ensure:

- stable operational reliability of the SGE-40-P- IOL,
- optimal functioning of the SGE-40-P- IOL,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs),
- Extension of the service life of the SGE-40-P- IOL.

The illustrations in this manual shall provide you with a basic understanding of the module and may vary from the actual design of your module.

1.2 Explanation of symbols

The safety notes are marked by a pictogram and a signal word. The safety notes describe the extent of the hazard.

DANGER

Danger!

This safety note indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Warning!

This safety note points out a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Caution!

This safety note points out a potentially dangerous situation which, if not avoided, can result in minor or slight injuries.

NOTICE

This safety note points out a potentially dangerous situation which, if not avoided, can cause substantial damage to property and the environment.

This note contains important additional information as well as useful tips for safe, efficient and trouble-free operation of the module.

Further warning signs:

Where applicable, the following standardised symbols are used in this manual to point out the various potential health risks.

	Warning - Dangerous electrical voltage.
	Warning - Risk of injury from contact with hot surfaces.
	Warning - Risk of hand and finger injury due to uncontrolled movements of components.
	Warning - Magnetic field
	Warning - back injury due to heavy lifting.
	Warning - Risk of injury as a result of parts being flung out!
	Warning -high noise levels

1.3 Additional symbols

In these assembly instructions the following symbols are used to highlight instructions, results, references, etc..

Symbol	Description
1.	Instructions (steps ...)
⇨	Results of actions
➲	References to sections
■	Enumerations not ordered

1.4 Applicable documents

In addition to the assembly instructions, the following documents must be observed:

- General terms and conditions.
- Catalogue data sheet of the SSGE-40-P- IOL.
- Instructions for integrated components (➲Supplier documentation).

  This documentation can be downloaded from www.afag.ch.

Each SGE-40-P-IOL is accompanied by a safety information sheet. This information sheet must be read carefully by every person who carries out work on and with the SGE-40-P-IOL.

1.5 Warranty

The warranty terms for Afag handling components and handling systems are the following:

- 24 months from initial operation and up to a maximum of 27 months from delivery.
- Parts in contact with the workpiece and wear parts are excluded from the warranty.

The warranty covers the replacement or repair of defective Afag parts. Further claims are excluded.

Note: However, a customer has a right to a defect-free product. This does also apply to defective accessories and wear parts. Normal wear and tear are excluded from the warranty.

The warranty shall expire in the following cases:

- Improper use of the module.
- Non-observance of the instructions regarding assembly, commissioning, operation and maintenance as well as ambient and operating conditions.
- Improper assembly, commissioning, operation and maintenance.
- Repairs and design changes carried out without prior technical instructions of Afag Automation AG.
- Removing the serial number from the product.
- Inadequate checking of wear parts.
- Non-observance of the EC Machinery Directive, the Accident Prevention Regulations, the Standards of the German Electrotechnology Association (VDE) and these safety and assembly instructions.

1.6 Liability

No changes shall be made to the module unless described in these assembly instructions or approved in writing by Afag Automation AG.

Afag Automation AG accepts no liability for unauthorized changes or improper assembly, installation, commissioning, operation, maintenance or repair work.

2 Safety instructions

2.1 General

This chapter provides an overview of all important safety aspects to ensure safe and proper use of the gripper and optimal protection of personnel.

Safe handling and trouble-free operation of the module requires knowledge of the basic safety regulations.

Every person carrying out installation, commissioning, maintenance work or operating the module must have read and understood the complete user manual, especially the chapter on safety instructions.

Beyond this, there are rules and regulations regarding accident prevention that are applicable to the place of installation which must be observed.

Improper use may result in danger to life and limb of the user or third parties or in damage to the automation system or other material assets.

Failure to follow the directions and safety instructions given in this instructions manual may result in serious hazards.

2.2 Intended use

The SGE-40-P-IOL are designed exclusively for gripping and time-limited secure holding of workpieces or objects.

The SGE-40-P-IOL are intended for industrial and industry-related applications.

The SGE-40-P-IOL are designed for installation into a machine. The applicable guidelines must be observed and complied with.

When implementing and operating the SGE-40-P-IOL in safety-related parts of control systems, the basic safety principles according to DIN EN ISO 13849-2 must be applied. For categories 1, 2, 3 and 4, the proven safety principles according to DIN EN ISO 13849-2 must also be applied.

The intended use of the module also includes:

- observance of all instructions given in this instructions manual.
- compliance with the inspection and maintenance work and the specifications in the data sheets,
- using only original spare parts.

2.3 Foreseeable misuse

Any use other than or beyond the intended use described above is considered a misuse of the SGE-40-P-IOL.

Especially the following use is considered a misuse:

- The use of the module as a pressing tool, punching tool, lifting tool, guiding aid, cutting tool, clamping device or drilling tool.

The SGE-40-P-IOL must not be exposed to corrosive media. Products for special environmental conditions are excluded.

WARNING

Risk of injury if the module is not used as intended!

The improper use of the module poses a potential hazard to the personnel.

- The module may only be used in a technically perfect condition in accordance with its intended use and the instructions in this manual as well as in compliance with the safety requirements!
- Any malfunctions, particularly those that could impair safety, must be eliminated immediately!

Risks can occur if the module is not used as intended. In the event of damages caused by improper use the following shall apply:

- the operating company shall be solely responsible for such damage, and
- Afag does not accept any liability for damage caused by improper use of the SGE-40-P-IOL.

2.4 Obligations of the operator and the personnel

2.4.1 Observe the assembly instructions

A basic prerequisite for safe and proper handling of the gripper is a good knowledge of the basic safety instructions.

These assembly instructions, in particular the safety instructions contained therein, must be observed by all persons working with the gripper.

2.4.2 Obligations of the operating company

In addition to the safety instructions given in this manual, the operating company must comply with the safety, accident prevention and environmental protection regulations valid for the field of application of the portal axis. The operating company is required to allow only persons to work on the SGE-40-P-IOL who:

- have the necessary professional qualifications and experience,
- are familiar with the basic rules regarding occupational safety and accident prevention,
- have been instructed in the correct handling of the SGE-40-P-IOL,
- have read and understood these assembly instructions.

The operating company is also required to:

- monitor on an ongoing basis that the personnel work safely considering any potential hazard involved and the assembly instructions are observed,
- ensure that the assembly instructions are always kept at hand at the installation in which the modules are mounted,
- observe and communicate universally applicable laws and regulations regarding accident prevention and environmental protection,
- provide the necessary personal protective equipment (e.g., protective gloves) and instruct the personnel to wear it,
- update the related safety data sheets.

2.4.3 Obligations of the personnel

All personnel working with the SGE-40-P-IOL are required to:

- read and observe these assembly instructions, especially the chapter on safety,
- use the SGE-40-P-IOL as intended,
- observe the occupational safety and accident prevention regulations,
- observe all safety and warning signs on the SGE-40-P-IOL,
- avoid any safety-critical actions,
- refrain from any working methods that impair the function and operational safety of the SGE-40-P-IOL,
- eliminate any faults that occur immediately,
- observe the maintenance and care instructions,
- observe the safety, accident prevention and environmental protection regulations for the area of application of the SGE-40-P-IOL.

In addition, the personnel must wear the personal protective equipment required for carrying out their work. (➲Chapter 2.6).

2.5 Personnel requirements

2.5.1 Personnel qualification

The activities described in the assembly instructions require specific requisites at the level of professional qualifications of the personnel.

Personnel not having the required qualification will not be able to assess the risks that may arise from the use of the smart gripper thus exposing themselves and others to the risk of serious injury. Therefore, only qualified personnel may be permitted to carry out the described activities on the gripper.

Persons whose ability to react is restricted due to the intake of medication or the like must not interact with the gripper.

These installation instructions are intended for skilled personnel (installers, system integrators, maintenance personnel, technicians), electricians and operating personnel.

The following is a description of the professional skills (qualifications) required for carrying out the different activities:

Qualified personnel:
Qualified personnel with appropriate training who are qualified due to their special know-how and fully familiar with the machine and who have been given instructions on how to carry out the task entrusted to them safely.

Qualified electrician:
Persons who have obtained their electrical qualifications through appropriate professional training and complementary courses that enables them to identify risks and prevent possible hazards resulting from electricity.

Operator (trained personnel):
Authorized persons who due to their specialized professional training, expertise and experience are capable of identifying risks and preventing possible hazards arising from the use of the machine.

2.6 Personal protective equipment (PPE)

The personal protective equipment serves to protect the personnel from hazards affecting their safety and health at work.

When working on/with the module, the personnel must wear the personal protective equipment assigned by the safety officer of the operating company or as required by safety regulations. In addition, the personnel are required to:

- To observe the occupational health and safety regulations and to comply with valid safety and accident prevention regulations,
- wear the personal protective equipment provided by the operating company (employer),
- check the personal protective equipment for proper condition, and
- immediately notify the person responsible on site of any defects found on the personal protective equipment.

Personal protective equipment and the respective mandatory signs:

	*Protective clothing* is a close-fitting clothing specifically designed to protect personnel from hazards during work.
	*Protective gloves* are specifically designed to protect the personnel against hand injuries (such as cuts, abrasion, burns).
	*Safety shoes* are specifically designed to protect the personnel against foot injuries from crushing, falling objects or slipping on slippery surfaces.
	Hearing protectors are required to protect the personnel against excessive noise levels to prevent noise-induced hearing loss.

2.7 Changes & Modifications

No changes may be made to the SGE-40-P-IOL, which have not been described in these assembly instructions or approved in writing by Afag. Conversions, modifications and reworking (e.g. additional threads, drill holes, etc.) can impair the correct functioning or safety of the gripper and/or cause material damage.

Afag Automation AG accepts no liability for unauthorised changes or improper assembly, installation, commissioning, maintenance or repair work.

The rotational axis may not be changed or modified in any way, except with the prior written consent of Afag.

2.8 General hazards / residual risks

Despite the safe design of the machine and the technical protective measures taken, there remain residual risks that cannot be avoided, and which present a non-obvious residual risk when operating the modules.

Observe the safety instructions in this chapter and in the other sections of this manual to avoid damage to property and dangerous situations for the personnel.

2.8.1 General hazards at the workplace

The gripper has been built according to the state-of-the-art and the applicable health and safety requirements. However, improper use of the gripper may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- to the SGE-40-P-IOL itself,
- Property damage.

Always keep the assembly instructions ready at hand at the workplace! Please, also observe:

- the general and local regulations on accident prevention and environmental protection,
- the safety information sheet for the gripper.

WARNING

Danger - Do not use the SGE-40-P-IOL in inappropriate environment !

Using the SGE-40-P-IOL, in inappropriate ambient and operating conditions poses a risk which can cause serious injuries and considerable damage to property or reduce the service life of the modules.

- Make sure that the SGE-40-P-IOL is only used within the defined application parameters (➲Technical data).

WARNING

Risk of injury from sharp edges and pointed corners!

Sharp edges and pointed corners can cause cuts.

- Wear personal protective equipment.

WARNING

Danger of injury from hot surfaces!

Surfaces of components can heat up strongly during operation. Skin contact with hot surfaces will cause severe burns to the skin.

- Wear protective gloves when working near hot surfaces.
- Ensure that all surfaces have cooled down before carrying out any work.

CAUTION

Danger of injury in the working area of the modules!

Due to the decentralised control system, the operator must not necessarily stand next to the gripper during operation so that he may not have a complete overview of the working area. Persons standing near the working area may be injured.

- When operating the modules, ensure a good overview of the working area.
- Unauthorized persons must not stay within the working area during operation.
- Observe safety distances.

CAUTION

Risk of injuries due to uncontrolled parts movements!

Incorrect control of connected drives, operating errors, incorrect parameter setting during commissioning or software errors can trigger unexpected movements that can cause personal injury or damage to property.

- Only qualified personnel may work with the gripper.
- Read these instructions carefully before working on or with the module.

CAUTION

Risk of noise-induced hearing loss!

When the grippers are installed in a machine or a plant, the permissible noise level may be exceeded depending on the various components, the environment and the resonance.

- The operating company is responsible for ensuring that the permissible noise levels are observed.
- If the noise level exceeds 85 dB(A) in normal operation, the operator must wear hearing protectors at the workplace.

2.8.2 Danger due to electricity

DANGER

Danger! Risk of electric shock!

If work on electrical components is required, ensure that the work is carried out properly, failure to do so will cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.
- Before connecting or disconnecting electrical lines and before assembly, conversion, maintenance and adjustment work, switch off the power supply and secure it against being switched on again.
- When the power supply is connected, do not touch the connection points of the SGE-40-P-IOL and do not move any parts by hand.
- Cover live parts.

WARNING

Risk of injuries due to uncontrolled parts movements!

When working on the SGE-40-P-IOL serious injuries can be caused by unexpected movements, if the power supply is switched on or if there is still residual energy in the system.

- Switch off the power supply and use a lockout device to make sure that the system cannot be switched on again.
- Ensure that there is no residual energy left in the system.

2.8.3 Dangers in case of power failure

WARNING

Risk of injury from falling objects if the power supply fails!

Electronic products are fundamentally not fail-safe. If the power supply fails, the gripping force drops, and it cannot be guaranteed that the gripped workpiece is held securely.

- The operator is responsible for ensuring that the drive is brought to a safe state in the event of a power supply failure.

2.8.4 Mechanical hazards

WARNING

Risk of injury - Do not reach into the system during operation!

There is a risk of injury if the personnel reach into the system during normal operation.

- Never reach into the system during normal operation!

WARNING

Risk of injury from falling or ejected objects!

During operation, falling or ejected objects can cause serious injuries or even death.

- Secure the danger zone with suitable measures!

CAUTION

Risk of injury from crushing and pushing!

When moving the base jaws and by breaking or loosening the gripping fingers, injuries to limbs can occur!

- Wear personal protective equipment!
- Do not reach into the open mechanism and into the movement area of the SGE-40-P-IOL.

2.8.5 Danger caused by omitting maintenance work

CAUTION

Danger of injury!

Poor or not regularly performed maintenance work may cause malfunction of the components which may result in injuries.

- The due diligence obligations of the operating company include ensuring that the personnel carrying out maintenance work is appropriately trained and qualified.

3 Technical data

3.1 Dimensional drawing SGE-40-P-IOL

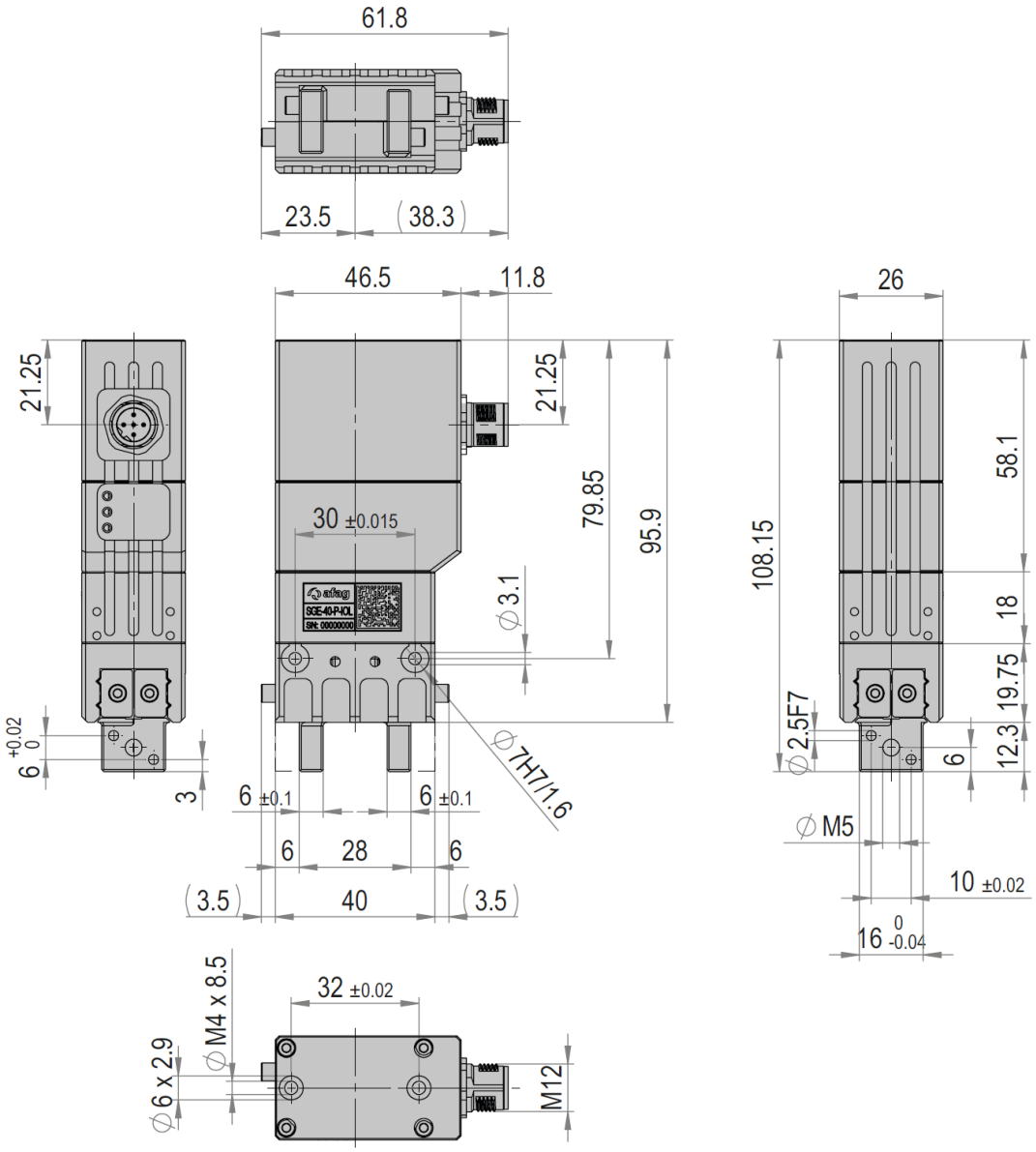


Fig. 1 Dimensional drawing gripper SGE-40-P-IOL

3.2 Technical data SGE-40-P-IOL

SGE-40-P-IOL	
Attachment grid	30 mm
Attachment thread	M4 mm
Ambient temperature	5-55 °C
Storage temperature	5-55 °C
Humidity	< 90 %

Typ	SGE-40-P-IOL
Order number	**50578183**
Opening stroke	2 x 6 mm
Net weight	0.34 kg
Recommended workpiece weight	0.7 kg
Max. gripping force 100%	140 N
Min. gripping force 25%	35 N
Max. allowable finger length	50 mm
Max. permissible mass per finger	0.08 kg
Closing / Opening time	0.2/0.2 s
Repeat accuracy	+/- 0.02 mm
Repeat accuracy (positioning unidirectional)	*+/- 0.1 mm
Repeat accuracy (positioning bidirectional)	**+/- 0.2 mm
Noise level	<70 dB (A)
Operating voltage	24 V
Nominal current	0.2 A
Peak current	2 A
Protection type	Mech.: IP30 / Electr.: IP40
Port	Class B
Transfer rate	COM2
Communication interface	IO Link
Controller electronics	integrated
Mounting position	

Clean room class: ISO 14644-1 Class 6

* Repeat accuracy (positioning unidirectional): Is defined as the deviation of the actual position of the base jaws during 100 successive movements to a nominal position from the same direction under constant conditions

** Repeat accuracy (positioning bidirectional): Is defined as the deviation of the actual position of the base jaws during 100 successive movements to a nominal position from both directions under constant conditions

Inlcuded in the delivery
(Catalogue HT accessories)
- 2x Centering sleeve SGE-40-P-IOL
- 2x Centering sleeve Ø7x3
- 2x Specoal screw M4x33.5/10

Accessories
(Catalogue HT accessories)
- Sensor actor cable-S4

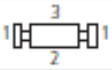
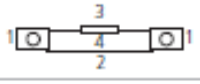
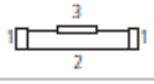
Note on EMC conformity (according to DIN EN 61000-6-4:2020:09): The SGE-40-P-IOL may only be used in DC distribution networks with an extension of < 30 m.

3.3 Recommended combinations SGE-40-P-IOL

ES20	1,3	< direct >	1
	1	VP 163	2
ES30	1	< direct >	1
	1	VP 163	2
	3	VP 112	1
SA-1	1,2	VP 149	1
SA-3	1	VP 163	1,2
	2	< direct >	1
	2	VP 163	2
SA-6	1	VP 163	1,2
	2	< direct >	1
	2	VP 163	2
RE-50	3	< direct >	1
	3	VP 163	2
RE-75	3	VP 112	2*
	3	VP 112 VP 163	2
SREH-50	3	< direct >	1
	3	VP 163	2
CS 12	1, 3	< direct >	1
	1	VP 163	2
CS 16	1, 3	< direct >	1
	1	VP 163	2
CS 20	1	< direct >	1
	1	VP 163	2
	3	VP 112	1
LM 20	1	VP 112	1
LM 25	1	VP 112	1
CR 16	3	< direct >	1
	3	VP 163	2
CR 20	3	< direct >	1
	3	VP 163	2

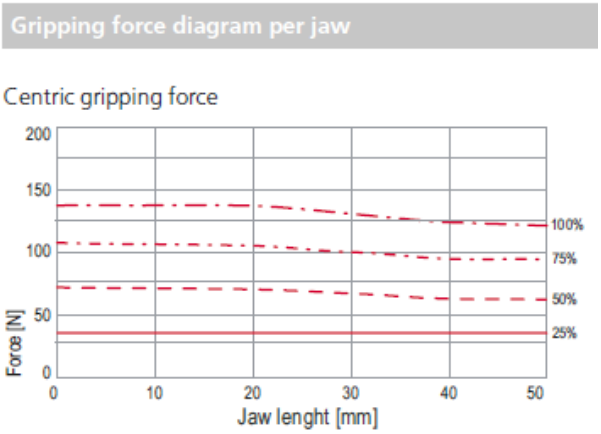
* Offset mounting

Mounting areas

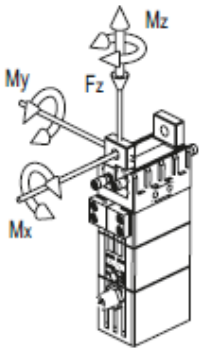
CS, ES	LM	HM	SA	UG, GM, SG, DG, PG, GE, SGE
				
PMP, PMP-c	**PEZ, PDZ**	**PEL, PDL**	**RM, RE**	**CR, RM 32, RE, SREH, RA**
				

Note that there might be different mounting positions from one module to another one.
The required connection elements and the range of support columns are depicted in the catalogue HT accessories.

3.4 Gripping force diagram SGE-40-P-IOL



3.5 Load of gripper fingers SGE-40-P-IOL

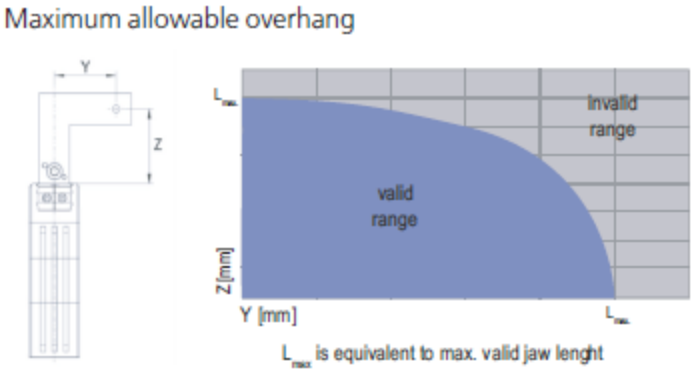


The specified torques and forces are static values, are valid per basic jaw and may occure at the same time. The charges may occure additionally to the torques due to the gripping force.

Fig. 2 Load of gripper fingers SGE-40-P-IOL

Type	SGE-40-P-IOL
Max. static torque Mx	1.5 Nm
Max. static torque My	2.0 Nm
Max. static torque Mz	4.0 Nm
Max. static force Fz	170 N

3.6 Maximum permissible cantilever



4 Transport, packaging and storage

This chapter provides information regarding proper transport, packaging and storage of the grippers.

4.1 Safety instructions

An improper transport of the SGE-40-P-IOL can lead to serious injuries and considerable damage to property.

CAUTION

Danger of injury when unpacking the module!

The grippers are packed in the original packaging (cardboard box). If handled incorrectly, the module may fall out of the box when unpacked and cause limb injuries.

- Unpack the SGE-40-P-IOL carefully.

Also observe the safety instructions in ➲ Chap. 2 „Safety instructions“ in this manual.

4.2 Scope of supply

The grippers are supplied with an operating and assembly instructions manual and a safety data sheet (see scope of supply below).

Fig. 3 Scope of delivery Smart Gripper SGE-40-P- IOL

[Unt]	SGE-40-P-IOL
1 x	Smart gripper
1 x	Assembly and operating instructions
1 x	Supplementary set

4.3 Transport

No liability can be assumed for damages caused by improper installation on the part of the operating company.

The following conditions must be complied with for transport and storage:

- Storage temperature: 5-55 °C
- Relative air humidity: < 90%, non condensing

4.4 Packaging

The gripper are packed in the most appropriate manner.

Standardized symbols for packages

Symbol	Note	Explanation
	Top	The package shall be transported, handled and stored with the arrows always pointing upwards (top side of the package).
	Fragile	Products marked with this symbol shall be handled with care and may never be turned upside down or tied up.
	Protect against moisture	The packages shall be protected against moisture and kept dry (keep covered during storage).
	Attachment points	The hosting equipment (chain, etc.) may only be attached to the points marked by this symbol.
	Centre of gravity	This symbol marks the centre of gravity of the packages (pay attention to the position of the centre of gravity).

NOTICE

Risk to the environment due to incorrect disposal of the packaging material

Environmental damage can be caused by incorrect disposal of the packaging material.

- Dispose of the packaging material in an environmentally sensitive way in accordance with the local environmental regulations.

4.5 Storage

If the SGE-40-P-IOL is stored for an extended period of time, observe the following:

- Do not store the grippers outdoors or expose them to weather conditions.
- The storage space must be dry and dust free.
- Room temperature of the storage space: 5-55 °C.
- Relative air humidity: < 90% non condensing.
- Clean the grippers and protect the blank metal parts against corrosion using the appropriate means.
- Protect the gripper from dirt and dust.

4.6 Operating and ambient conditions

Note on EMC conformity (according to DIN EN 61000-6-4:2020:09): The SGE-40-P-IOL may only be used in DC distribution networks with an extension of < 30 m.

5 Design and description

This chapter provides an overview of the gripper's structure and functioning.

5.1 Design gripper SGE-40-P-IOL

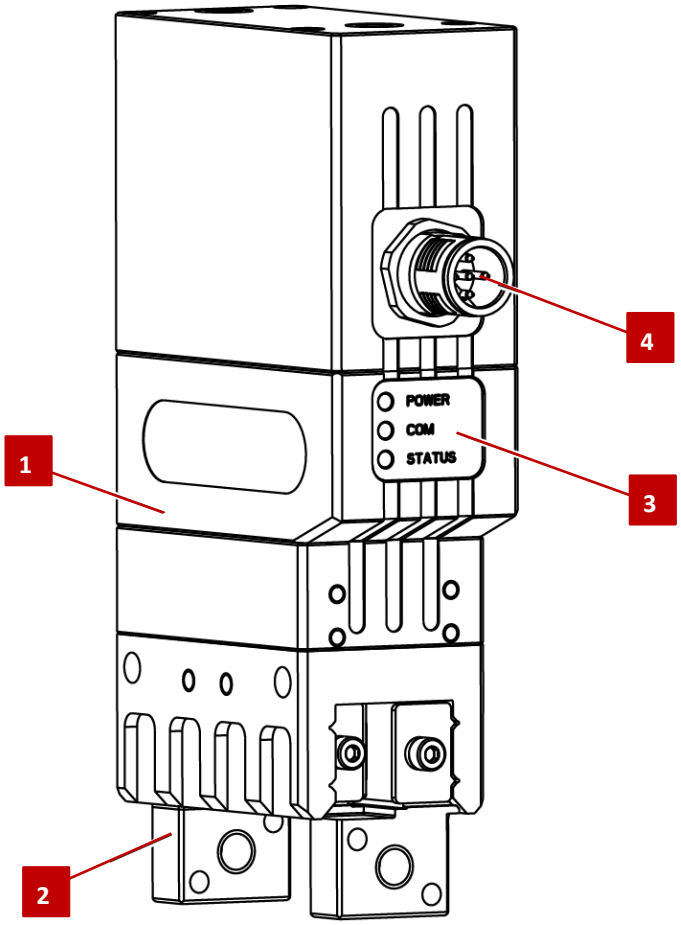


Fig. 4 Smart gripper SGE-40-P-IOL

1. Housing
2. Base jaw
3. "POWER", "COM" and "STATUS" LED
4. IO-Link" connector

5.2 Product description

The grippers of the SGE-40-P-IOL series are precision mechanical devices. In order ensure safe and reliable operation it is important that the modules are handled with care.

The SGE-40-P-IOL are highly compact, smart grippers designed for gripping and time-limited secure holding of workpieces or objects.

The SGE-40-P-IOL are suitable for industrial and industry-related applications and are intended for installation in a machine. The SGE-40-P-IOL is a high-performance servo-electric two-finger gripper with integrated electronics.

5.3 Displays

The following shows the display of the SGE-40-P-IOL.

"IO-Link" display

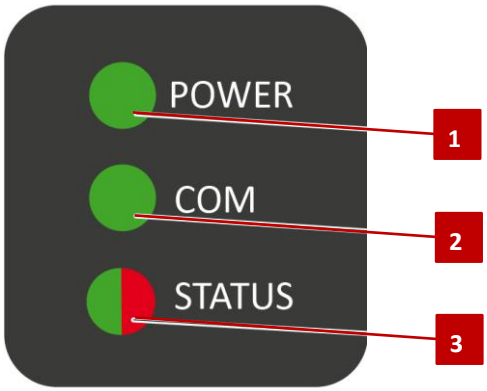


Fig. 5 Functional label SGE-40-P-IOL

1. "POWER" LED
2. "COM" LED
3. "STATUS" LED

Display	Colour	Function
POWER	Green	▪ **lights:** Ready for operation. ▪ **does not light:** Logic or actuator voltage reversed or not within valid range.
COM	Green	▪ **does not light:** IO-Link communication not active. ▪ **Flashing:** IO-Link communication active.
Status	Green/ Red	▪ **lights:** Electronics not active or defective. ▪ **Lights up green:** Ready for operation. ▪ **Lights up red:** Error. The error message is communicated via IO-Link.

5.4 Accessories

The following accessories are available for this product and can be ordered separately. The catalogue data sheet contains information on the various accessory items that can be used with the corresponding product variant.

You will find more information on the accessories for the SGE-40-P-IOL on our website www.afag.com.

The following accessories are available for the SGE-40-P-IOL described in this manual:

Connection cable	
Designation	**Order no.**
Sensor actuator cable -S4-1.5m-0-0-2	xxxx

Connecting plate	
Designation	**Order no.**
‘Connecting plate VP 163	50578392

When using a cable provided by the customer, observe the following**: at least 4 x 0.25 mm²**

6 Installation, assembly & setting

This chapter contains specific safety instructions and information regarding proper installation, assembly and setting of the grippers including their connection to the control unit and the electric system.

6.1 Safety instructions

WARNING

Danger due to stored energy!

Stored energy can lead to serious injuries and considerable damage to property.

- Design the gripper finger in such a way that the product reaches either the "Open" or "Closed" position in the energy-free state.
- Only change the gripper fingers if no residual energy can be released.
- Ensure that the SGE-40-P-IOL and the gripper fingers are adequately dimensioned for the intended application.

CAUTION

Risk of injury when connecting to mechanics and electrics!

When connecting the SGE-40-P-IOL to the mechanics and electrics, unexpected movements can occur when the power supply is still switched on or due to existing residual energies, which can cause personal injury or damage to property.

- The connecting work may only be carried out by qualified personnel!
- Before starting any work on the SGE-40-P-IOL, switch off the power supply/control unit and use a lockout device to make sure that it cannot be switched on again.
- Ensure that there is no residual energy left in the system.
- Read carefully the assembly and safety instructions before working with or on the SGE-40-P-IOL.

CAUTION

Danger of crushing or shearing between the gripper fingers and the system!

The gripper fingers are electrically operated. Restricted freedom of movement between the gripper fingers and the machine components can cause crushing or shearing injury.

- Observe the instructions manual of the machine on which the SGE-40-P-IOL is mounted.
- Maintenance and care work may only be carried out by qualified personnel.
- The operating company shall make sure that the machine is operated in a safe manner.

CAUTION

Danger of injury when handling the SGE-40-P- IOL!

Careless handling of the SGE-40-P-IOL can cause personal injuries and damage to the SGE-40-P-IOL.

- Only qualified personnel may work with or on the module!
- Observe the assembly instructions!

No liability can be assumed for damages caused by improper installation/assembling work on the part of the operator.

The safety instructions in ➲ Chap. 2 "Safety instructions" of these assembly instructions must be observed in addition to the safety instructions contained in this chapter.

6.2 Installation & Assembly

NOTICE

Avoid over-temperature faults due to too high temperatures!

Excessively high temperatures of the SGE-40-P-IOL can lead to temperature errors.

- Ensure sufficient heat dissipation via the screw-on surface.
- Mount the SGE-40-P in such a way that sufficient cooling is ensured.
- The size of the cooling surface depends on the application.
- Avoid additional heat input, e.g., through attachments or through the attached axle.

6.2.1 Mounting “IO-Link”

1. Check the evenness of the mounting surface (➲ chap. 6.3).
2. Screw the SGE-40-P-IOL to the machine/system (➲ chap. 6.3).
   - If necessary, use suitable connecting elements (adapter plates).
   - Use centring sleeves from the accessory kit.
   - Observe the permissible screw-in depth (➲ chap. 6.3).
   - Observe the tightening torque of the fastening screws (➲ chap. 6.3).
3. Attach the gripper fingers to the base jaws (➲ chap. 6.3).
4. Place the cable for sensors on the M12 connector and tighten the threaded ring hand-tight (➲ chap. 6.4).

   ⇨ SGE-40-P-IOL Variant Digital I/O is mounted.

For further information on parametrisation and control, see chapter 7 "Commissioning".

6.3 Mechanical connection

6.3.1 Flatness of the mounting surface

The values given below refer to the entire screw-on surface on which the SGE-40-P-IOL are mounted.

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

Requirements for the evenness of the screw-on surface (dimensions in mm)

6.3.2 Connections on the housing

The SGE-40-P-IOL can be mounted from three sides.

- A: from top
- B: right side
- C: left side

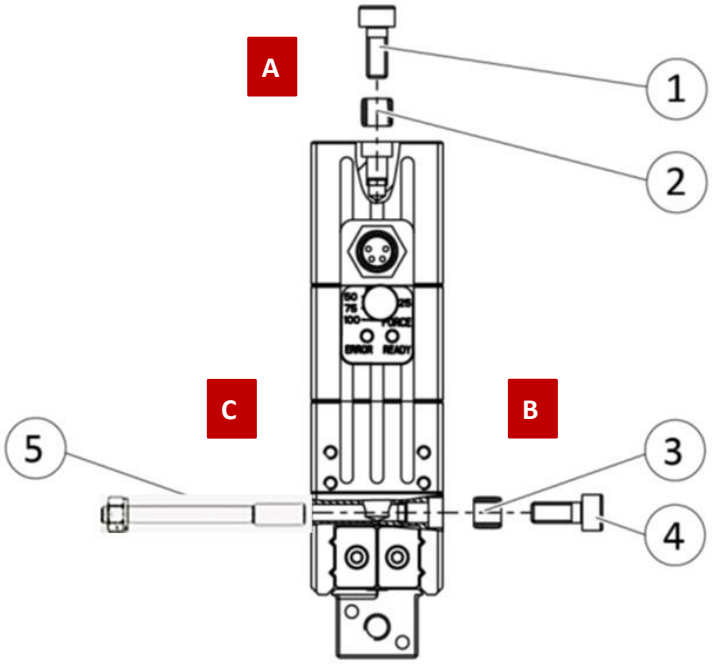


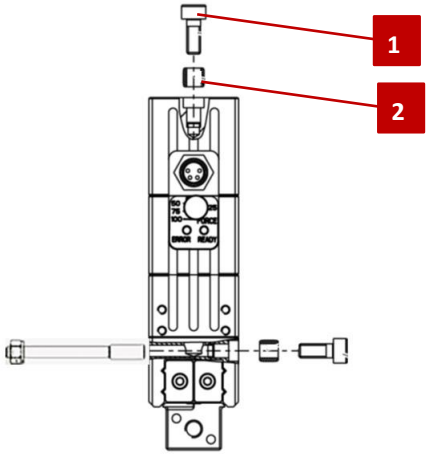
Fig. 6 Options for mounting the SGE-40-P-IOL (sides A, B, C)

1. Fastening screw M4
2. Centering sleeve Ø 6 mm
3. Centering sleeve Ø 7 mm
4. Fastening screw M4
5. Special screw M4x33.5/10

A) Fastening from top:

Screw-in depths and tightening torques for fastening.

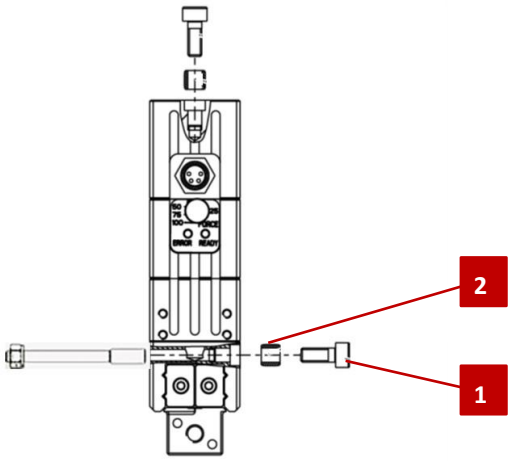
Pos.	Fastening	SGE-40-P-IOL
1	Fastening screw	M4
	Max. screw-in depth	8.9 mm
	Min. screw-in depth	8.4 mm
	Tightening torque	3.1 Nm
2	Centering sleeve	Ø 6 mm



B) Mounting from the right side:

Screw-in depths and tightening torques for fastening.

Pos.	Fastening	SGE-40-P-IOL
1	Fastening screw	M4
	Max. screw-in depth	8.9 mm
	Min. screw-in depth	8.4 mm
	Tightening torque	3.1 Nm
2	Centering sleeve	Ø 7 mm



C) Fastening with special screw from the left side:

Screw-in depths and tightening torques for fastening.

Pos.	Fastening	SGE-40-P-IOL
4	Fastening with special screw	M4x33.5/10
5	Centering sleeve	Ø 7 mm

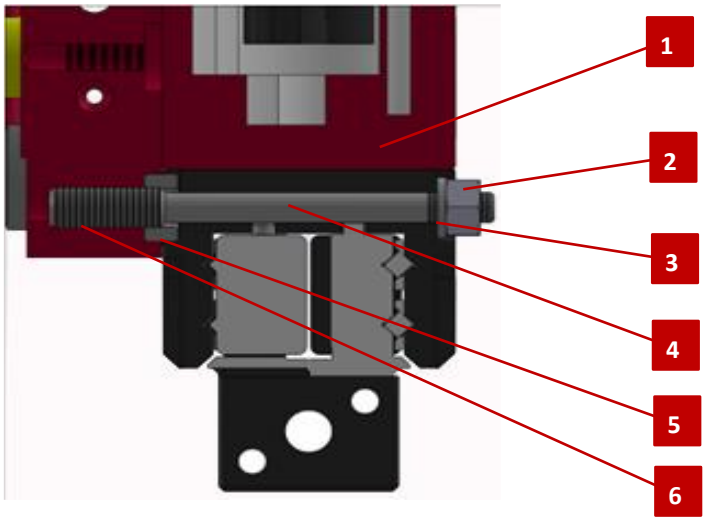


Fig. 7 Mounting with special screw

1. Housing
2. Hexagon nut M3x1D
3. Washer for bolt Ø 3 mm
4. Special screw M4x33.5/10
5. Centering sleeve Ø 7 mm
6. Thread M4x10 mm

6.3.3 Connections on the base jaws (for gripper fingers)

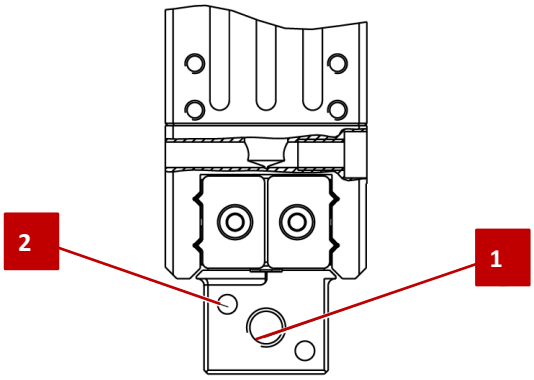


Fig. 8 Assembly of the gripper fingers

Item	Fastening the module	SGE-40-P-IOL
Side A		
1	Thread in base jaws	M5
	Max. screw-in depth from stop surface	6 mm
	Max. tightening torque screws	6.1 Nm
2	Bore for cylindrical pin	Ø 2.5 mm

6.4 Electrical connection

WARNING

Danger due to electrostatic energy!

Components or assemblies can become electrostatically charged. When touched, the electrostatic discharge can cause a startle reaction that can lead to injuries.

- The operator must ensure that all components and assemblies are included in the local equipotential bonding in accordance with the relevant rules.
- Have the equipotential bonding carried out by a qualified electrician in accordance with the relevant rules, taking account of the actual working environment conditions.
- Have the effectiveness of the equipotential bonding verified by regular safety measurements.

NOTICE

Damage to the electronics possible!

Incorrect connection may cause damage to the internal electronics.

- The supply network is of the "PELV" type for power and logic.
- Note the PIN assignment of the connection terminals.
- Ensure that all components are properly earthed.

6.4.1 “IO-Link” connection

Power supply and control

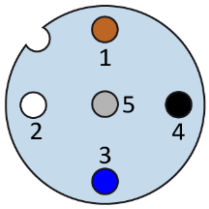


Fig. 9 IO-Link cable assignment, 5-pin M12 port class B

Pin	Strand	Signal
1	Brown	+ 24 V
2	White	+ 24 V (actuator)
3	blue	GND
4	Black	C/Q IO-Link
5	grey	GND (actuator)

Components electrical connection

Connector gripper	Connector (customer)
Plug 5-pin, M12, A-coded	Connection cable 5-pole, socket M12, A-coded

6.4.2 Wiring diagram IO-Link

NOTICE

Risk of damage due to improper control!

The internal electronics can be damaged by double pulses.

- Observe pause times between commands (➲ Software manual).

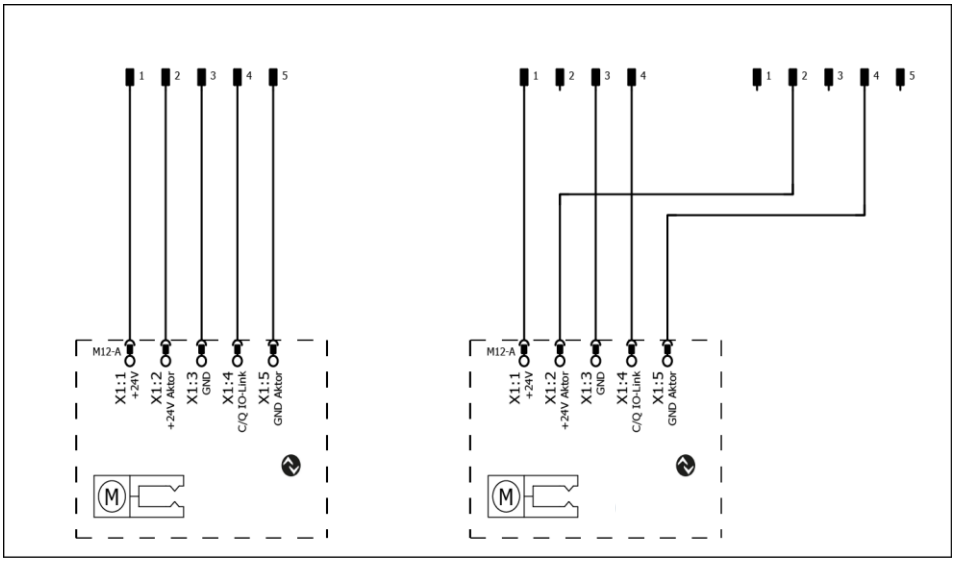


Fig. 10 Wiring diagram IO-Link

7 Commissioning

This chapter contains information on how to commission SGE-40-P-IOL. After connection to the system and mounting of the sensors, the smart grippers are commissioned for the first time via the system control.

7.1 Safety instructions

Incorrect ambient and operating conditions can cause hazards from the grippers that can lead to serious injuries and considerable damage to property or reduce the service life of the modules.

DANGER

Danger from live parts!

Touching live parts can lead to serious or fatal injuries.

- Before switching on the SGE-40-P-IOL, check that the protective earth conductor is correctly attached to all electrical components according to the connection diagram.
- Check that covers and guards are in place to prevent contact with live components.

WARNING

Danger due to electrostatic energy!

Components or assemblies can become electrostatically charged. When touched, the electrostatic discharge can cause a startle reaction that can lead to injuries.

- The operator must ensure that all components and assemblies are included in the local equipotential bonding in accordance with the relevant rules.
- Have the equipotential bonding carried out by a qualified electrician in accordance with the relevant rules, taking particular account of the actual working environment conditions.
- Have the effectiveness of the equipotential bonding verified by regular safety measurements.

CAUTION

Danger of injury by moving components!

Limbs can be crushed by moving components!

- Work on and with the smart gripper may only be carried out by qualified personnel.
- Make sure that there are no persons or tools in the working area of the gripper.

CAUTION

Risk of injury to third parties during commissioning!

There is a risk of injury to third parties during commissioning of the electric gripper SGE-40-P-IOL.

- Before commissioning the SGE-40-P-IOL, secure the danger zone with a suitable protective measure.

Also observe the safety instructions in ➲ Chap. 2 „Safety instructions“ in this manual.

7.2 Commissioning of the modules

Commissioning depends on the design of the IO-Link master. For further information on handling the IO-Link master, see the documentation of the respective IO-Link master manufacturer.

The gripping force is set via the "IOLink" communication interface.

The gripping modes FastGrip and SoftGrip are available ➲ 7.3.

Prerequisites for commissioning:

- IO-Link master is integrated in the PLC.
- Product is connected to IO-Link master and power supply ➲6.4.2.

1. Ensure that the product is ready for operation and does not report an error. Correct any reported error, ➲ 8.3.1.

   ✓ POWER LED lights up green.

   ✓ LED COM flashes green.

   ✓ LED-STATUS lights up green for approx. 3 seconds, then red.

2. Import IODD to the IO-Link master.

   Note: The IODD can be accessed via "IODDfinder" of the IO-Link community.

3. Configure product via IO-Link Master Device Tool.

   Note: If the IO-Link master does not support IODD, the product can be parametrised via acyclic data exchange.

   ✓ Parametrisation has been transferred to the product.

4. Control product via PLC.

For a detailed description of how to integrate the product into a control system, see the documentation of the respective control system manufacturer.

Further information on parametrisation, control and start-up behaviour of the product ➲Software manual.

7.3 Gripping modes

The gripping modes *FastGrip* and *SoftGrip* can be set in the IO-Link process data. For further information, see the software manual.

- **FastGrip:** Robust gripping mode for cycle-time optimised industrial applications (e.g., pick & place applications).
- **SoftGrip:** Gripping mode with pulse reduction of the gripping force for gripping delicate, fragile or break-sensitive workpieces (e.g., electronics, glasses, ceramics).

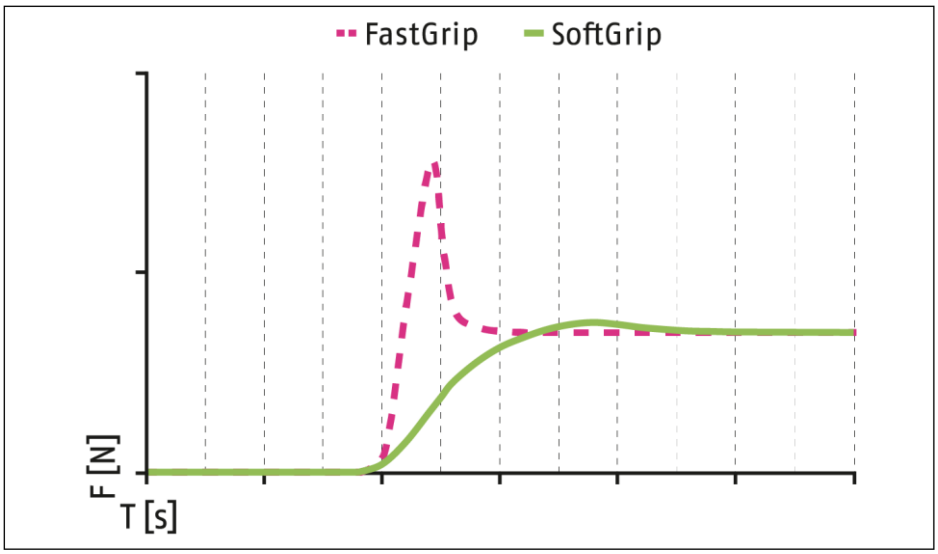


Fig. 11 *Force curve with FastGrip and Softgrip*

F [N]: Gripping force T [s]: Time

The gripping modes FastGrip and SoftGrip differ in terms of their force curve when gripping a workpiece. The force curve is achieved by different speeds when the gripper fingers hit the workpiece.

While FastGrip is characterised by a very fast gripping speed and a resulting high gripping force impulse, SoftGrip has a greatly reduced gripping force impulse with a slightly reduced gripping speed at the same time. This protects fragile gripping objects.

The resulting gripping force is identical for both gripping modes. In SoftGrip mode, the gripping force impulse is significantly reduced when impacting the workpiece.

8 Fault elimination

8.1 General Notes

This chapter contains general information and safety instructions for troubleshooting for the SGE-40-P-IOL.

8.2 Safety instructions

WARNING

Danger of injury due to improper work!

Poorly performed troubleshooting work can lead to serious injuries and damage to property.

- The due diligence obligations of the user include ensuring that the personnel working on eliminating faults appropriately trained and qualified.

Measures to be taken in the event of faults

- Immediately take the SGE-40-P-IOL out of operation and report the fault to the responsible authorities/persons.
- Have the fault rectified by trained personnel.
- Do not put the SGE-40-P-IOL back into operation until the fault has been eliminated.
- Check the SGE-40-P-IOL after a malfunction to ensure that the functions of the SGE-40-P-IOL are still given and that no extended hazards have arisen.

Also observe the safety instructions in ➲ Chap. 2 „Safety instructions“ in this manual.

8.3 Table Fault causes and remedy

The following table contains an overview of possible fault causes and how to proceed to eliminate them.

8.3.1 Troubleshooting table

Fault	Possible cause	Remedy:
SGE-40-P-IOL does not move	▪ Base jaws jammed in the housing, e.g. because the flatness of the mounting surface is insufficient ▪ Sensor incorrectly adjusted / sensor has become misaligned ▪ Power supply incorrectly connected	▪ Check the flatness of the screwed-on surfaces (➲ chap. 6.3) ▪ Loosen the fastening screws and operate the product again. ▪ Adjust the sensor so that it is not in the travel path of the GE-25-P. Distance to the interrogation mechanism: approx. 0.2 mm). ▪ Check power supply
SGE-40-P-IOL does not perform the full stroke	▪ Dirt accumulation between base jaws and guide ▪ Screw-on surface not sufficiently flat ▪ Breakage of components in the product (e.g. due to overload)	▪ Clean and lubricate module (➲ Chap. 9) ▪ Check the mounting surface for evenness (➲ Chap. 6.3) ▪ Send the module with repair order to Afag
SGE-40-P-IOL opens or closes jerkily	▪ Not enough lubricant in the mechanical guide surfaces ▪ Screw-on surface not sufficiently flat ▪ Loading too large	▪ Clean and lubricate module (➲ Chap. 9) ▪ Check the mounting surface for evenness (➲ Chap. 6.3) ▪ Check the permissible weight and length of the gripper fingers (➲6.3)
Gripping force too low	▪ Too much lubricant in the mechanical clearances ▪ Incorrect gripping force preselection	▪ Clean and lubricate module (➲ Chap. 9) ▪ Check setting of the gripping force ▪ Check design of the product, observe the max. workpiece weight (➲ Chap. 3)
Opening and closing times are not achieved	▪ Loading too large	▪ Check the permissible weight and length of the gripper fingers
Electrical signals are not transmitted	▪ Cable incorrectly connected ▪ Strands reversed	▪ Check round plug connector for correct seating ▪ Check PIN assignment
Faults indicated via LED Status only with “IO-“ variant)	▪ Errors requiring acknowledgement (LED lights up red)	▪ Check device status via IO-Link. ▪ Measures see error message ▪ Acknowledge error (see software manual IO-Link)

9 Maintenance and Repair

9.1 General notes

The smart grippers are almost maintenance-free. Nevertheless, some maintenance work must be carried out to ensure an optimum operating condition of the smart gripper. This chapter describes the required maintenance activities.

Each smart gripper is accompanied by a safety information sheet. This information sheet must be read carefully by every person who carries out work on and with the smart gripper.

9.2 Safety instructions

WARNING

Danger of injury due to improper maintenance!

Improperly carried out maintenance activities can cause considerable damage to property and serious injury.

- The operator must exercise due care and only use trained maintenance personnel to carry out the activities.
- Always wear personal protective equipment when carrying out maintenance and repair work!

WARNING

Risk of injury due to uncontrolled movements of the smart gripper!

Signals from the control system can trigger unintentional movements of the modules, which can cause injury.

- Before starting any work on the universal gripper, switch off the control unit and secure to prevent it from being switched on.
- Observe the operating instructions of the controller used!
- Before starting any activities, switch off the media supply and secure it from being switched on again!
- Set safety devices out of function.

Also observe the safety instructions in ➲ Chap. 2 „Safety instructions“ in this manual.

9.3 Maintenance activities and maintenance intervals

The SGE-40-P-IOL are almost maintenance-free. Nevertheless, some maintenance work must be carried out to ensure an optimum operating condition of the smart grippers.

The gripper does not need to be dismantled for maintenance work.

9.3.1 Maintenance intervals

Fig. 12 Maintenance points SGE-40-P-IOL

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	SGE-40-P-IOL	Check 	1000 cycles or daily	[On]	▪ Perform a complete stroke on the SGE-40-P-IOL
2	Module SGE-40-P-IOL	Cleaning & checking 	As required	[Off]	▪ Clean the smart gripper with a dry, lint-free cloth. - Do not spray the rotational axis with water, do not use aggressive cleaning agents. ▪ Perform a visual inspection of the smart gripper.
3	Metal guide surfaces	Lubricating 	2 Million cycles	[Off]	▪ Lubricate all lubrication points with lubricant (guides: Lubricant Klübersynth UH1 14-151)

In extreme ambient and operating conditions, shortened maintenance cycles can ensure that the service life is maintained.

9.3.1 Lubricants and lubrication points

NOTICE

Risk of damage due to hardening lubricants!

At temperatures above 60°C lubricants harden faster and the SGE-40-P-IOL can be damaged.

- Reduce the maintenance interval accordingly.

NOTICE

Risk of damage due to insufficient lubrication!

In the case of continuous short lifting movements, insufficient lubrication can cause the product to run dry and be damaged.

- Run the complete stroke every 1000 cycles or at least once a day.

Change contaminated food-grade lubricant. Observe the safety data sheet of the lubricant manufacturer.

Lubricate all lubrication points with lubricant during maintenance. Apply lubricant thinly with a non-linting rag or brush.

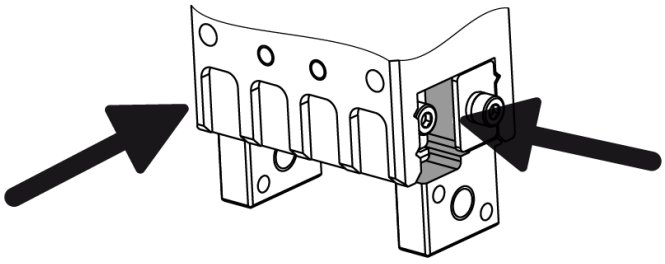


Fig. 13 Lubrication point overview SGE-40-P- IOL

Lubrication point	Lubricant
Metal guide surfaces	Klübersynth UH1 14-151*

* The product contains food-grade lubricants. The requirements of the EN 1672-2:2020 standard are not fully met.

The product contains the following components whose lubricants/foreign substances are not food grade:

- Engine bearing (commercial bearing grease)
- Pinion bearing (commercial bearing grease)

9.3.2 Further maintenance

Further maintenance is not required, if the ambient conditions listed below are complied with:

- Clean working area
- No use of splash water
- No abrasive or process dust and vapours
- Climate and temperature as specified in the technical data

9.4 Spare parts and repair work

Afag Automation AG offers a reliable repair service. Defective smart grippers can be sent to Afag for warranty repair within the warranty period.

After expiry of the warranty period, the customer may replace or repair defective modules or wear parts himself or send them to the Afag repair service.

Please note that Afag does not assume any warranty for modules that have not been replaced or repaired by Afag!

CAUTION

Risk of injury when removing the SGE-40-P-IOL due to uncontrolled movements!

When disassembling the smart grippers from a system, there is a danger of uncontrolled movements.

- Disconnect the media supply (electrics, pneumatics) before removing the modules!
- Disassembling should only be carried out by qualified personnel!
- Only dismount the smart gripper when the control unit is switched off and secured!

NOTICE

Risk of injury by using unauthorized spare parts!

The use of unauthorised spare parts can be dangerous to personnel and cause damage or malfunction to the SGE-40-P-IOL.

- Only use original spare parts approved by Afag.

NOTICE

Material damage due to unauthorised disassembly!

Incorrectly performed work can cause damage to the mechanics and internal electronics.

- Disassembly or opening of the SGE-40-P-IOL is not permitted.

10 Decommissioning, disassembly, disposal

The smart gripper must be properly dismounted after use and disposed of in an environmentally friendly manner.

10.1 Safety instructions

WARNING

Risk of injury due to improper decommissioning, disassembly and disposal!

Improperly carried out activities can result in considerable material damage and serious injury.

- The operator must exercise due care and only use specially trained and qualified personnel for this work.

Also observe the safety instructions in ➲ chap. 2 „Safety instructions“ in this manual.

10.2 Decommissioning

If the smart grippers are not used for a longer period of time, they must be properly commissioned and stored as described in ➲ chapter 4.5.

10.3 Disassembly

The smart grippers may only be dismounted by qualified personnel.

CAUTION

Risk of injury due to uncontrolled movements of the gripper!

When disassembling the smart grippers from a system, there is a danger of uncontrolled movements.

- Disconnect the media supply (electrics, pneumatics) before removing the modules!
- Disassembling should only be carried out by qualified personnel!
- Only dismount the smart gripper when the control unit is switched off and secured!

10.4 Disposal

The SGE-40-P-IOL must be disposed of properly at the end of their service life and the raw materials used must be recycled. Observe the legal regulations and company requirements.

The smart gripper must not be disposed of as a complete unit. Dismantle the smart gripper and separate the various components according to type of material and dispose of them properly:

- Scrap the metallic materials.
- Hand over plastic parts for recycling.
- Sort the rest of the components by their material properties and dispose of them accordingly.

NOTICE

Risk to the environment due to incorrect disposal of the packaging material of the SGE-40-P- IOL!

Incorrect disposal of the SGE-40-P-IOL may present hazards from the product that could result in serious injury, significant property damage and environmental damage.

- Electronic parts, electrical scrap, auxiliary and operating materials must be disposed of by approved specialist companies.
- Information on proper disposal can be obtained from the responsible local authorities.

11 Declaration of incorporation

Declaration of incorporation

for partly completed machinery according to the Machinery Directive 2006/42/EC, Annex II, 1.B

The manufacturer hereby declares:

Afag Automation AG, Luzernstrasse 32, CH-6144 Zell

that the partly completed machine:

Product description	Smart gripper
Type:	SGE-40-P-IOL

complies with the following essential health and safety requirements of the Machinery Directive 2006/42/EC at the time of declaration: 1.1; 1.1.1; 1.1.2; 1.1.3; 1.1.4; 1.1.5; 1.1.6; 1.2; 1.2.1; 1.2.2; 1.2.3; 1.2.4; 1.2.4.1; 1.2.4.2; 1.2.4.3; 1.2.4.4; 1.2.5; 1.3; 1.3.3; 1.3.4; 1.3.5; 1.3.6; 1.3.7; 1.3.8; 1.3.8.1; 1.3.8.2; 1.3.9; 1.4; 1.4.1; 1.4.2; 1.5; 1.5.1; 1.5.2; 1.5.3; 1.5.4; 1.6; 1.6.1; 1.6.3; 1.6.4; 1.6.5; 1.7; 1.7.1; 1.7.1.1; 1.7.1.2; 1.7.2; 1.7.4; 1.7.4.1; 1.7.4.2; 1.7.4.3; 3.3.5; 3.4.1.

Harmonised standards applied, in particular:	
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2014/35/EU	Low Voltage Directive (LVD)
EN ISO 12100:2010	Safety of machinery - General design principles - Risk assessment and risk reduction.
DIN EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Note: The partly completed machinery must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of Machinery Directive 2006/42/EC.

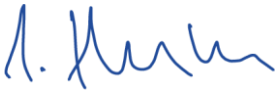
The manufacturer undertakes to transmit, in response to a reasoned request by the national authorities, relevant technical documentation for the partly completed machinery.

The relevant technical documentation was created according to Annex VII, Part B of the above-mentioned Directive.

Authorised representative for compiling the technical documentation:
Niklaus Röthlisberger, Product Manager, Afag Automation AG, CH-6144 Zell

Zell, 31.05.2023

Adrian Fuchser



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