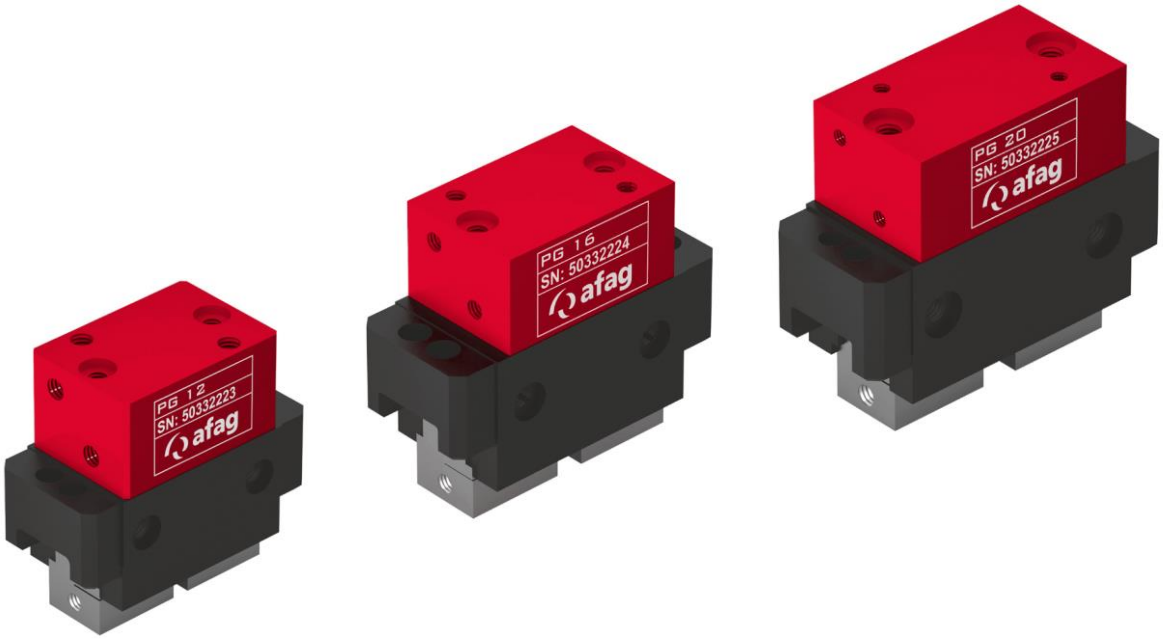
Assembly and operating instructions

Precision gripper

PG 12 I PG 16 I PG 20



Translation of the Original Assembly Instructions EN

- PG 12 ⇨ Order no.: 50332223
- PG 16 NN ⇨ Order no.: 50332224
- PG 16 NC ⇨ Order no.: 50531661
- PG 16 NO ⇨ Order no.: 50531662
- PG 20 ⇨ Order no.: 50332225

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 precision gripper or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The precision grippers 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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Table of contents

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 precision grippers to ensure safe and efficient handling of the precision grippers PG 12, PG 16 and PG 20.

Consistent compliance with these assembly instructions will ensure:

- permanent operational reliability of the precision gripper,
- optimal functioning of the precision gripper,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs),
- prolongation of the precision gripper's service life.

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 precision gripper.

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 - 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

Each precision 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 precision gripper.

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.
- Wear parts are excluded from the warranty *(The customer is entitled to a product free of defects. This does also apply to defective accessories and wear parts. Normal wear and tear are excluded from the warranty).*

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

The warranty shall expire in the following cases:

- Improper use of the module.
- Non-observance of the instructions regarding assembly, commissioning, operation and maintenance of the module.
- 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 precision gripper unless described in this instructions manual 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 precision grippers and optimal protection of personnel.

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

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

Also observe all rules and regulations regarding accident prevention applicable to the place of installation of the modules.

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 precision grippers series is designed for the shock-free linear movement of permanently mounted loads in **non-explosive** environments and in the ambient and operating specially conditions defined for these modules.

The precision grippers are used in automation systems.

The precision grippers are exclusively intended for operation with original LinMot components (controller, cables ...).

Any use beyond the described purpose is considered to be not in accordance with the intended use.

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/improper use of the precision grippers.

Especially the following use is considered a misuse:

- Use in potentially explosive atmospheres

WARNING

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

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

- The precision gripper may only be used in a technically perfect condition in accordance with their intended use and 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 damages caused by improper use.

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 parallel 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 precision gripper.

2.4.2 Obligations of the operating company

In addition to the safety instructions given in this manual, the operating company must also comply with the safety, accident prevention and environmental protection regulations valid for the field of application of the precision gripper.

The operating company is required to use only personnel 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 precision gripper,
- 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 automation system in which the precision grippers have been integrated,
- 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.

2.4.3 Obligations of the personnel

All personnel working with the precision gripper are required to:

- read and observe these assembly instructions, especially the chapter on safety,
- observe the occupational safety and accident prevention regulations,
- observe all safety and warning signs on the precision gripper,
- refrain from any activity that might compromise safety and health.

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 precision gripper thus exposing himself and others to the risk of serious injury. Therefore, only qualified personnel may be permitted to carry out the described activities on the precision gripper.

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

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 precision gripper, 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:

- 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 precision grippers which have not been described in these assembly instructions or approved in writing by Afag Automation AG.

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

The precision grippers may not be changed or modified in any way, except with the prior written consent of AFAG Automation AG.

2.8 General hazards / residual risks

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

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 precision grippers have been built according to the state-of-the-art and the applicable health and safety requirements. Nevertheless, improper use of the precision grippers may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- on the precision grippers themselves,
- 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.
- Observe the safety information sheet for the precision grippers.

WARNING

Danger - Do not use in unsuitable environment!

The precision grippers are designed for use in **non-**explosive atmospheres.

- Do **not** use the precision gripper in potentially explosive atmospheres!

CAUTION

Risk of injuries due to uncontrolled parts movements!

When connecting the precision gripper to the control unit or when operating the precision gripper sudden, unexpected movements may occur which can cause personal injury or property damage.

- Only qualified personnel may work with or on the precision gripper.
- Read the assembly instructions carefully before carrying out any work on or with the precision gripper.

2.8.2 Danger due to electricity

WARNING

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.

2.8.3 Danger due to pneumatics

WARNING

Risks by the pneumatic system!

The pneumatic system can pose various hazards that can cause serious or fatal injuries if the work is carried out improperly.

- Only qualified personnel may work with or on the pneumatic system!
- The necessary personal protective equipment must be provided and used.

2.8.4 Mechanical hazards

CAUTION

Danger of injury from moving components!

Limbs can be crushed by moving components!

- Work on and with the precision gripper may only be carried out by qualified personnel.
- Never reach into the system during normal operation!

3 Technical data

3.1 Precision gripper PG 12

3.1.1 Dimension drawing PG 12

Type	PG 12
A	Sensor Ø 3 mm
P	M3

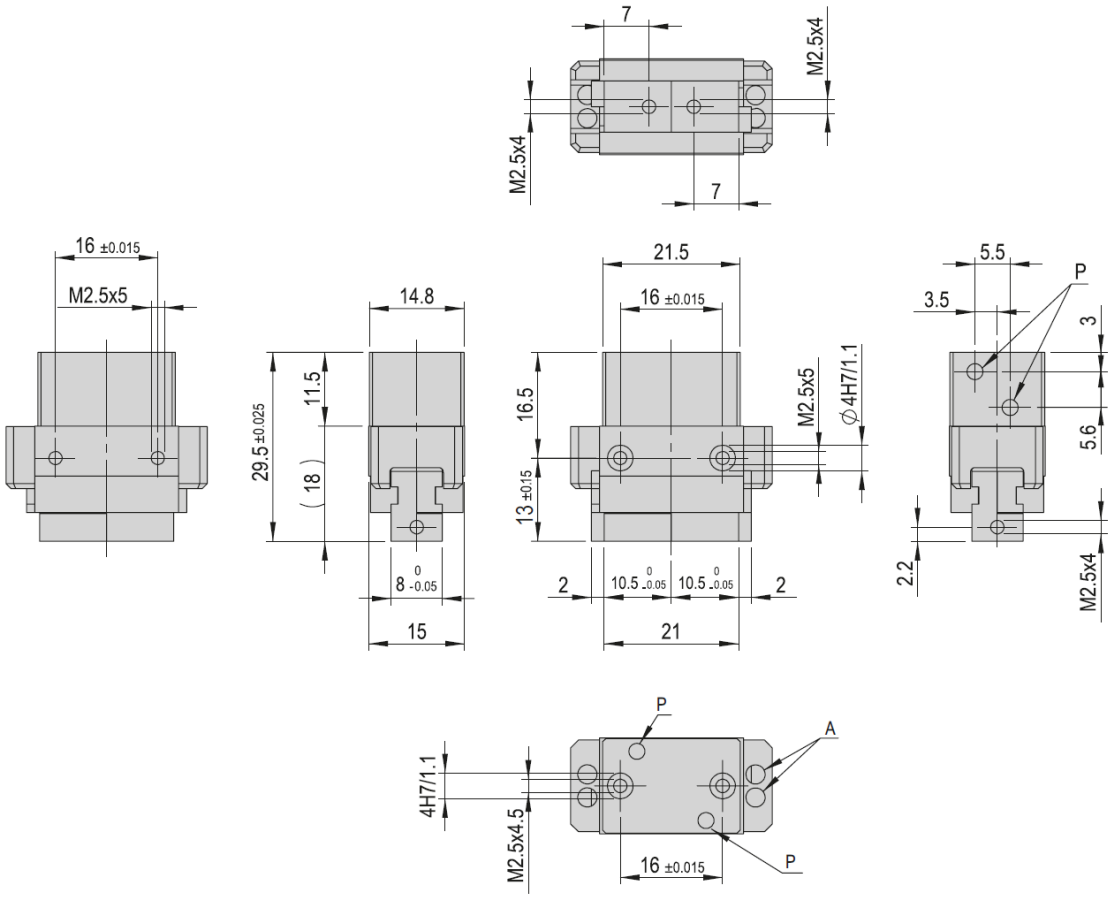


Fig. 1 Dimensional drawing of precision gripper PG 12

3.1.2 Technical data PG 12

PG 12	
Attachment grid	16 mm
Attachment grid alternative	M2.5
Operating pressure	6 +/- 2 bar
Air connection P	M3
Cylinder Ø	11 mm
Operating temperature	0 - 50 °C
Storage temperature	0 - 50 °C

Type	PG 12
Order number	**50332223**
Net weight	0.035 kg
Air consumption/cycle	0.005 NL
Closing time	**Closing time = Finger weight 50 ms = 30 g 30 ms = 20 g 20 ms = 15 g 10 ms = 10 g
Gripping force, opening	*46 N
Gripping force, closing	*36 N
Opening stroke	2 x 2 mm
Repeat accuracy	+/- 0.01 mm
Handling accuracy	+/- 0.05 mm
Positions	2
Mounting position	

The technical data refer to a nominalpressure of 6 bar under Afag standard test conditions.
The module can be operated with lubricated or dry air.
Cleanroom class ISO 14644-1, class ISO 7

*Observe gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping
**Closing times in unthrottled operationObserve gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping

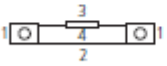
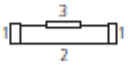
Inlcuded in the delivery
(Catalogue HT accessories)
- 2x Centering bushing Ø4x2

Accessories
(Catalogue HT accessories)
- Compressed air connection straight M3 x 0.5
- Compressed air connection angled M3 x 0.5
- INI d3x22-Sn0.8-PNP-NO-M8x1
- INI d3x12-Sn0.8-PNP-NO

3.1.3 Preferred combinations PG 12

CS 6	1 3	VS 514 VP 153	1,2 1,2
CS 8	1,3 1,3	VP 153 VP 152	1 2
CR 12	3 3	VP 153 VP 152	1 2
RM 12	3	VF 400	1,2
SA-1	1,2 1,2	VP 153 VP 152	1 2
SREH-50	3	VP 160	1
	3	VP 151	2
RA-40	3	VP 50486392	2

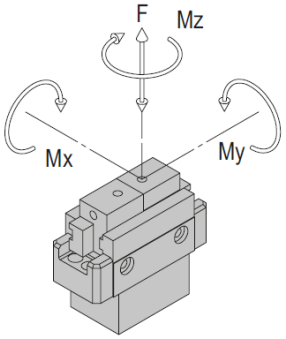
Mounting areas

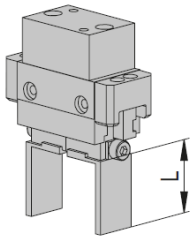
CS, ES	LM	HM	SA	UG, GM, SG, DG, PG, GE, SGE
				
PMP, PMP-c	**PEZ, PDZ**	**PEL, PDL**	**RM, RE**	**CR, RM 32, RE, SREH, RA**
				

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.

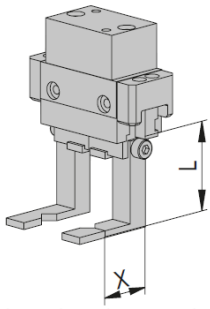
3.1.4 Module stresses PG 12

Type	PG 12
Max. static torque Mx	1 Nm
Max. static torque My	1 Nm
Max. static torque Mz	1 Nm
Max. dynamic torque Mx	0.01 Nm
Max. dynamic torque My	0.01 Nm
Max. dynamic torque Mz	0.01 Nm
Max. static force F	30 N
Max. dynamic force F	0.3 N





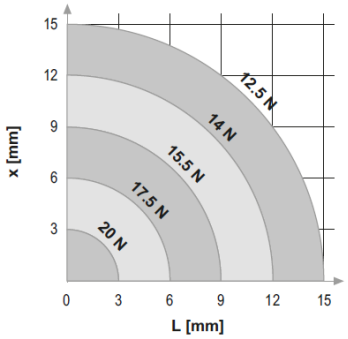
Finger length centric



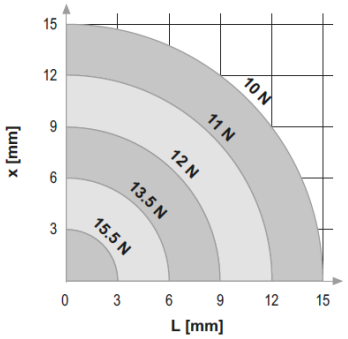
Finger length eccentric

Gripping force diagrams per jaw

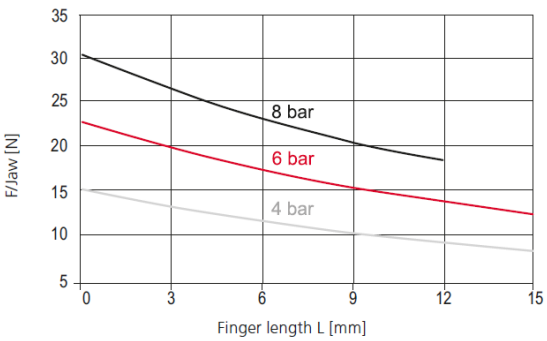
Centric gripping force, closing



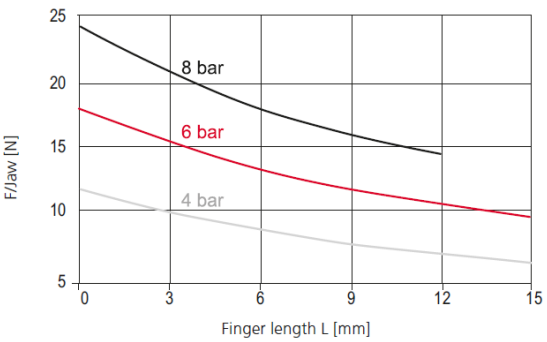
Centric gripping force, closing



Centric gripping force, closing



Centric gripping force, closing



3.2 Precision gripper PG 16

3.2.1 Dimensional drawing PG 16 NN

Type	PG 16 NN
A	Sensor Ø 4 mm
P	M3

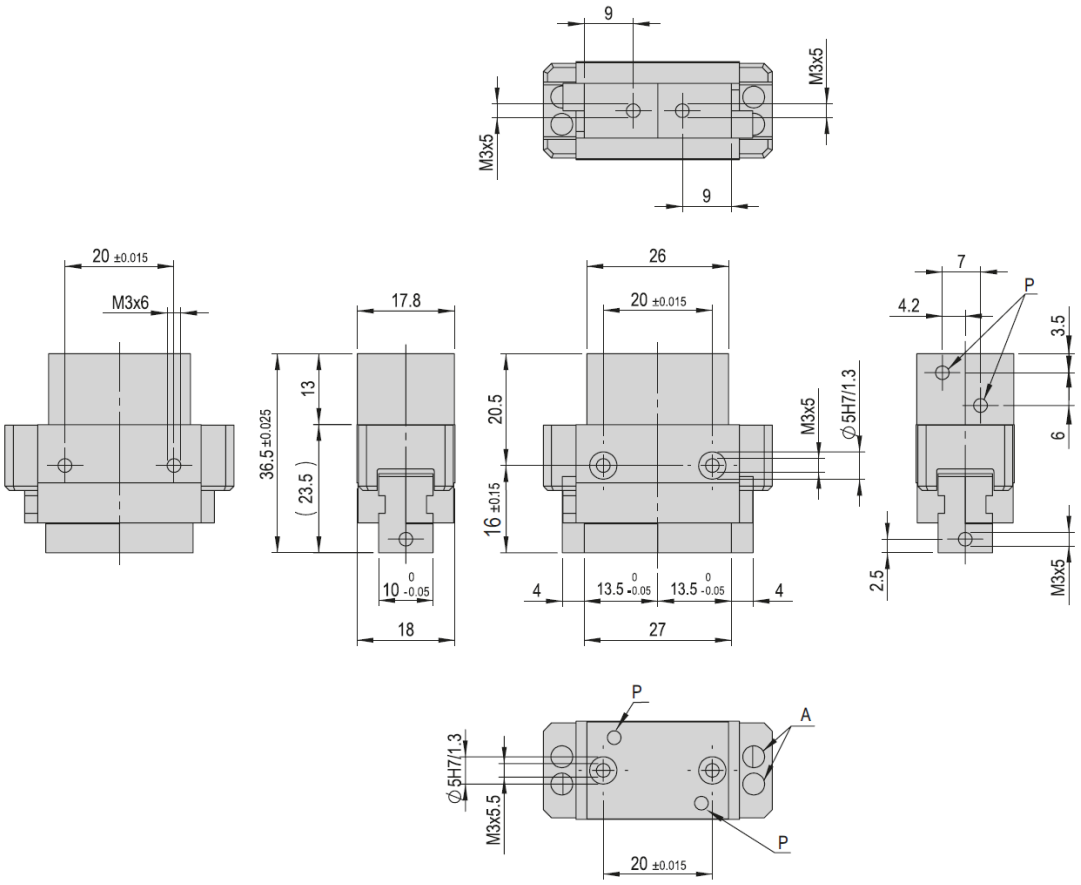


Fig. 2 Dimensional drawing of precision gripper PG 16 NN

3.2.2 Technical data PG 16 NN

PG 16	
Attachment grid	20 mm
Attachment grid alternative	M3
Operating pressure	6 +/- 2 bar
Air connection P	M3
Cylinder Ø	16 mm
Operating temperature	0 - 50 °C
Storage temperature	0 - 50 °C

Type	PG 16 NN
Order number	**50332224**
Net weight	0.066 kg
Air consumption/cycle	0.0064 NL
Closing time	**Closing time = Finger weight 50 ms = 60 g 30 ms = 40 g 20 ms = 30 g 10 ms = -
Gripping force, opening	*78 N
Gripping force, closing	*66 N
Opening stroke	2 x 4 mm
Repeat accuracy	+/- 0.01 mm
Handling accuracy	+/- 0.05 mm
Positions	2
Mounting position	

The technical data refer to a nominalpressure of 6 bar under Afag standard test conditions.
The module can be operated with lubricated or dry air.
Cleanroom class ISO 14644-1, class ISO 7

*Observe gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping
**Closing times in unthrottled operationObserve gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping

Inlcuded in the delivery
(Catalogue HT accessories)
- 2x Centering bushing Ø5x2.5

Accessories
(Catalogue HT accessories)
- Compressed air connection straight M3 x 0.5
- Compressed air connection angled M3 x 0.5
- INI d4x25-Sn1.0-PNP-NC-M8x1

Alternative accessories
(Catalogue HT accessories)
- INI M4x12-Sn0.8-PNP-NO

3.2.3 Dimensional drawing PG 16 NC & PG 16 NO

Type	PG 16 NC	PG 16 NO
A	Sensor Ø 4 mm	Sensor Ø 4 mm
P	M3	M3

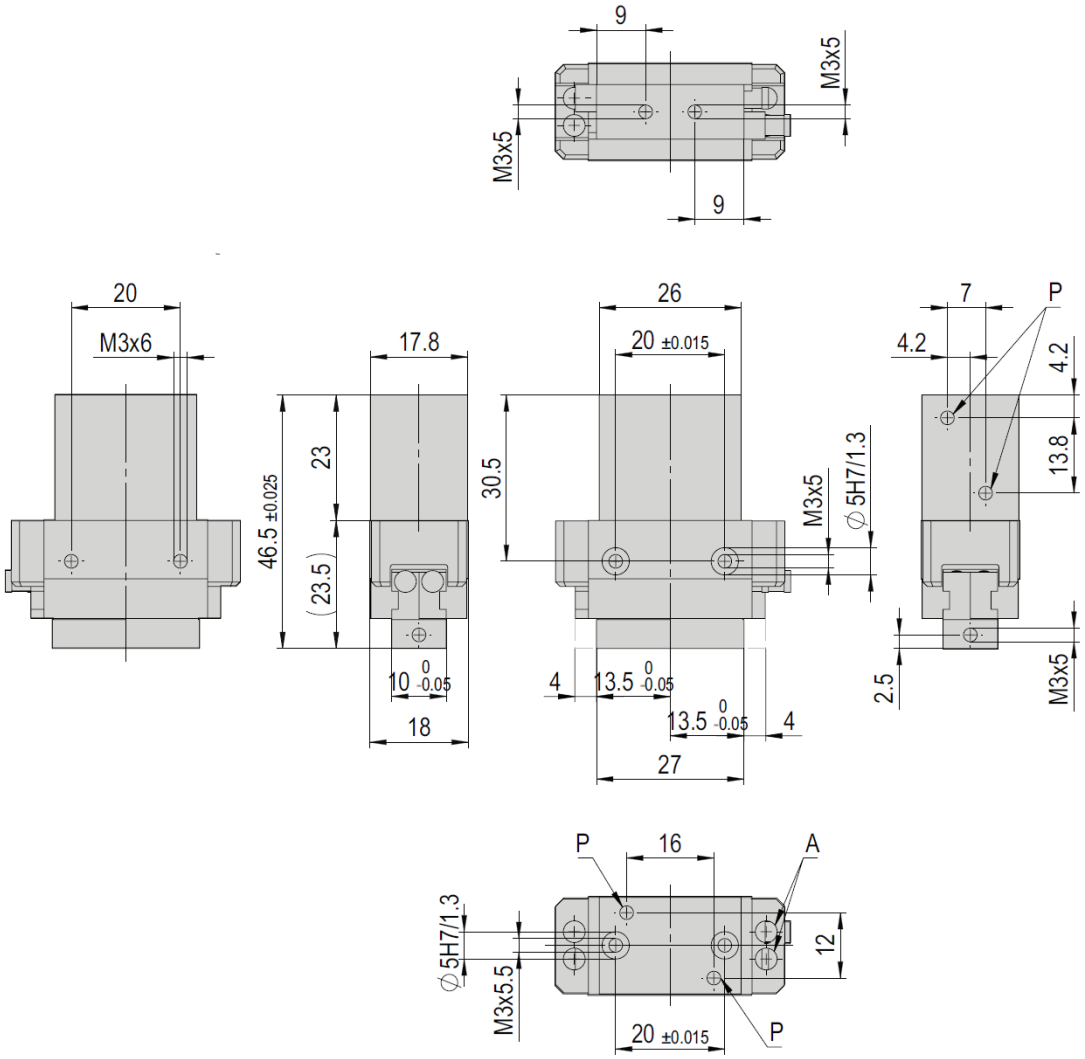


Fig. 3 Dimensional drawing of precision gripper PG 16 NC & PG 16 NO

3.2.4 Technical data PG 16 NC & PG 16 NO

PG 16	
Attachment grid	20 mm
Attachment grid alternative	M3
Operating pressure	6 +/- 2 bar
Air connection P	M3
Cylinder Ø	16 mm
Operating temperature	0 - 50 °C
Storage temperature	0 - 50 °C

Type	PG 16 NO	PG 16 NC
Order number	**50531661**	**50531662**
Net weight	0.074 kg	0.073 kg
Air consumption/cycle	0.0064 NL	0.0064 NL
Gripping time	0.01 s	0.01 s
Closing time	**Closing time = Finger weight 50 ms = 60 g 30 ms = 40 g 20 ms = 30 g 10 ms = -	
Gripping force, opening	*52 N	*100 N
Gripping force, closing	*92 N	*44 N
Spring force	13 N	11 N
Opening stroke	2 x 4 mm	2 x 4 mm
Repeat accuracy	+/- 0.01 mm	+/- 0.01 mm
Handling accuracy	+/- 0.05 mm	+/- 0.05 mm
Positions	2	2
Mounting position		

The technical data refer to a nominalpressure of 6 bar under Afag standard test conditions.
The module can be operated with lubricated or dry air.
Cleanroom class ISO 14644-1, class ISO 7

*Observe gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping
**Closing times in unthrottled operationObserve gripping force diagrams
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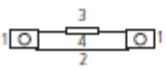
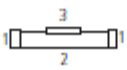
- INI d4x25-Sn1.0-PNP-NC-M8x1

Alternative accessories
(Catalogue HT accessories)
- INI M4x12-Sn0.8-PNP-NO

3.2.5 Preferred combinations PG 16

CS 6	1 3	VP 152 VP 153	1,2 1,2
CS 8	1 3	< direct > VP 101	1,2 1,2
CS 12	1,3	VP 111	1,2
LM 12	1	VW 305	1,2
LM 16	1	VW 305	1,2
CR 12	3	VP 101	1,2
CR 16	3	VP 101	1,2
RM 12	3	VF 400	1,2
RM 16	3	VF 403	1,2
ES12	1,3 1,3	VP 111 VP 151	1 2
SA-1	1 2 2	VS 503 VP 101 VP 100	1,2 1 2
SA-3	1 2 2	VP 111 VP 111 VP 151	1,2 1 2
RE-50	3 3	VP 111 VP 151	1 2
SREH-50	3	VP 160	1
	3	VP 151	2
RA-40	3	VP 50486393	2

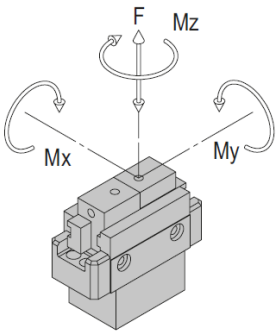
Mounting areas

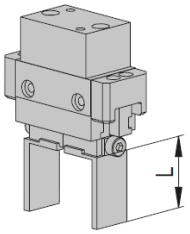
CS, ES	LM	HM	SA	UG, GM, SG, DG, PG, GE, SGE
				
PMP, PMP-c	**PEZ, PDZ**	**PEL, PDL**	**RM, RE**	**CR, RM 32, RE, SREH, RA**
				

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.

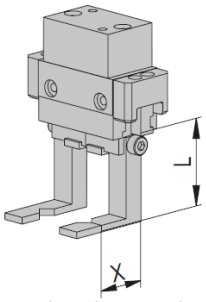
3.2.6 Module stresses PG 16 NN

Type	PG 16 NN
Max. static torque Mx	3 Nm
Max. static torque My	3 Nm
Max. static torque Mz	3 Nm
Max. dynamic torque Mx	0.03 Nm
Max. dynamic torque My	0.03 Nm
Max. dynamic torque Mz	0.03 Nm
Max. static force F	60 N
Max. dynamic force F	0.6 N





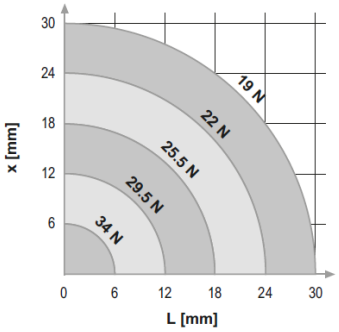
Finger length centric



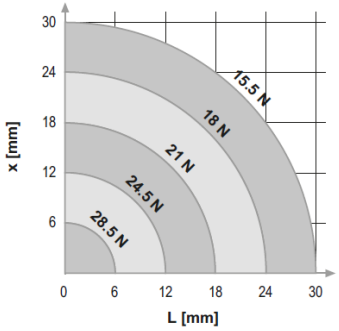
Finger length eccentric

Gripping force diagrams per jaw

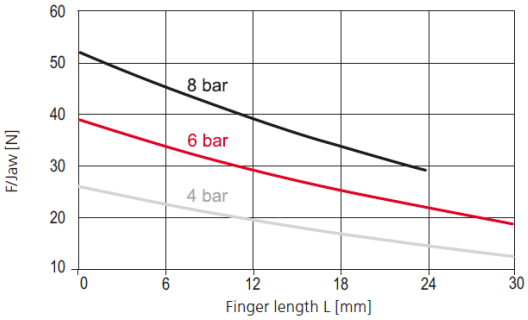
Centric gripping force - PG 16 NN opening



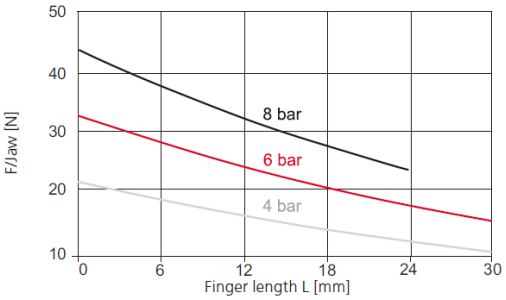
Centric gripping force - PG 16 NN closing



Centric gripping force - PG 16 NN opening



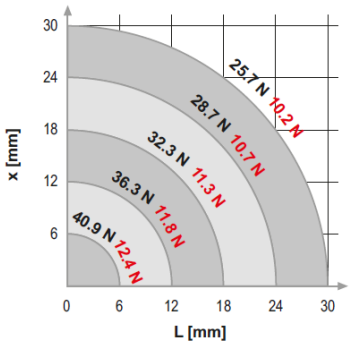
Centric gripping force - PG 16 NN closing



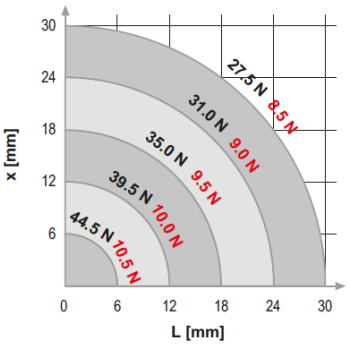
3.2.7 Module stresses PG 16 NC & PG 16 NO

Gripping force diagrams per jaw

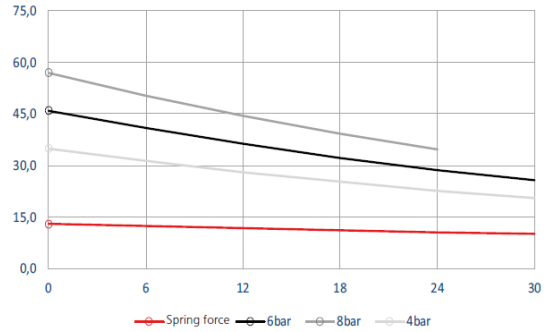
Centric gripping force - PG 16 NC closing



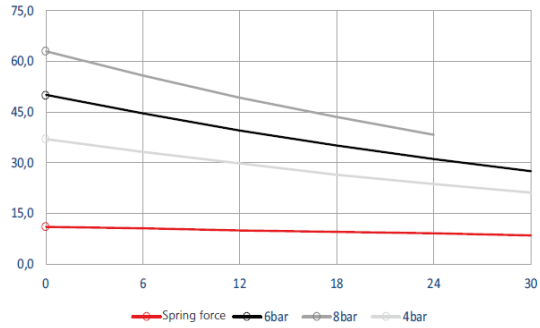
Centric gripping force - PG 16 NO opening



Centric gripping force - PG 16 NC closing



Centric gripping force - PG 16 NO opening



3.3 Precision gripper PG 20

3.3.1 Dimensional drawing PG 20

Typ	PG 20
A	Sensor Ø 4 mm
P	M3

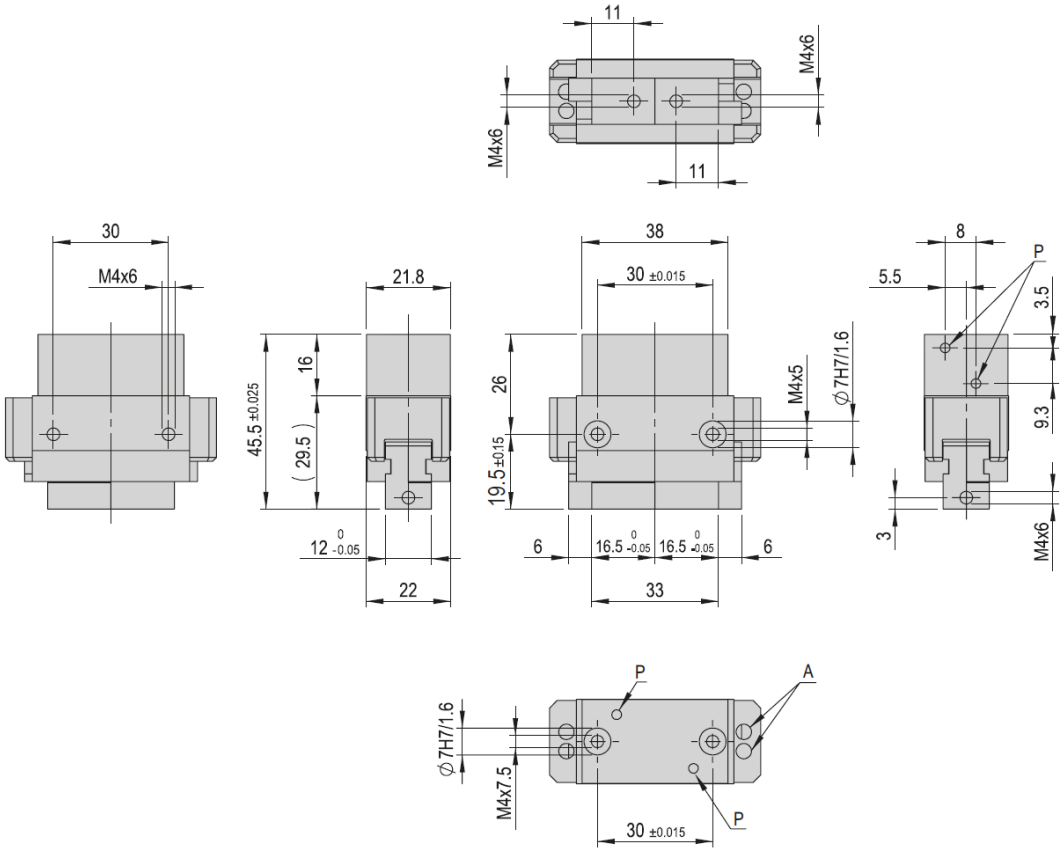


Fig. 4 Dimensional drawing of precision gripper PG 20

3.3.2 Technical data PG 20

PG 20	
Attachment grid	30 mm
Attachment grid alternative	M4
Operating pressure	6 +/- 2 bar
Air connection P	M3
Cylinder Ø	20 mm
Operating temperature	0 - 50 °C
Storage temperature	0 - 50 °C

Type	PG 20
Order number	**50332225**
Net weight	0.132 kg
Air consumption/cycle	0.01 NL
Closing time	**Closing time = Finger weight 50 ms = 100 g 30 ms = 60 g 20 ms = - 10 ms = -
Gripping force, opening	*136 N
Gripping force, closing	*108 N
Opening stroke	2 x 6 mm
Repeat accuracy	+/- 0.01 mm
Handling accuracy	+/- 0.05 mm
Positions	2
Mounting position	

The technical data refer to a nominalpressure of 6 bar under Afag standard test conditions.
The module can be operated with lubricated or dry air.
Cleanroom class ISO 14644-1, class ISO 7

*Observe gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping
**Closing times in unthrottled operationObserve gripping force diagrams
- Measurements for slowly closing fingers
- All module measurements carried out via outer clamping

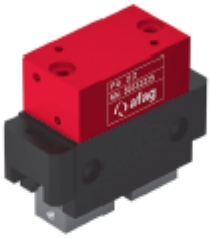
Inlcuded in the delivery
(Catalogue HT accessories)
- 2x Centering bushing Ø7x3

Accessories
(Catalogue HT accessories)
- Compressed air connection straight M3 x 0.5
- Compressed air connection angled M3 x 0.5
- INI d4x25-Sn1.0-PNP-NC-M8x1

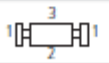
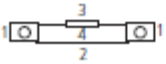
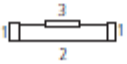
Alternative accessories
(Catalogue HT accessories)
- INI M4x12-Sn0.8-PNP-NO

3.3.3 Preferred combinations PG 20

CS 12	1 2	VS 512 VP 139	1,2 1,2
CS 16	1 3	VS 512 VP 139	1,2 1,2
LM 16	1 1	VP 112 VP 108	1 2
LM 20	1	VP 105	1,2
HM 10	1	VP 139	1,2
CR 16	3	VP 151	1,2
CR 20	3	VP 151	1,2
RM 16	3	VF 403	1,2
RM 25	3	VF 403	1,2
ES20	1,3	VP 139	1,2
SA-3	1 2 2	< direct > VP 137 VP 151	1,2 1 2
SA-6	1 2 2	< direct > VP 137 VP 151	1,2 1 2
RE-50	3 3	VP 137 VP 151	1 2
SREH-50	3	VP 160	1
	3	VP151	2
RA-40	3	VP 50486394	2



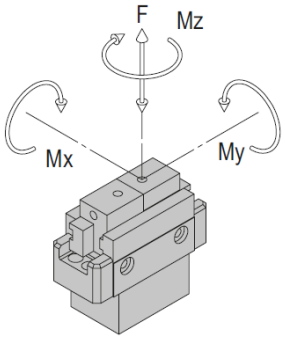
Mounting areas

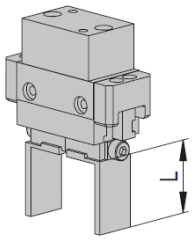
CS, ES	LM	HM	SA	UG, GM, SG, DG, PG, GE, SGE
				
PMP, PMP-c	**PEZ, PDZ**	**PEL, PDL**	**RM, RE**	**CR, RM 32, RE, SREH, RA**
				

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.

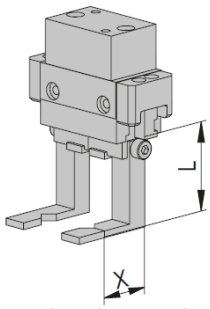
3.3.4 Module stresses PG 20

Type	PG 20
Max. static torque Mx	10 Nm
Max. static torque My	10 Nm
Max. static torque Mz	10 Nm
Max. dynamic torque Mx	0.1 Nm
Max. dynamic torque My	0.1 Nm
Max. dynamic torque Mz	0.1 Nm
Max. static force F	100 N
Max. dynamic force F	1 N





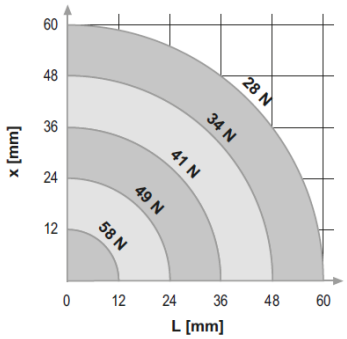
Finger length centric



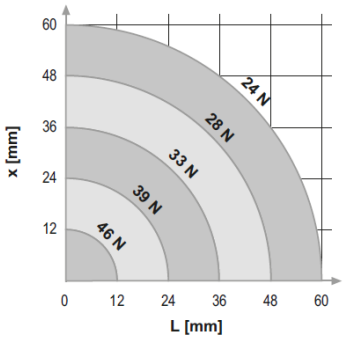
Finger length eccentric

Gripping force diagrams per jaw

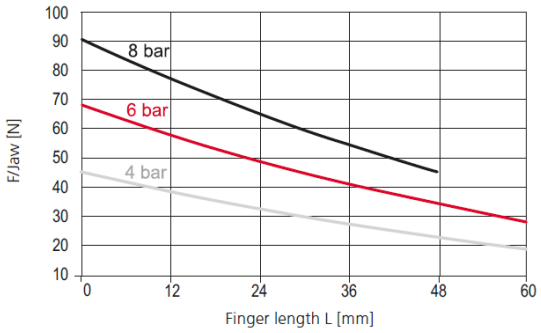
Centric gripping force, closing



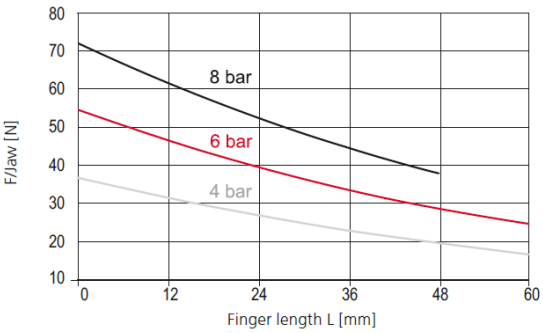
Centric gripping force, closing



Centric gripping force, closing



Centric gripping force, closing



4 Transport, packaging and storage

4.1 Safety instructions for transport

CAUTION

Risk of injury when packing and unpacking the precision gripper!

The precision gripper can be moved back and forth while they are still loose and cause crushing injuries.

- Pack and unpack the precision gripper carefully.

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

4.2 Scope of supply

In addition to the assembly and operating instructions, a safety information sheet is enclosed with each precision gripper.

This information sheet must be read by every person who carries out work with and on the precision grippers!

Fig. 5 Scope of delivery precision grippers PG 12, PG 16 and PG 20

Unt.	PG 12	PG 16	PG 20
1 x	Module PG 12	Module PG 16	Module PG 16
2 x	Centering bushing ø4x2 mm	Centering bushing ø5x2.5 mm	Centering bushing ø7x3
1 x	Mounting/operating instruct.	Mounting/operating instruct.	Mounting/operating instruct.

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: 0-50 °C
- Relative air humidity: < 90%, non condensing

4.4 Packaging

The precision grippers are transported in the transport packaging of AFAG Automation AG. If no AFAG packaging used, the precision gripper must be packed so that they are protected against shock and dust.

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 precision grippers are stored for an extended period of time, observe the following:

- Store the precision gripper in the transport packaging
- Do not store the precision gripper outdoors or expose them to weather conditions.
- The storage space must be dry and dust free.
- Room temperature of the storage space: 0-50 °C.
- Relative air humidity: < 90% non condensing.
- Clean the precision gripper and protect the blank metal parts against corrosion using the appropriate means.
- Protect the precision gripper from dirt and dust.

5 Structure and description

5.1 Design precision gripper

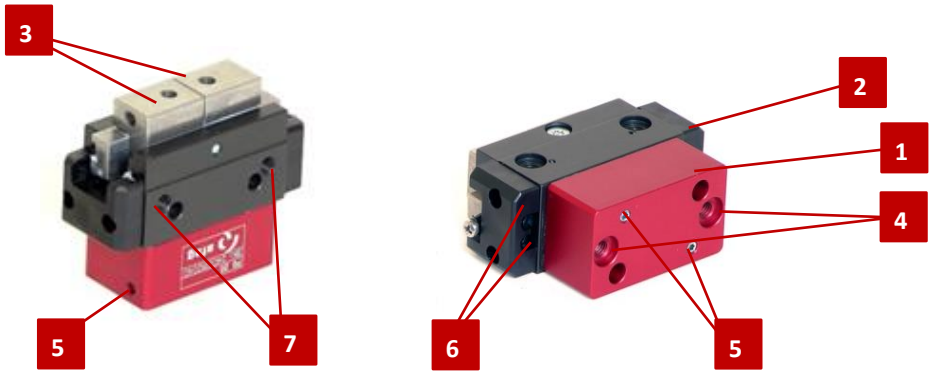


Fig. 6 Design of the precision gripper (example)

1. Gripper housing
2. Gripping head
3. Gripper jaws
4. Mounting holes for options
5. Air connections at rear/side
6. Holders for sensors
7. Mounting holes (e.g. holding-down unit)

5.2 Product description

AFAG's precision grippers are precise and compact gripping modules designed for gripping and precise insertion of oriented mass parts. The positions "open" and "close" can be detected by means of initiators. These initiators are not included in the standard scope of supply and can be ordered separately.

The precision grippers have a repeatability accuracy of +/- 0.01 mm and a turning precision of +/- 0.05 mm. The gripping forces are indicated in the corresponding table of the gripper type in this manual.

Precision grippers can be combined with other modules from the Afag modular system.

5.3 Accessories

PG 12	PG 16	PG 20
Centring bushing ø 4x2 mm Order no.: 50332257	Centring bushing ø 4x2 mm Order no.: 50035831	Centring bushing ø 4x2 mm Order no.: 11016850
Initiator INI Ø 3x22-Sn0.8-PNP-NO-M8x1 Order no.: 50001023	Initiator INI Ø 4x25-Sn1.0-PNP-NC-M8x1 Order no.: 50093507	Initiator INI Ø 4x25-Sn1.0-PNP-NC-M8x1 Order no.: 50093507
Sealing set Order no.: 50468493	Sealing set Order no.: 50468494	Sealing set Order no.: 50468495
Initiator holder Order no.: 50466840	Initiator holder Order no.: 50260912	Initiator holder Order no.: 50260914

6 Installation, assembly & setting

The customer is responsible for the installation of the precision gripper into the automation system!

6.1 Safety Instructions for installation & assembly

The precision gripper is an incomplete machine.

For safe operation, the precision grippers must be integrated into the safety concept of the automation system in which they are installed.

During normal operation it must be ensured that the user cannot interfere with the working area of the precision gripper.

When installing a precision gripper in an assembly system, the system operator must provide the system with a protective device with a locked door safety circuit!

CAUTION

Danger of injury from attachments!

The gripper fingers are pneumatically controlled. Attachments can restrict the free movement of the gripper fingers and cause injuries such as crushing.

- Make sure that the movement of the gripper fingers is not restricted by mounted attachments.
- Take appropriate measures to ensure safe operation!

No liability can be assumed for damages caused by improper installation/assembling work carried out by the operator.

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

6.2 Assembly & attachment

The PG precision grippers can be installed in a vertical and horizontal position.

The Afag module components are provided with a precise module centring which guarantees a high and repetitive accuracy of fit during installation, operation and exchange of a module.

6.2.1 Attachment

The precision grippers can be mounted at the rear and the side.

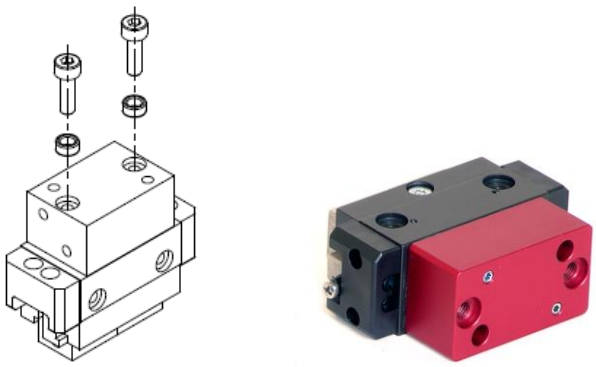


Fig. 7 Attachment of the precision gripper (example)

For mounting use the centering sleeves (➲ chapter 4.2) included in the scope of delivery.

6.2.2 Tightening torques

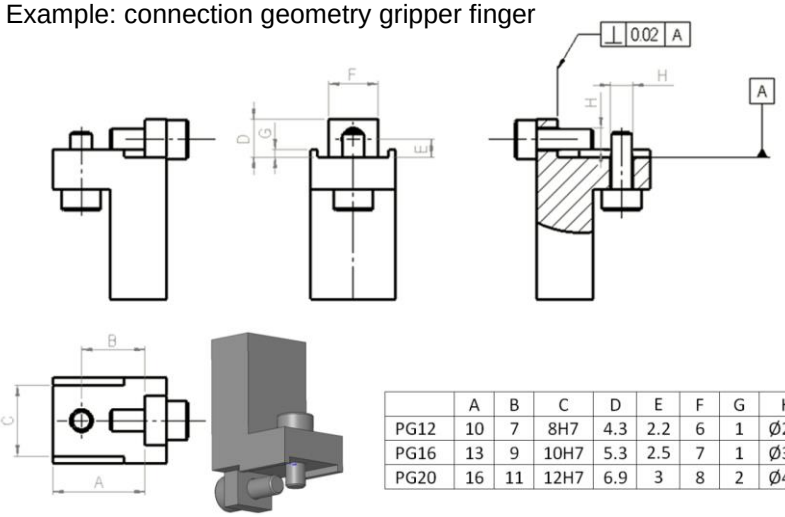
For assembling use screws with the following minimum specifications:

Standard	VDI 2230
Screw strength	Category 8.8
Surface:	Galvanized blue, oiled or greased

Thread	Tightening torque
M2	0.3 … 0.35 Nm
M2.5	0.5 … 0.73 Nm
M3	1.1 … 1.4 Nm
M4	2.6 … 3.3 Nm
M5	5.2 … 6.5 Nm
M6	9.0 … 11.3 Nm
M8	21.6 … 27.3 Nm

6.3 Assembly of the gripper fingers

Example: connection geometry gripper finger



	A	B	C	D	E	F	G	H
PG12	10	7	8H7	4.3	2.2	6	1	Ø2.7
PG16	13	9	10H7	5.3	2.5	7	1	Ø3.2
PG20	16	11	12H7	6.9	3	8	2	Ø4.3

Fig. 8 Connection geometry of gripper finger

6.4 Pneumatic connection

Please see the Technical dimensional drawings in this manual (➲ Chapter 3)!

Two pneumatic connections each are at the rear and at the sides of the base body of the pneumatic gripper.

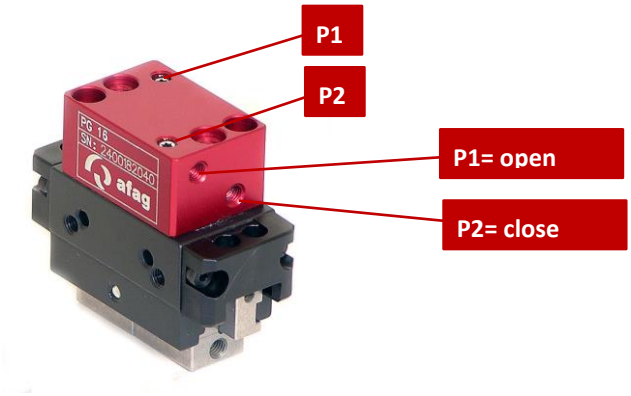
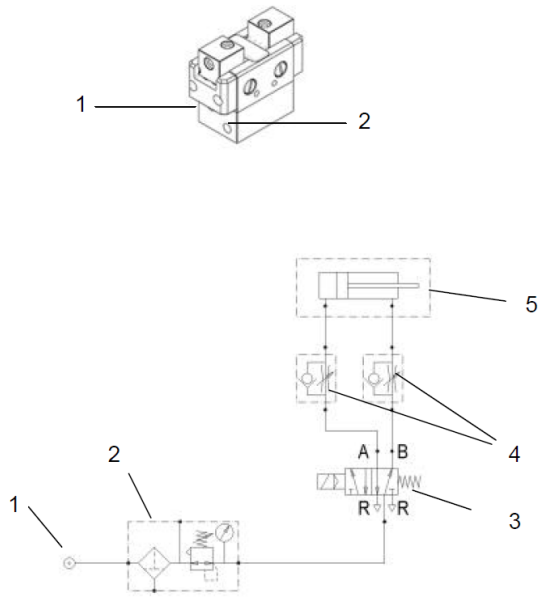


Fig. 9 Pneumatic connections of the precision gripper

Operating pressure: 6 bar +/- 2

Close air connections which are not used air-tight before installing the module in a system.

Caution: Carry out a leakage test!



1. Compressed air connection
2. Maintenance unit
3. 5/2 port directional control valve
4. One-way restrictor
5. Precision gripper

Fig. 10 Pneumatic diagram of precision gripper

6.5 Installation and adjustment of the inductive sensors

6.5.1 Installation of the inductive sensors

With the inductive sensors, the opening or closing position of the precision gripper can be detected. The inductive sensors can be used on both sides of the black gripper head. This depends on whether the opening or the closing position is to be detected.

Fig. 11 Installation of inductive sensors

1. Loosen the clamping screws (Fig. 11, 1) on the holder (Fig. 11, 2).
2. Mount the sensors (Fig. 11, 3) to the grippers.
3. Adjust the sensors in unpressurised condition.
4. Tighten clamping screws (Fig. 11, 1) slightly.
5. Check the sensors for proper function.
   - Readjust the sensors if necessary (➲ Chapter 6.5.2).
6. Tighten clamping screws (Fig. 11, 1).
   ⇨ The inductive sensors are mounted.

6.5.2 Adjustment of the inductive initiators

The detection position of the gripper jaws is adjusted by turning the screws (Fig. 12, 4) and (Fig. 12, 5). The spacer (Fig. 12, 6) must be shortened according to the setting. The second spacer (Fig. 12, 7) is mounted when the gripper jaws grip from the inside to the outside.

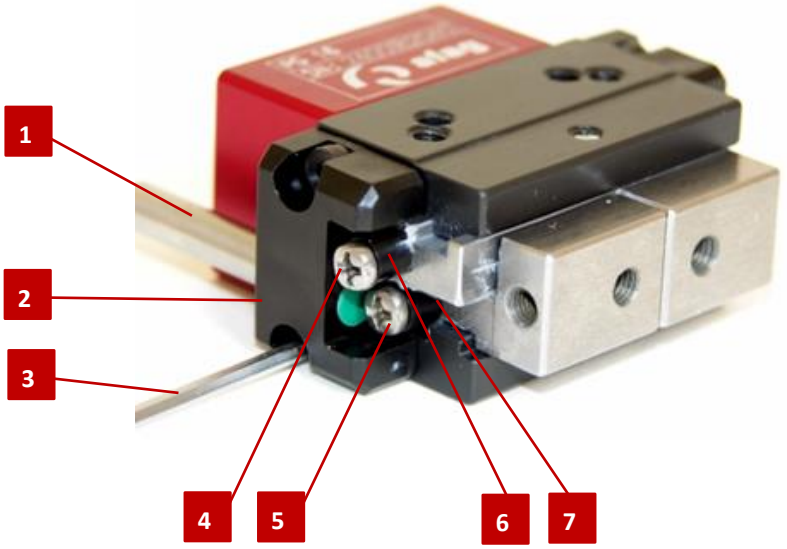


Fig. 12 Installation of the initiators

1. Proximity switch (see accessories)
2. Clamp holder
3. Allen key
4. Adjustment screw
5. Adjustment screw
6. Spacer (gripper jaws grip from outside to inside)
7. Spacer (gripper jaws grip from inside to outside)

7 Commissioning

After connection, the precision grippers are put into operation for the first time via the control.

7.1 Safety instructions for commissioning

CAUTION

Danger of injury in the working area of the precision gripper!

Due to the decentralised control system, the operator of the precision gripper must not necessarily stand next to the rotary modules during operation so that he may not have a complete view of the working area. Persons within the working area may be injured.

- When operating the precision gripper, ensure a good overview of the entire working area.
- Unauthorized persons must not stay within the working area during operation.

CAUTION

Risk of injuries due to uncontrolled parts movements!

When the control unit is switched on, signals from the control unit can lead to unintentional movements of the precision gripper and cause serious injuries or material damage.

- When working on the precision gripper, make sure that the control unit and compressed air are switched off and that they cannot be switched on again unintentionally.
- Only connect or disconnect the cables when the control unit is switched off.
- Observe the operating instructions of the controller used!

Observe the safety instructions in ➲ Chapter 2 "Safety instructions" of these mounting instructions!

7.2 Commissioning of the modules

NOTICE

Material damage due to improperly carried out work!

The precision grippers are precision mechanical devices and must be handled with the necessary care and cleanliness during all work.

- Commissioning may only be carried out by qualified personnel!

Proceed carefully and follow the instructions step by step when commissioning the modules for the first time:

1. Slowly pressurize the system.
2. Observe the permissible technical values.
   - Payload
   - Movement frequency
   - Momentary load to the guideways
3. Make sure that there are no persons or tools in the working area.
4. Perform test run:
   - Start with slow movements
   - Then continue under normal operating conditions

   ⇨ Commissioning is completed.

7.3 Setting up & retrofitting

CAUTION

Risk of injury due to incorrect operation of the system!

Incorrect operation during setup work on the machine can lead to unintentional starting of the precision gripper and cause injuries.

- Setting up and retrofitting work may only be carried out by qualified personnel.
- Observe the operating instructions!

CAUTION

Danger of injury from attachments!

The gripper fingers are electrically controlled. Attachments can restrict the free movement of the gripper fingers and lead to injuries.

- Ensure that the movement of the gripper fingers is not restricted by mounted attachments.
- Take appropriate measures to ensure safe operation!

8 Fault elimination

8.1 Safety instructions for troubleshooting

WARNING

Danger of injury due to faulty troubleshooting!

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

- Only use trained specialist personnel for troubleshooting.
- All work on the precision gripper must be carried out with the power supply cut off!

NOTICE

Risk of material damage due to unexpected movements!

There is a risk of material damage if unusual movement of the precision gripper (e.g. hard shocks) is detected during normal operation.

- Stop the system immediately and eliminate the cause!

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

8.2 Fault causes and remedy

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

Fault	Possible cause	Remedy:
Gripper jaws do not return to end position	▪ Payload too high ▪ Pressure too low ▪ Module defect ▪ Module incorrectly connected ▪ Throttle non-return valve completely closed	▪ Reduce payload ▪ Increase pressure to max. 8 bar ▪ Send module to Afag for overhaul ▪ Check pneumatic connections and connect module correctly ▪ Open throttle non-return valve
Module audibly loses compressed air	▪ Leakage from compressed air connection ▪ Leakage from cylinder	▪ Check closures on air connections, retighten if necessary ▪ Send module to AFAG

9 Maintenance and repair

9.1 General notes

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

9.2 Safety instructions for maintenance and repair

WARNING

Danger of injury due to improper maintenance!

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

- Only use qualified personnel to carry out the activities.
- Always wear personal protective equipment when carrying out maintenance and repair work!

WARNING

Risk of injuries due to uncontrolled parts movements!

Signals from the control system can trigger unintentional movements of the precision gripper and cause injury.

- Before starting any work on the precision gripper, switch off the control unit and make sure that it cannot be switched on again unintentionally.
- Observe the operating instructions of the controller used!
- Before starting any activities, switch off the media supply and make sure it cannot be switched on again unintentionally!

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

9.3 Maintenance activities and maintenance intervals

- Observe the specified maintenance and care intervals. The intervals refer to normal operating conditions.

9.3.1 Overview of the maintenance points

Fig. 13 Precision gripper

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Fasteners	Checking 	After commissioning	[Off]	-
			▪ Check fastening elements for tight fit		
2	Module	Cleaning 	After commissioning	[Off]	-
			- Clean with a dry, lint-free cloth (The precision gripper must not be sprayed. Do not use aggressive cleaning agents).		

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
- Ambient conditions as specified in the technical data

9.3.3 Lubrication

The precision grippers are lifetime lubricated and can be operated with oil-lubricated or non oil-lubricated compressed air.

Compressed air specification
Dry (condensation-free)
Filtered (40 µm filter for oil-lubricated air)
Filtered (5 µm filter for oil-lubricated air)

If the precision grippers are operated with lubricated compressed air, we recommend that you use the following types of oil:

Oil type	
Festo Special oil	Shell Tellus Oel C 10
Avia Avilub RSL 10	Mobil DTE 21
BP Energol HPL 10	Blaser Blasol 154
Esso Spinesso 10	

Oil quantity: 5-10 drops of oil per 1000 ltr. Compressed air

Viscosity range: 9-11 mm2/s (= cST) at 40°C, ISO class VG 10 acc. ISO 3448

NOTICE

Risk of damage to property!

The operation of the gripper modules with oil-lubricated compressed air causes the factory primary lubrication to be washed out. Therefore, it is absolutely essential that the gripper modules continue to be operated with oil-lubricated compressed air in order to avoid damage to the rotary modules.

- Once the gripper modules have been operated with oil-lubricated compressed air, they **may never** be operated without oil-lubricated compressed air.

NOTICE

Danger of corrosion!

When used in an ionised air environment (e.g. high voltage processors/ coronisation), the precision grippers can corrode.

- Regularly apply lubricant to open flanges/shafts as well as guides and pliers.
- We recommend monthly cleaning and lubrication according to AFAG standard: - Staburax NBU8EP (flat guides)
  - Blasolube 301 (piston rod)

9.4 Spare parts and repair work

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

After the warranty period has expired, the customer can 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 precision gripper from uncontrolled movements!

When dismounting the precision gripper from the machine, there is a danger of uncontrolled movements.

- Disconnect the media supply (electrics) before removing the grippers!
- Disassembling should only be carried out by qualified personnel!
- Only remove the precision grippers when the control system is switched off and secured!

10 Decommissioning and disposal

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

10.1 Safety instructions for decommissioning and disposal

WARNING

Risk of injury from improper decommissioning and disposal!

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

- Use only qualified personnel to carry out the activities.
- Disconnect the media supply before removing the grippers!
- Only remove the precision gripper when the control system is switched off and secured!

10.2 Decommissioning

If the precision grippers are not used for a longer period of time, they must be properly decommissioned and stored as described in Chapter 4.5.

10.3 Disposal

The precision grippers 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 precision grippers must not be disposed of as a complete unit. Dismantle the precision grippers and separate the various components according to type of material and dispose of 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 from incorrect disposal of the precision grippers.

Environmental damage can be caused by improper disposal of the precision grippers.

- 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	Precision gripper PG
Type:	PG 12, PG 16 NN, PG 16 NC, PG 16 NO, PG 20

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; 1.2.3; 1.3.3; 1.3.6; 1.3.7.1.4.1; 1.5; 1.6; 1.6.1; 1.6.2; 1.6.4; 1.7; 1.7.4; 1.7.4.2.

Harmonised standards applied, in particular:	
EN ISO 12100:2010	Safety of machinery - General design principles - Risk assessment and risk reduction.

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.

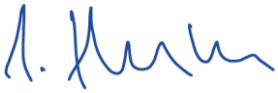
The relevant technical documentation was created according to Annex VII, Part B of the above-mentioned Directive.

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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