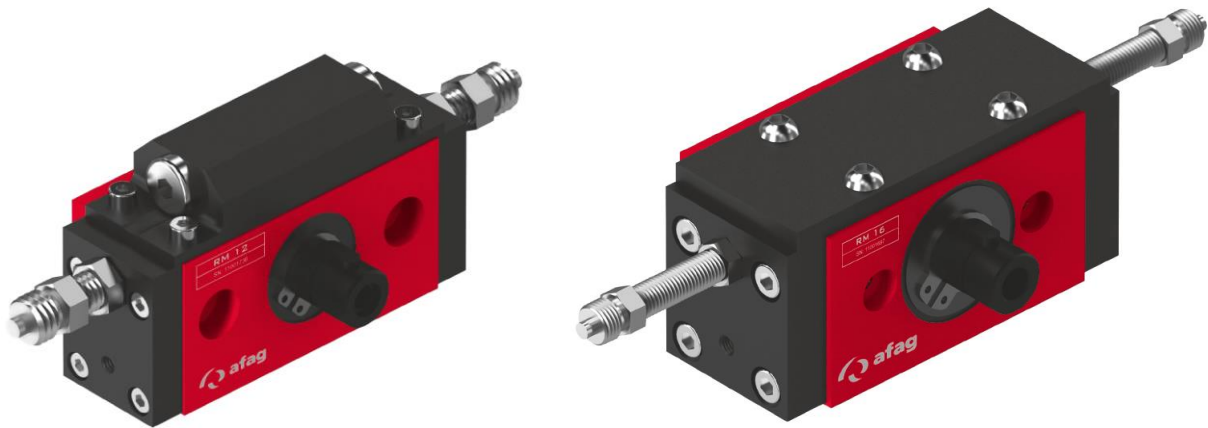


Assembly and operating instructions

Rotary Modules RM 12 | RM 16



Translation of the Original Assembly Instructions EN

■ RM12	⇒ Order no.: 11001736	■ RMZ 16	⇒ Order no.: 11001699
■ RM 12-SD	⇒ Order no.: 11001739	■ RM 16-SD/360°	⇒ Order no.: 11009028
■ RMZ 12	⇒ Order no.: 11001737	■ RMZ 16/360°	⇒ Order no.: 11009029
■ RM 16	⇒ Order no.: 11001697	■ RMZ 16/2	⇒ Order no.: 11001700
■ RM 16-SD	⇒ Order no.: 11001702		

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 rotary module or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The rotary 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 essential information on assembly, commissioning, functioning and maintenance of the rotary modules RM 12, RM 16 to ensure safe and efficient handling and operation.

Consistent compliance with these assembly instructions will ensure:

- permanent operational reliability of the rotary module,
- optimal functioning of the rotary module,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs),
- prolongation of the rotary module 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 severe injury.

WARNING



Warning!

This safety note points out a potentially hazardous situation which, if not avoided, could result in death or severe 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:

- Safety data sheets etc.
- Instructions for integrated components (➡ supplier documentation)



Each rotary module is accompanied by a safety information sheet. This information sheet must be read carefully by every person who conducts work on and with the rotary module.

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 (e.g. shock absorbers) are excluded from the warranty*.

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

* *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 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.
- Using the module without shock absorbers or with defective shock absorbers.
- 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 rotary modules RM 12, RM 16 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 rotary module and optimal protection of personnel.



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

2.2 Intended use

The RM 12, RM 16 rotary modules are used for shock-free rotating of loads in non-hazardous atmospheres under the ambient and operating conditions defined for these modules.

The RM modules are exclusively designed for rotational movements for the following payloads: RM12 radial: 350 N, axial: 220 N; RM 16 radial: 1200 N, RM 16 axial: 800 N.

The rotary modules can be used in combination with other modules as a pick & place station, whereby the permissible load capacity must not be exceeded.



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 rotary module.

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 rotary modules poses a potential hazard to the personnel.

- The rotary module may only be used in a technically perfect condition in accordance with its intended use and the instructions in this manual and 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 rotary modules 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 modules.

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 rotary modules.

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 rotary modules,
- 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 modules are required to:

- read and observe these assembly instructions (especially chapter safety),
- observe the occupational safety and accident prevention regulations,
- observe all safety and warning signs on the rotary modules,
- 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. (→ chap. 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 rotary modules 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 rotary modules.

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

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 RM modules, 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:

	<i>Protective clothing</i> is a close-fitting clothing specifically designed to protect personnel from hazards during work.
	<i>Protective gloves</i> are specifically designed to protect the personnel against hand injuries (such as cuts, abrasion, burns).
	<i>Safety shoes</i> are specifically designed to protect the personnel against foot injuries from crushing, falling objects or slipping on slippery surfaces.
	Hearing <i>protectors</i> 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 rotary modules 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 rotary modules 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 machine 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 rotary 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 rotary module has been built according to the state-of-the-art and the applicable health and safety requirements. However, improper use of the rotary modules may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- on the rotary modules 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,
- the safety information sheet for the rotary modules.



WARNING

Danger - Do not use in unsuitable environment !

The rotary modules are designed for use in **non** explosive atmospheres.

- Do **not** use the rotary modules in potentially explosive atmospheres!



CAUTION

Danger of injury in the working area of the rotary modules!

Due to the decentralised control system, the operator of the rotary modules 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 in the working area may be injured.

- When operating the rotary modules, 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 operating the rotary modules uncontrolled movements may occur which can cause personal injury or property damage.

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



CAUTION

Risk of noise-induced hearing loss!

When the rotary modules are installed in a machine or 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

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 Mechanical hazards

CAUTION



Danger of injury by moving components!

Limbs can be crushed by moving components!

- Work on and with the rotary modules may only be carried out by qualified personnel.

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!

2.8.4 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.

2.8.5 Danger caused by omitting maintenance work

CAUTION



Danger of injury!

Poor or not regularly performed maintenance may cause component failures which may lead to injuries.

- The operator must exercise due care and only use trained maintenance to carry out the activities.

3 Technical data

3.1 Rotary module RM 12

3.1.1 Dimensional drawing RM 12

Type	RM 12	RM 12-SD	RMZ 12
P	M5	M5	M5

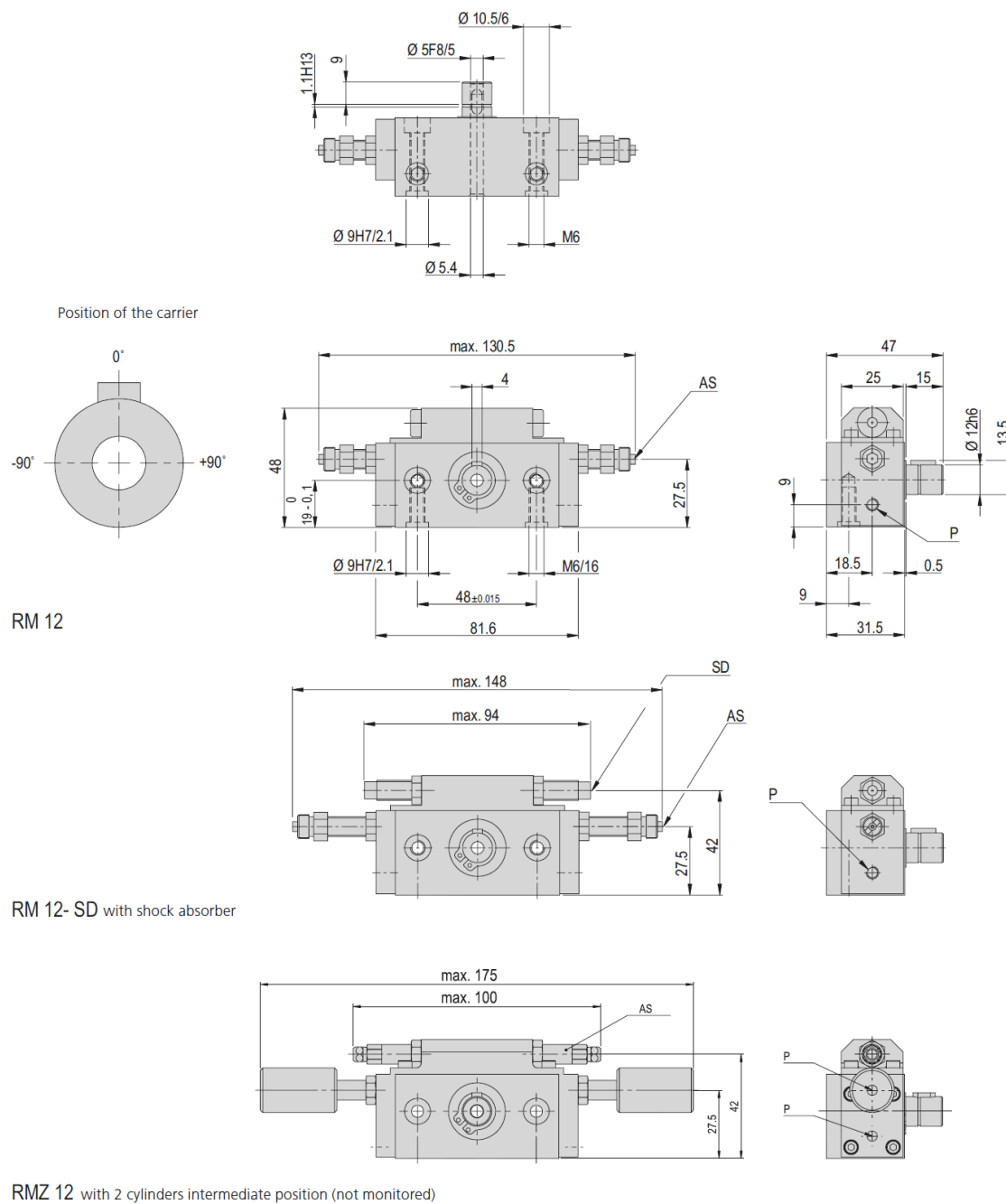


Fig. 1 Dimensional drawing - Rotary module RM 12

3.1.2 Technical data RM 12

RM 12			
Attachment grid	48 mm		
Attachment thread	M6		
Operating pressure	6 +/- 2 bar		
Air connection P	M5		
Operating temperature	0 - 50 °C		
Storage temperature	0 - 50 °C		
Humidity	< 90 %		
Medium filtered compressed air	10 - 40 µm		

Type	RM 12	RM 12-SD	RMZ 12
Order number	11001736	11001739	11001737
Net weight	0.323 kg	0.32 kg	0.345 kg
Max. payload, radial	*350 N	*350 N	*350 N
Max. payload, axial	*220 N	*220 N	*220 N
Air consumption (180°)	0.013 NL	0.013 NL	0.021 NL
Angle of rotation	0-180 °	0-180 °	0-180 °
Min. rotation time 90°	0.11 s	0.11 s	0.11 s
Min. rotation time 180°	0.18 s	0.18 s	0.18 s
Noise level	54 dB (A)	54 dB (A)	54 dB (A)
Angle accuracy	0.13 °	0.13 °	0.13 °
Torque	0.3 Nm	0.3 Nm	0.3 Nm
Positions	2	2	4
Mounting position	✚	✚	✚

The technical data refer to a nominal pressure of 6 bar under Afag standard test conditions.

Note: RM 12 is supplied without shock absorbers, RM 12-SD with shock absorbers, RMZ 12 is supplied without shock absorbers and uses ASC 8/30 instead of AS 8/25

The module can be operated with lubricated or dry air.

Cleanroom class ISO 14644-1, class ISO 7

*Observe rotation time diagram

Included in the delivery (Catalogue HT accessories)

- 2x Centering bushing Ø9x4
- 2x Stop screw AS 08/25
- 1x Key 4x4x10

Accessories

- Rotation flange RM 12 [p. 93]
- Cylinder, intermediate pos. RMZ 12 [p. 93]
(Catalogue HT accessories)
- INI d6.5x44-Sn1.5-PNP-NO-M8x1

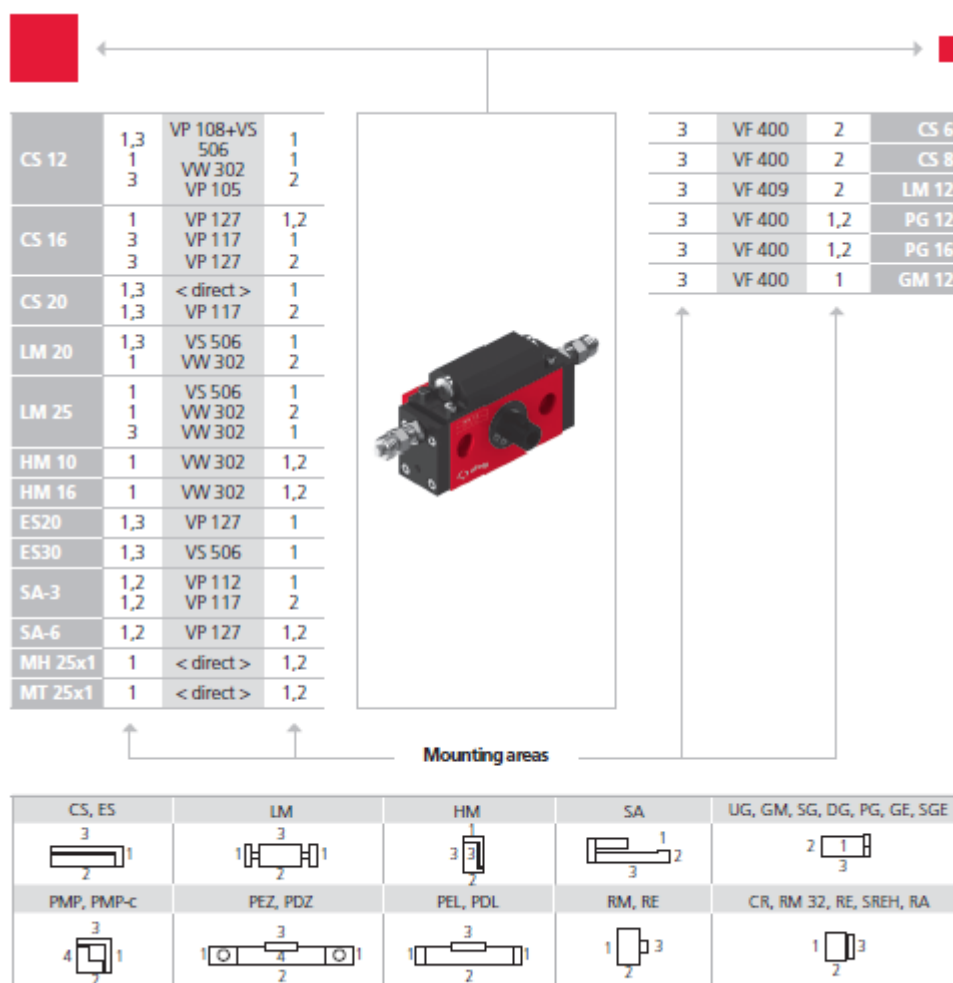
Alternative accessories (Catalogue HT accessories)

- INI 8x8xx38.5-Sn1.5-PNP-NO-M8x1

Fig. 2

Table technical data RM 12

3.1.1 Preferred combinations RM 12



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.

3.1.2 Module loads RM 12

Rotation time diagrams

Rotation time

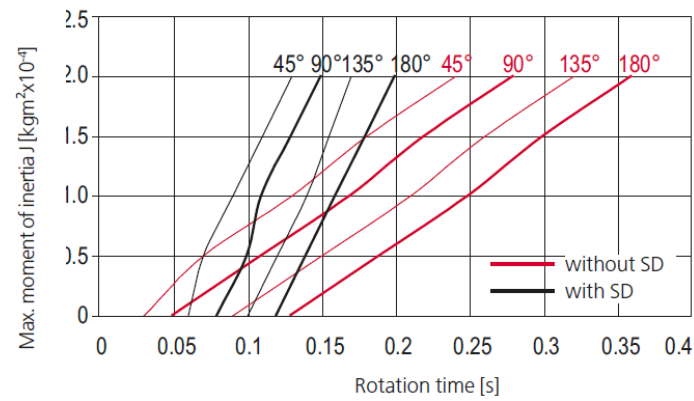


Fig. 3 Swivel time diagrams RM 12

3.2 Rotary module RM 16

3.2.1 Dimensional drawing RM 16

Type	RM 16	RM 16-SD
P	M5	M5

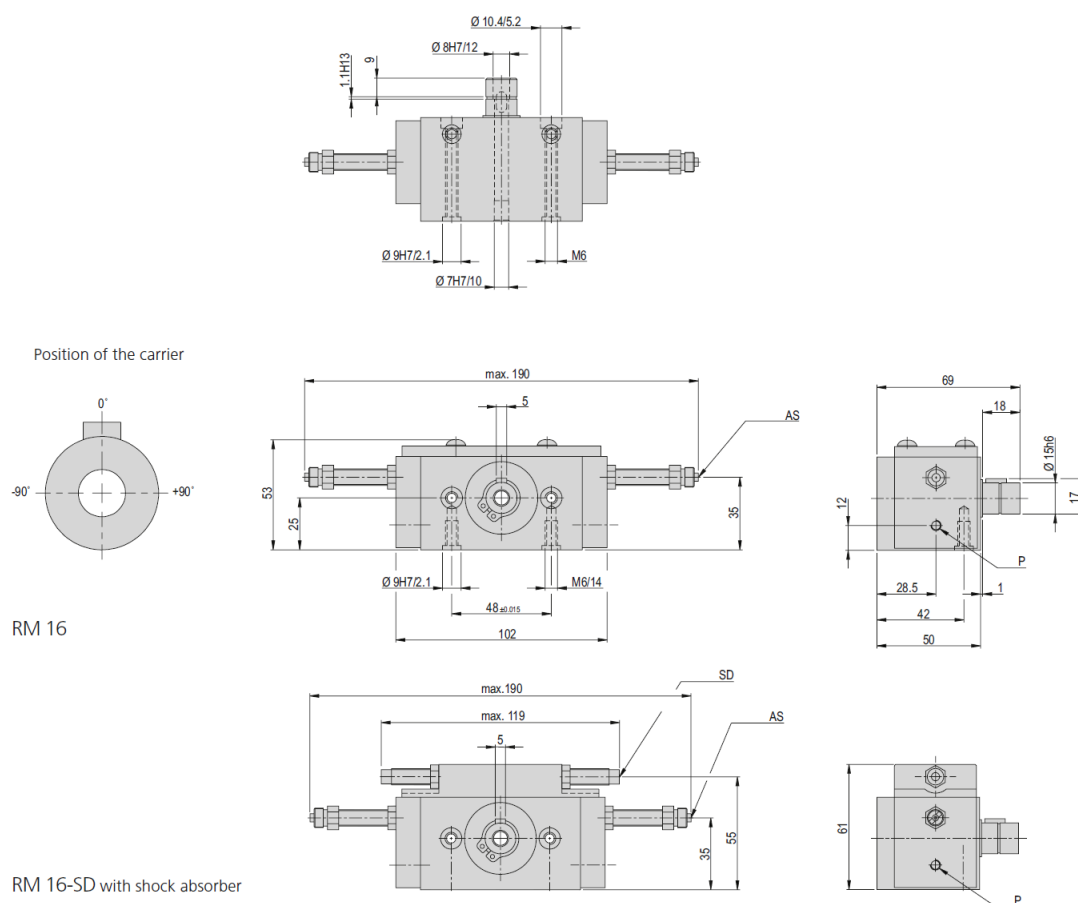




Fig. 4 Dimensional drawing - Rotary module RM 16

3.2.2 Technical data RM 16

RM 16		
Attachment grid	48 mm	
Attachment thread	M6	
Operating pressure	6 +/- 2 bar	
Air connection P	M5	
Operating temperature	0 - 50 °C	
Storage temperature	0 - 50 °C	
Humidity	< 90 %	
Medium filtered compressed air	10 - 40 µm	

Type	RM 16	RM 16-SD
Order number	11001697	11001702
Net weight	0.76 kg	0.844 kg
Max. payload, radial	*1200 N	*1200 N
Max. payload, axial	*800 N	*800 N
Air consumption (180°)	0.27 NL	0.27 NL
Angle of rotation	0-180 °	0-180 °
Min. rotation time 90°	0.16 s	0.16 s
Min. rotation time 180°	0.3 s	0.3 s
Noise level	58 dB (A)	58 dB (A)
Angle accuracy	0.1 °	0.1 °
Torque	0.6 Nm	0.6 Nm
Positions	2	2
Mounting position		

The technical data refer to a nominal pressure of 6 bar under Afag standard test conditions.
 Note: Rm 16 is supplied without shock absorbers, RM 16-SD is supplied with shock absorbers.
 The module can be operated with lubricated or dry air.
 Cleanroom class ISO 14644-1, class ISO 7

*Observe rotation time diagram

Included in the delivery (Catalogue HT accessories)

- 2x Centering bushing Ø9x4
- 2x Stop screw AS 08/40
- 1x Key 5x5x10
- 2x Shock absorber SD M8x1 -3

Accessories

- Torque amplifier RM 16 [p. 94]
 - Cylinder, intermediate position RM 16 [p. 94]
 - Accessories intermediate pos. RM 16 [p. 95]
 - Accessories shock absorber RM 16 [p. 95]
 - Clamping support RM 16/RM 25 [p. 96]
- (Catalogue HT accessories)
- INI d6.5x44-Sn1.5-PNP-NO-M8x1

Alternative accessories (Catalogue HT accessories)

- INI 8x8xx38.5-Sn1.5-PNP-NO-M8x1

Fig. 5 Table technical data RM 16

3.2.3 Dimensional drawing RM 16 / 360°

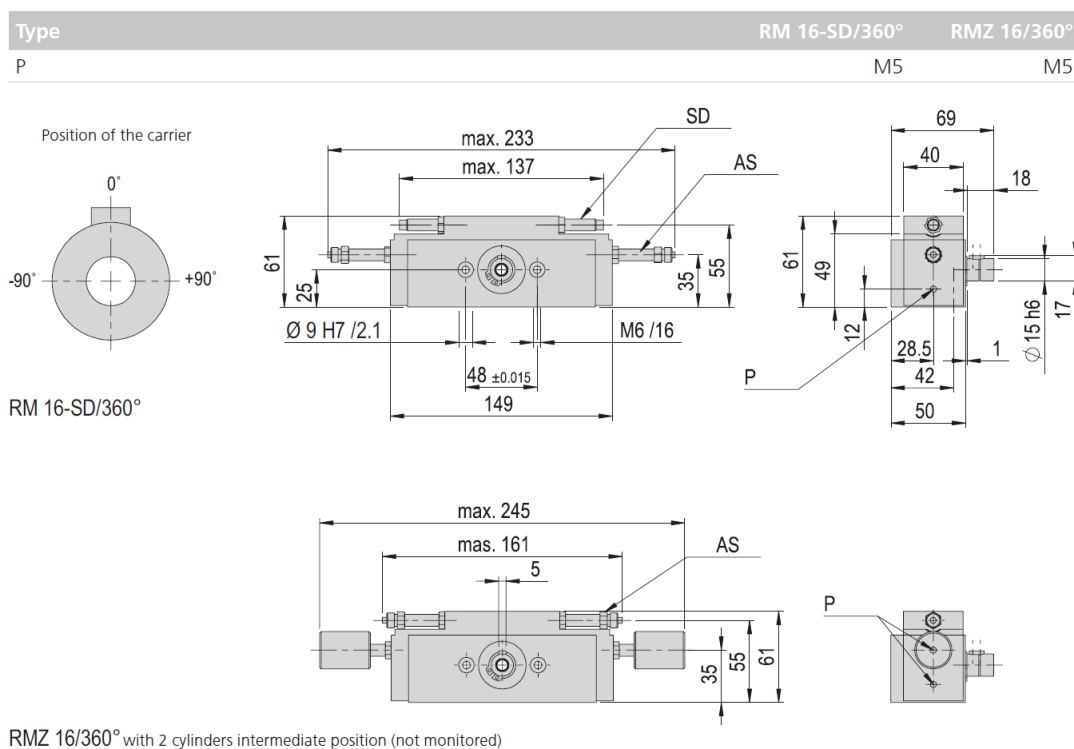




Fig. 6 Dimensional drawing - Rotary module RM 16 / 360°

3.2.4 Technical data RM16 / 360°

RM 16/360°		
Attachment grid	48 mm	
Attachment thread	M6	
Operating pressure	6 +/- 2 bar	
Air connection P	M5	
Operating temperature	0 - 50 °C	
Storage temperature	0 - 50 °C	
Humidity	< 90 %	
Medium filtered compressed air	10 - 40 µm	

Type	RM 16-SD/360°	RMZ 16/360°
Order number	11009028	11009029
Net weight	1.162 kg	1.247 kg
Max. payload, radial	*1200 N	*1200 N
Max. payload, axial	*800 N	*800 N
Air consumption (180°)	0.055 NL	0.071 NL
Angle of rotation	0-360 °	0-360 °
Min. rotation time 90°	0.16 s	0.16 s
Min. rotation time 180°	0.3 s	0.3 s
Noise level	58 dB (A)	58 dB (A)
Angle accuracy	0.1 °	0.1 °
Torque	0.6 Nm	0.6 Nm
Positions	2	4
Mounting position		

The technical data refer to a nominal pressure of 6 bar under Afag standard test conditions.
 Note: Rm 16 is supplied without shock absorbers, RM 16-SD is supplied with shock absorbers.
 The module can be operated with lubricated or dry air.
 Cleanroom class ISO 14644-1, class ISO 7

* Observe rotation time diagram

Included in the delivery (Catalogue HT accessories)

- 2x Centering bushing Ø9x4
- 2x Stop screw AS 08/40
- 1x Key 5x5x10
- 2x Shock absorber SD M8x1 -3
- 2x Cylinder, intermediate position RMZ 16/360°

Accessories

- Clamping support RM 16/RM 25 [p. 96]
(Catalogue HT accessories)
- INI d6.5x44-Sn1.5-PNP-NO-M8x1

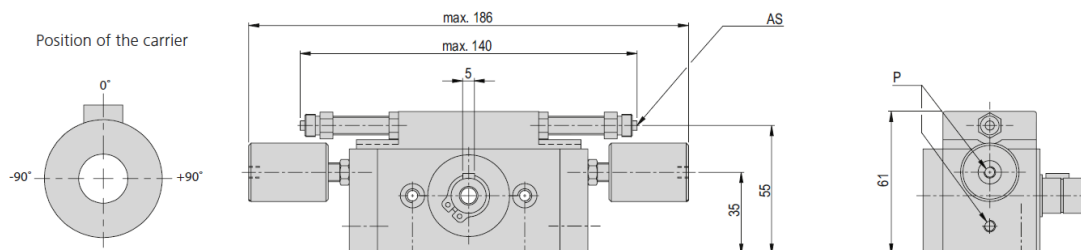
Alternative accessories (Catalogue HT accessories)

- INI 8x8x38.5-Sn1.5-PNP-NO-M8x1

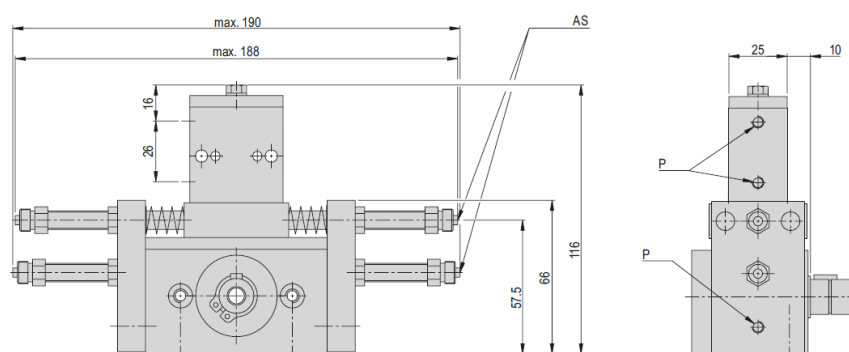
Fig. 7 Table technical data RM 16 / 360°

3.2.5 Dimensional drawing RMZ 16

Type	RMZ 16	RMZ 16/2
P	M5	M5



RMZ 16 with 2 cylinders intermediate position (not monitored)



RMZ 16/2 with 2 cylinders intermediate position (monitored)

Fig. 8 *Dimensional drawing - Rotary module RMZ 16*

3.2.6 Technical data RMZ 16

RMZ 16		
Attachment grid	48 mm	
Attachment thread	M6	
Operating pressure	6 +/- 2 bar	
Air connection P	M5	
Operating temperature	0 - 50 °C	
Storage temperature	0 - 50 °C	
Humidity	< 90 %	
Medium filtered compressed air	10 - 40 µm	

Type	RMZ 16	RMZ 16/2
Order number	11001699	11001700
Net weight	0.913 kg	1.21 kg
Max. payload, radial	*1200 N	*1200 N
Max. payload, axial	*800 N	*800 N
Air consumption (180°)	0.048 NL	0.048 NL
Angle of rotation	0-180 °	0-180 °
Min. rotation time 90°	0.16 s	0.16 s
Min. rotation time 180°	0.3 s	0.3 s
Noise level	58 dB (A)	58 dB (A)
Angle accuracy	0.1 °	0.1 °
Torque	0.6 Nm	0.6 Nm
Positions	4	4
Mounting position	↔	↔

The technical data refer to a nominal pressure of 6 bar under Afag standard test conditions.
 Note: Rm 16 is supplied without shock absorbers, RM 16-SD is supplied with shock absorbers.
 The module can be operated with lubricated or dry air.
 Cleanroom class ISO 14644-1, class ISO 7

*Observe rotation time diagram

Included in the delivery (Catalogue HT accessories)

- 2x Centering bushing Ø9x4
- 2x Stop screw AS 08/40
- 1x Key 5x5x10
- 2x Shock absorber SD M8x1 -3

Accessories

- Torque amplifier RM 16 [p. 94]
 - Cylinder, intermediate position RM 16 [p. 94]
 - Cylinder, intermediate position RMZ 16/360° [p. 94]
 - Accessories intermediate position RM 16 [p. 95]
 - Accessories shock absorber RM 16 [p. 95]
 - Clamping support RM 16/RM 25 [p. 96]
- (Catalogue HT accessories)
- INI d6.5x44-Sn1.5-PNP-NO-M8x1

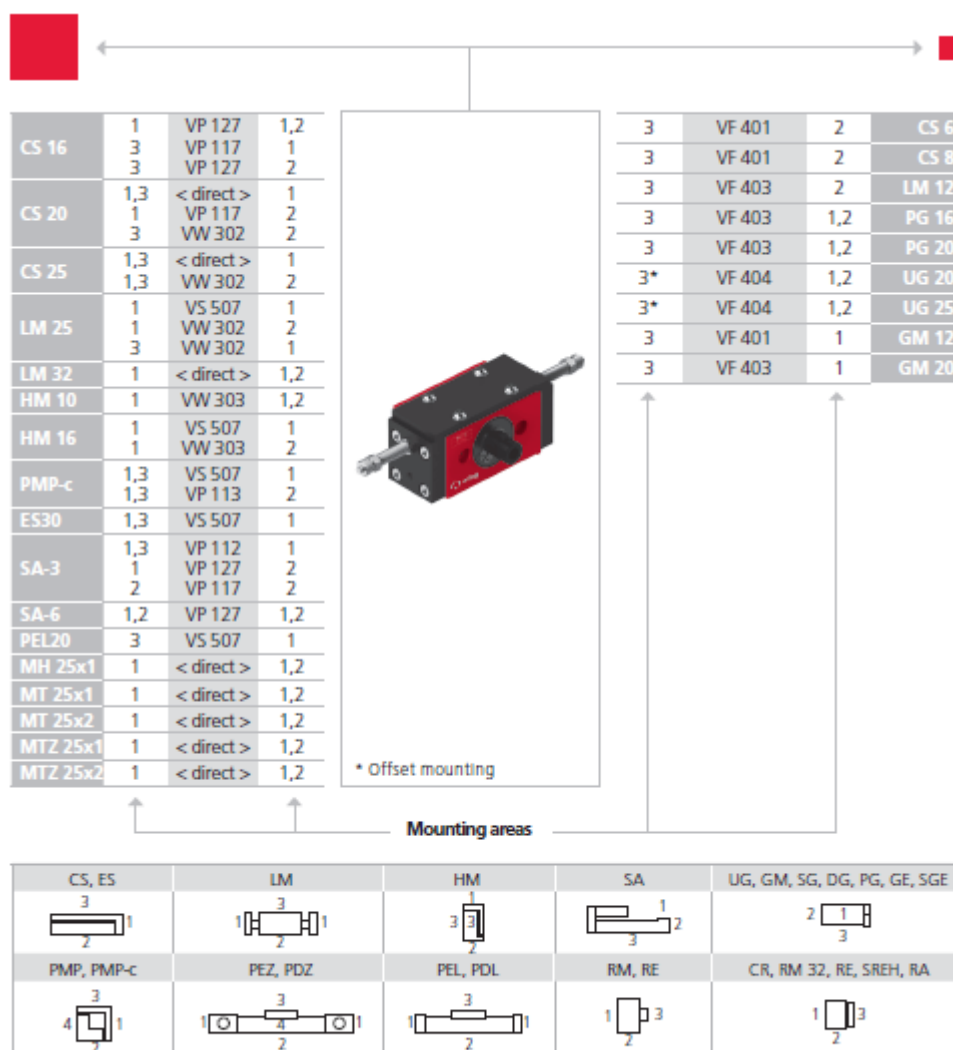
Alternative accessories

- (Catalogue HT accessories)
- INI 8x8xx38.5-Sn1.5-PNP-NO-M8x1

Fig. 9

Table technical data RMZ 16

3.2.7 Preferred combinations RM 16



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.

3.2.8 Module loads RM 16

Rotation time diagrams

Rotation time

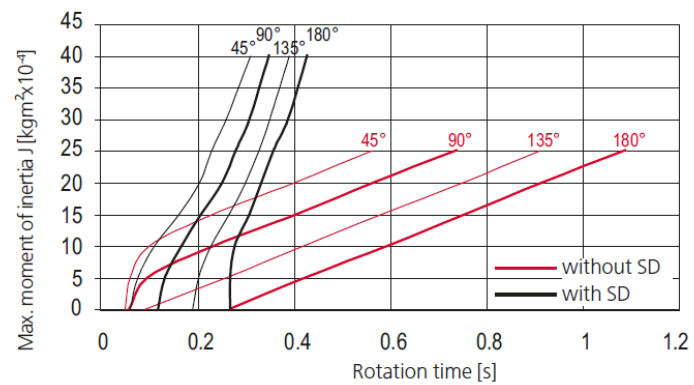


Fig. 10 Swivel time diagram RM 16

4 Transport, packaging and storage

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

4.1 Safety instructions for transport

CAUTION



Danger of injury when unpacking the rotary modules!

The rotary modules 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.

- Carefully unpack the rotary modules.



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

4.2 Scope of supply

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

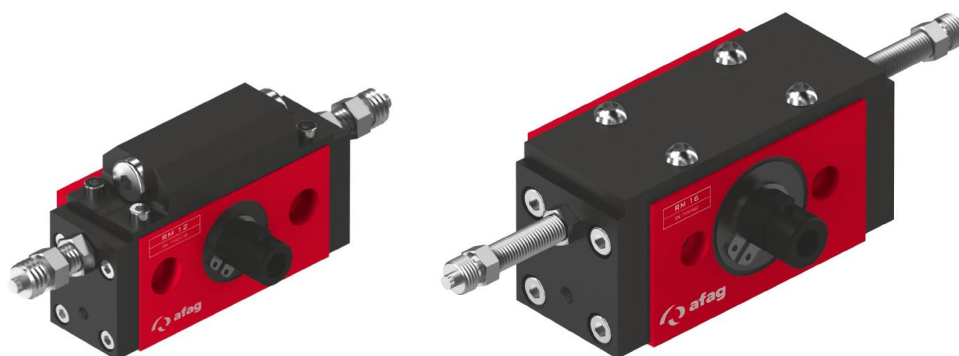


Fig. 11 Scope of delivery rotary modules RM 12 / RM 16

[Unt]	RM 12	[Unt]	RM 16
1 x	Module RM 12	1 x	Module RM 16
2 x	Centering bushing Ø9x4 mm	2 x	Centering bushing Ø9x4 mm
1 x	Key for shaft	1 x	Key for shaft
1 x	Assembly & operat. instructions	1 x	Assembly & operating instructions

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 rotary modules 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 rotary modules are stored for an extended period of time, observe the following:

- Do not store the rotary modules 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 rotary modules and protect the blank metal parts against corrosion using the appropriate means.
- Protect the rotary modules from dirt and dust.

5 Design and description

This chapter provides an overview of the rotary modules RM 12, RM 16 and of the variant' structure and functioning.

5.1 Construction rotary modules

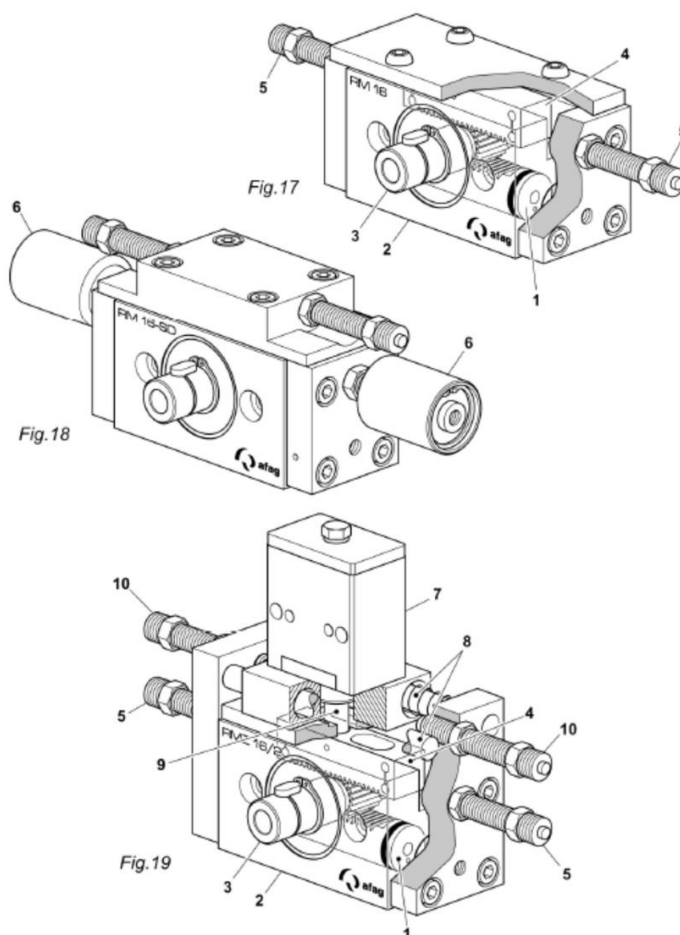


Fig. 12 Structure of the rotary module RM

- | | |
|-----------------|-------------------------------|
| 1. Piston | 6. Intermediate pos. piston |
| 2. Housing | 7. Intermediate pos. cylinder |
| 3. Pinion shaft | 8. Longitudinal guide |
| 4. Rack | 9. Index |
| 5. Stop screw | 10. Stop screw |

5.2 Product description

Rotary module series 12

The RM 12 rotary module is a pneumatically driven module for rotating small loads in confined spaces.

With torques of maximum 0.3 Nm, loads can be rotated from 0-180° - depending on the variant also with intermediate positions. The end positions can be finely adjusted as required over the entire stroke range using stop screws. The rotary module of the series 12 is available in three variants:

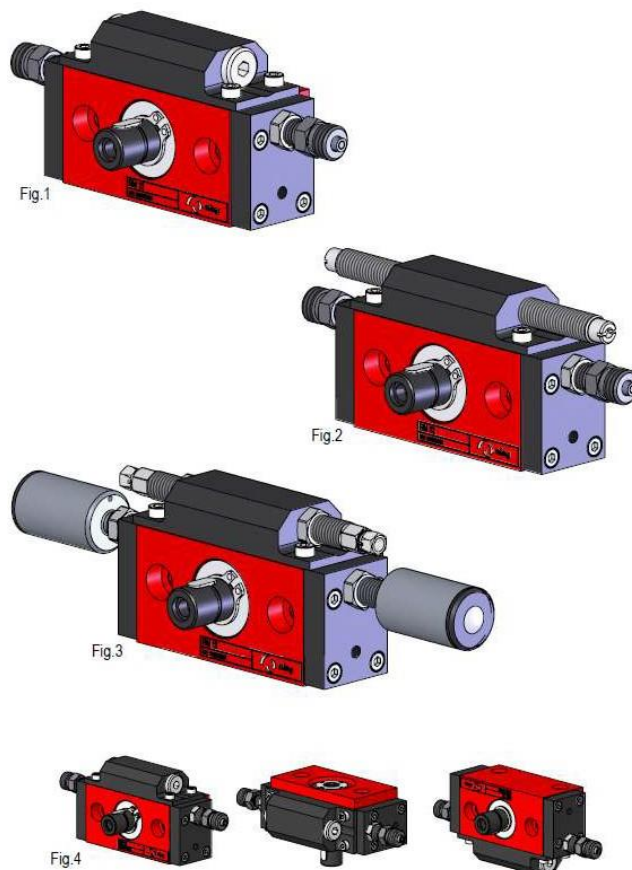


Fig. 13 Three variants of the RM 12

RM 12

180° module with two stop screws, end positions undamped. For the standard application (**Fig.1**).

RM 12-SD

180° module with end position shock absorbers. For applications with fast cycle times and larger masses (**Fig.2**).

RMZ 12

180° module with two additional not monitored intermediate positions. For the exclusive application in the tightest of spaces (**Fig.3**).

The RM can be combined with the entire Afag range in any position (example RM 12, **Fig.4**).

Rotary module series 16

The RM 16 module is designed for medium loads. With torques of max. 0.6 Nm, loads can be rotated from 0-180° or 360°. The rotary module of the series 16 is available in six variants:

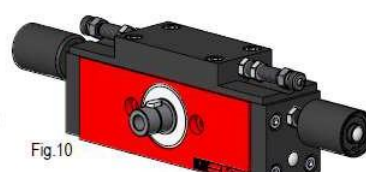
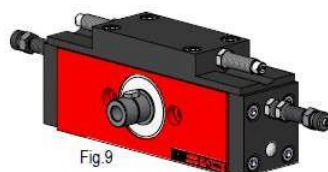
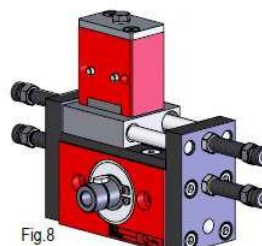
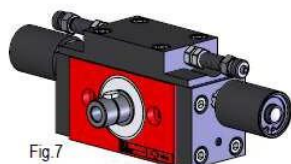
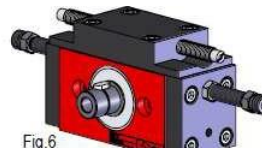


Fig. 14 Three variants of the RM 16

RM 16

180° module with two stop screws, end positions undamped (**Fig.5**).

RM 16-SD

180° module with end position shock absorbers (**Fig.6**).

RMZ 16

180° module with two additional not monitored intermediate positions (**Fig.7**).

RMZ 16/2

180° module with two additional monitored intermediate positions (**Fig.8**)

RM 16-SD/360°

360° module with end position shock absorbers (**Fig.9**).

RMZ 16/360°

360° module with two additional not monitored intermediate positions (**Fig.10**).

5.3 Functional description

The RM are pneumatically operated devices for rotary movements from 0 to 180° or from 0 to 360°.

A double-acting piston (1) inside the housing (2) drives a pinion shaft (3) with ball bearings. The pinion shaft moves a rack (4) back and forth. The stroke of the rack and thus the angle of rotation of the pinion shaft can be limited with two stop screws (5) (Fig.17).

In the rotary modules with an intermediate position, the stroke of the rack is limited by two intermediate position pistons (6) (Fig. 18).

On the rotary module RMZ 16-2 with two intermediate positions, an intermediate position cylinder (7) is additionally mounted above the housing on a longitudinal guide (8). Its index (9) engages with the rack (4) when actuated and is carried along by it in a horizontal line. The stroke limit of the intermediate position cylinder is adjusted with a second pair of stop screws (10) (Fig.19).

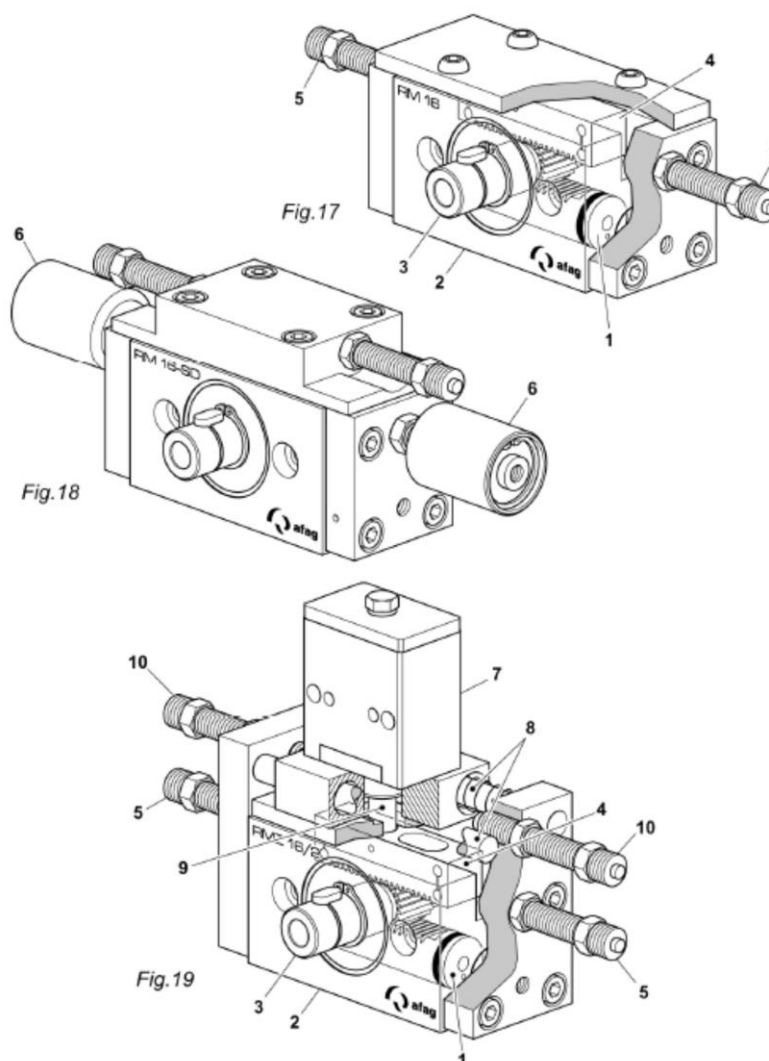
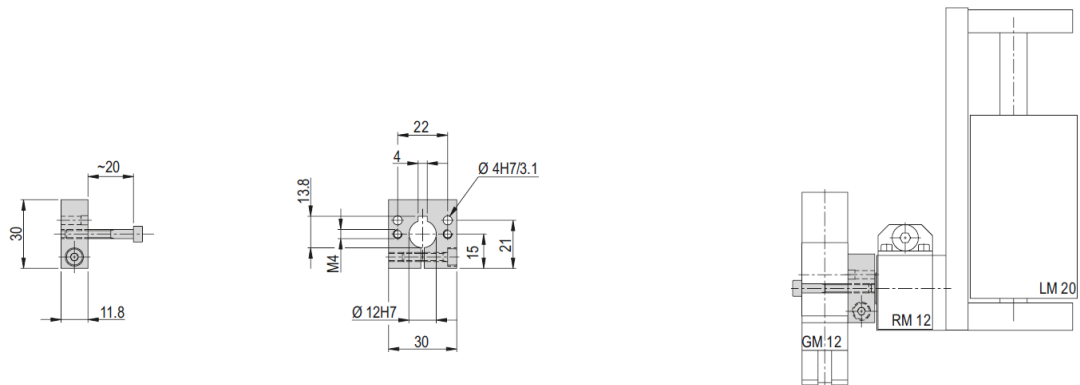


Fig. 15 Rotary module

5.4 Accessories

5.4.1 Accessories rotary module RM 12

Rotation flange RM 12	RM 12
Order number	11001824
Net weight	0.033 kg
Suitable for	RM 12 RM 12-SD RMZ 12



Note: Recommendation for new constructions: Use VF 400.

Cylinder intermediate position RMZ 12	RMZ 12
Order number	11017147
Stroke H	11 mm
Net weight	0.025 kg
Suitable for	RMZ 12
P	M5
SW	10 mm

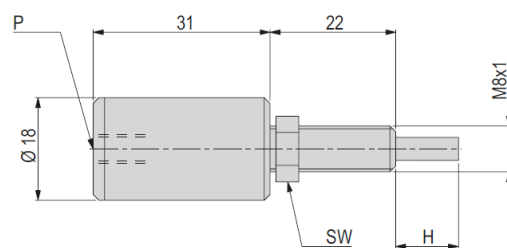
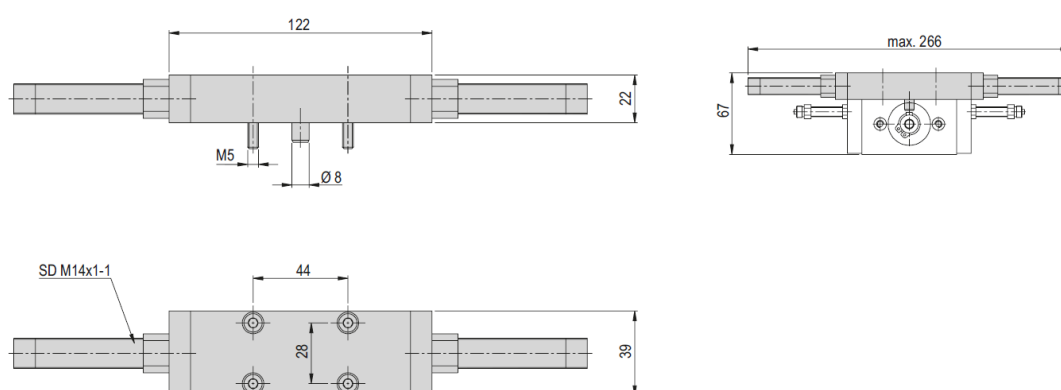


Fig. 16 Rotating flange RM 12 and intermediate position cylinder RMZ 12

5.4.2 Accessories rotary module RM 16

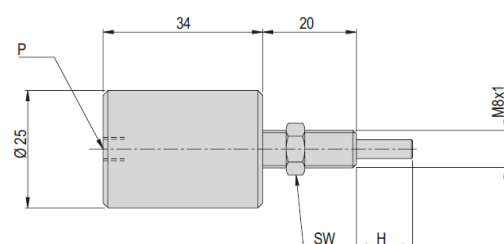
Torque amplifier RM 16 to increase torque	RM 16
Order number	11001676
Net weight	0.39 kg
Torque	1.4 Nm
Suitable for	RM 16 RM 16-SD RMZ 16



Included in the delivery
(Catalogue HT accessories)

- 2x Shock absorber SD M14x1 -1

Cylinder, intermediate position RM 16 RMZ 16	
Order number	11001670
Stroke H	12 mm
Net weight	0.044 kg
Suitable for	RMZ 16
P	M5
SW	10 mm



Cylinder intermediate position RMZ 16/360°	RMZ 16/360°
Order number	11015776
Stroke H	26,8 mm
Net weight	0.052 kg
Suitable for	RMZ 16/360°
P	M5
SW	10 mm

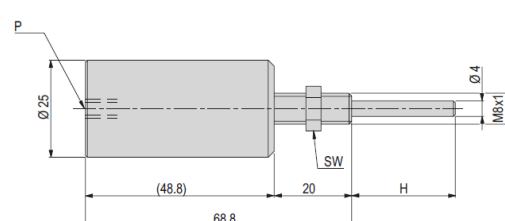
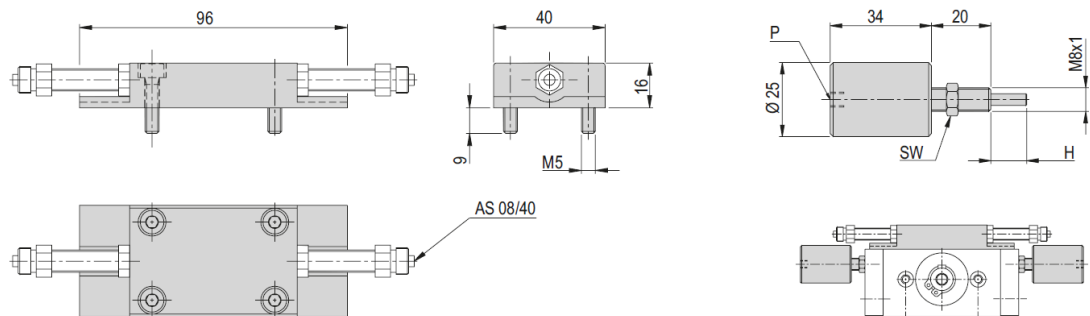


Fig. 17 RM 16 additional cylinder & RM 16/RMZ16 360° intermediate pos. cylinder

Accessories intermediate position RM 16	RM 16
Order number	11001680
Stroke H	12 mm
Net weight	0.21 kg
Suitable for	RM 16
P	M5
SW	10 mm



Included in the delivery

(Catalogue HT accessories)

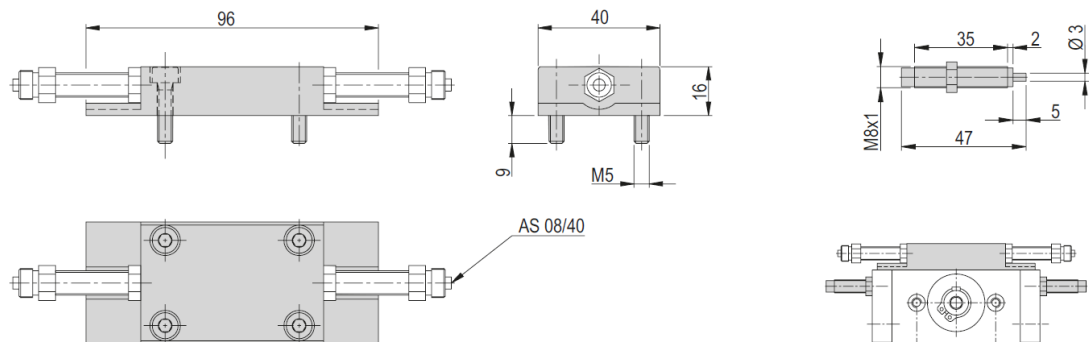
- 2x Cylinder, intermediate position RM 16

Accessories

(Catalogue HT accessories)

- Stop screw AS 08/40

Accessories shock absorber RM 16	RM 16
Order number	11001683
Net weight	0.15 kg
Suitable for	RM 16



Included in the delivery

(Catalogue HT accessories)

- 2x Shock absorber SD M8x1 -3

Accessories

(Catalogue HT accessories)

- Stop screw AS 08/40

Fig. 18 Removal kit intermediate pos. RM 16 & removal kit shock absorber RM 16

Design and description

Shock absorber SD M8x1 -2

Order number	11004990
Net weight	0.016 kg
Max. energy input/stroke	3 Nm
Max. energy input/s	5 650 Nm
Suitable for	LM 12, LM 16 RM 12 GMQ 12, GMQ 20, GMQ 32

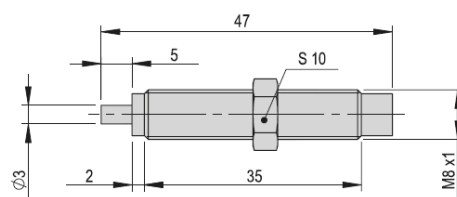
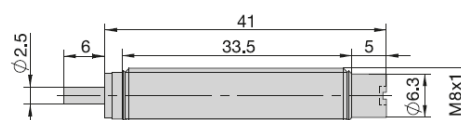


Fig. 19 Shock absorber

Shock absorber SD M8x1 -3

Order number	50041089
Net weight	0.011 kg
Max. energy input/stroke	3 Nm
Max. energy input/s	5 650 Nm
Suitable for	RM 16



AS 08/25	AS 08/40
11004991	11004992
0.02 kg	0.02 kg
+/- 0.01 mm	+/- 0.01 mm
RM 12 LM 12, LM 16, LM 20	RM 16, RM 25 LM 12, LM 16, LM 20, LM 25 PMP-c
M8 x 1 mm	M8 x 1 mm
5.5 mm	5.5 mm
42 mm	57 mm
25 mm	40 mm
3 mm	3 mm
1 mm	1 mm
10 mm	10 mm
10 mm	10 mm

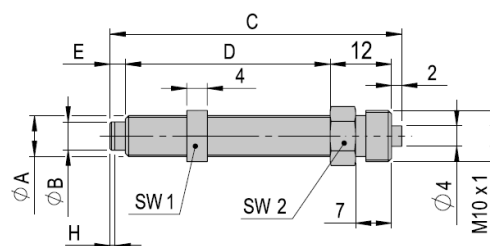


Fig. 20 AS adjustment stop screws

INI d6.5x44-Sn1.5-PNP-NO-M8x1

Order number	11005439
Net weight	0.005 kg
Operating voltage	10 - 30 VDC
Switching distance	1.5 mm

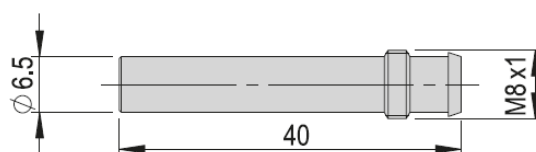


Fig. 21 Initiators

6 Installation, assembly & setting

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

6.1 Safety Instructions for Installation & assembly

CAUTION



Danger of injury when connecting the rotary modules to the control unit and the compressed-air system!

When connecting the rotary modules to the control unit or the compressed-air system sudden, unpredictable movements may occur which can cause personal injury or property damage.

- The connecting work may only be carried out by qualified personnel!
- Read carefully the assembly and safety instructions before working with or on the rotary modules.

CAUTION



Danger of injury when handling the rotary modules!

Careless handling of the rotary modules can cause personal injuries and damage to the rotary modules.

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

NOTICE

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



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

6.2 Installation & assembly

6.2.1 Assembly & attachment



The rotary modules RM 12 and RM 16 can be mounted both in horizontal and vertical position.

The RMZ 16, RMZ 16/360° and RMZ 16/2 rotary modules can only be installed in a horizontal position.

Attachment options

There are three different mounting options for each rotary module: from the front, from the back and from below.

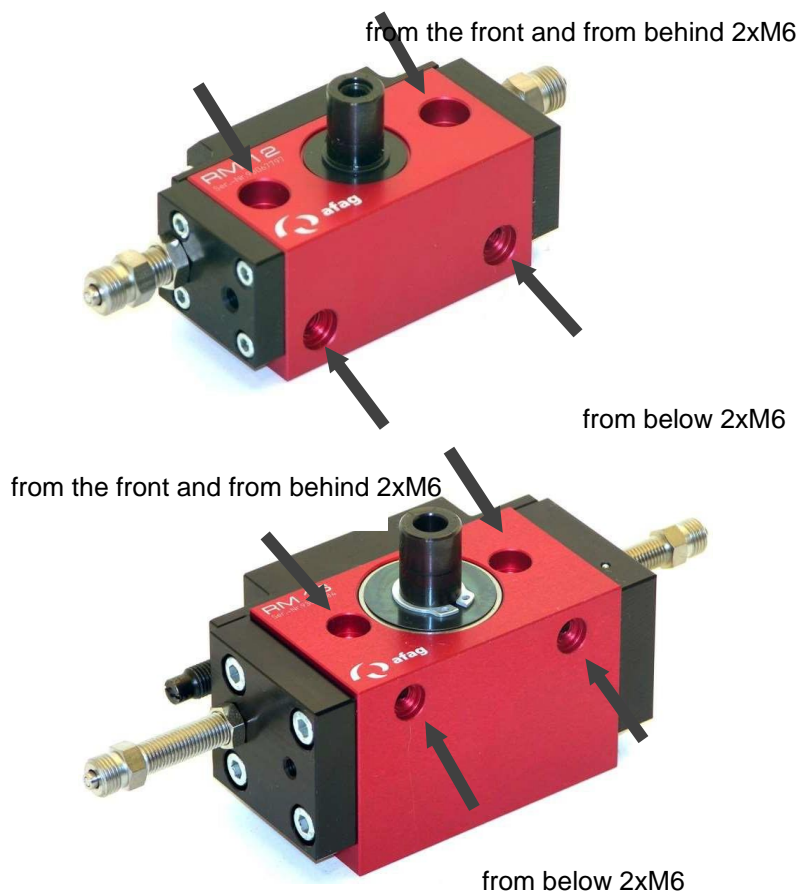


Fig. 22 Attachment options rotary modules

6.2.2 Module centering

In order to ensure high and repetitive accuracy of fit during assembling, operation and exchanging of a module, the components of the Afag modules are provided with a precise module centering unit.

Centring bushing and hole grid

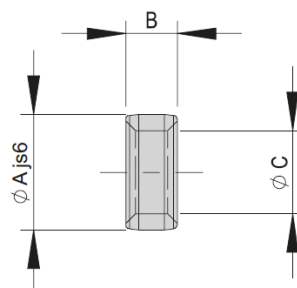
Designation	RM12	RM 16
Hole grid	48mm	48 mm (30)
Thread/Bore	2 x M6	2 x M6
Centering bushing (H7)	9x4 mm	9x4 mm



Use the supplied centering bushings to position the rotary modules. Insert the centering bushings in two diagonally opposite holes of the attachment grid.

The dimensions of the mounting holes and the distances between holes are indicated in the dimensional drawings in chap. 3 „Technical Data“.

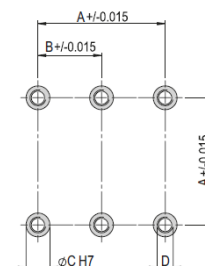
Centering bushings	Ø4x2	Ø5x2.5	Ø7x3	Ø8x3.5	Ø9x4	Ø12x4.8	Ø19x5.8
Order number	50332257	50035831	11016850	50263565	11004942	50187424	50189497
Net weight	0.001 kg	0.001 kg	0.001 kg	0.001 kg	0.001 kg	0.002 kg	0.006 kg
A	4 mm	5 mm	7 mm	8 mm	9 mm	12 mm	19 mm
B	2 mm	2.5 mm	3 mm	3.5 mm	4 mm	4.8 mm	5.8 mm
C	2.6 mm	3.2 mm	4.3 mm	5.4 mm	6.5 mm	8.5 mm	13 mm



Attachment grid	16x16 mm	20x20 mm	30x30 mm	38x38 mm	48x48 mm	60x60 mm	75x75 mm	96x96 mm
A	16 mm	20 mm	30 mm	38 mm	48 mm	60 mm	75 mm	96 mm
B	8 mm	10 mm	15 mm	19 mm	24 mm	30 mm	35 mm	48 mm
C	4x1.1 mm	5x1.3 mm	7x1.6 mm	8x1.8 mm	9x2.1 mm	12x2.5 mm	15x2.7 mm	19x3 mm
D	M2.5	M3	M4	M5	M6	M8	M10	M12

Module-centering, centering bushings

In order to guarantee a high and repetitive fit accuracy during installation, operation or replacement of a module, all components of the entire program are consequently provided with a precise module centering. Centering bushings or pins are supplied as standard with each module.



6.2.3 Tightening torques for screws

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
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

6.2.4 Connection to the pneumatic system

WARNING



Danger when connecting to pneumatics!

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.

NOTICE

Functional impairment to leaking compressed air connections!

Unused air connections that are not hermetically sealed lead to a pressure loss and thus to functional impairment.

- Before installing the module in a system, all unused compressed air connections must hermetically sealed.
- Perform a leak test!



When connecting the compressed air supply for the first time, make sure that all compressed air throttles are closed.

Vent the system slowly!



The minimum compressed air quality shall comply with the specifications of ISO 8573-1:2010.

Pneumatic connections rotary module RM 12

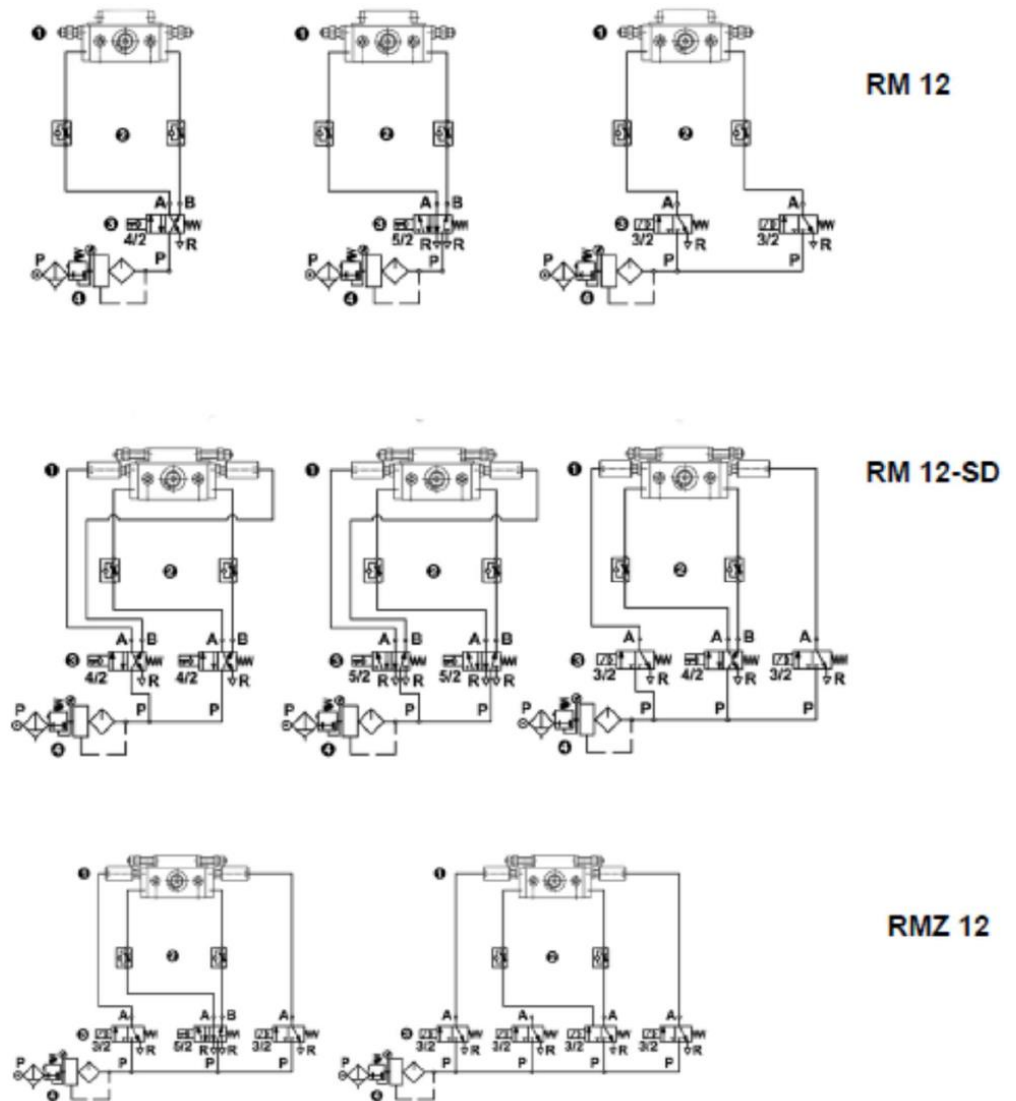


Fig. 23 Pneumatic circuit diagram rotary module RM 12

- | | |
|-------------------------------------|------------------------------|
| 1. Module | 4. Maintenance unit |
| 2. Throttle check valve | P. Compressed air connection |
| 3. Directional valve (standard 5/2) | |

Pneumatic connections rotary module RM 16

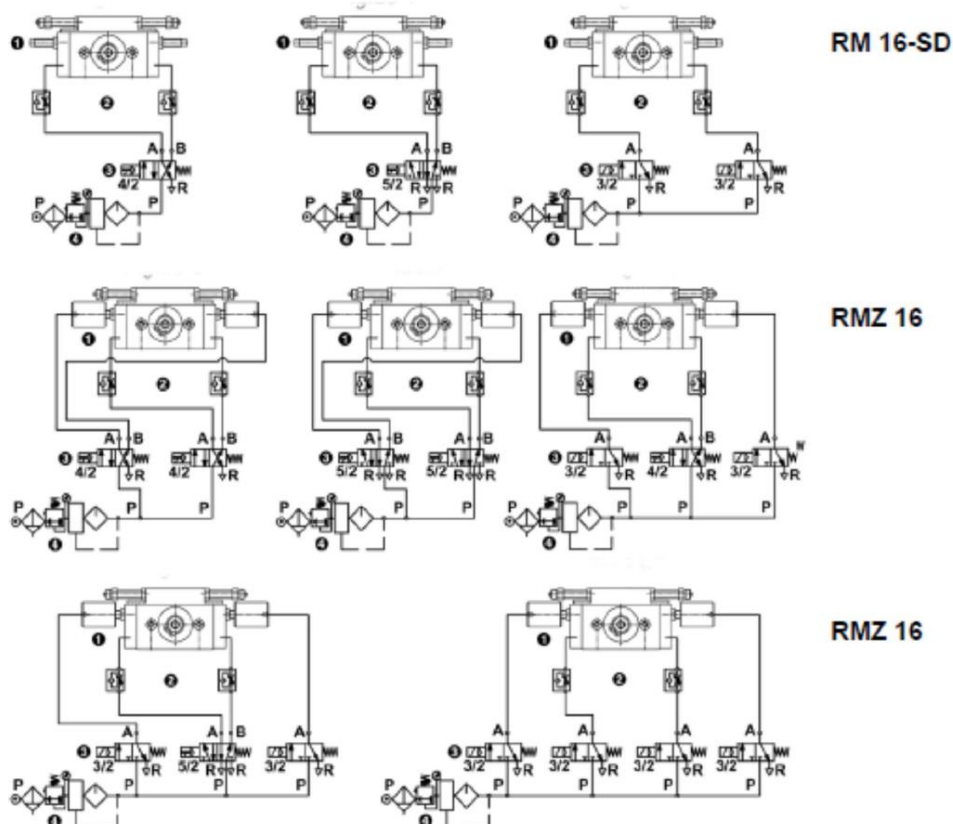


Fig. 24 Pneumatic circuit diagram rotary module RM 16

- | | |
|-------------------------------------|------------------------------|
| 1. Module | 4. Maintenance unit |
| 2. Throttle check valve | P. Compressed air connection |
| 3. Directional valve (standard 5/2) | |

Pneumatic connections rotary module RMZ 16/2

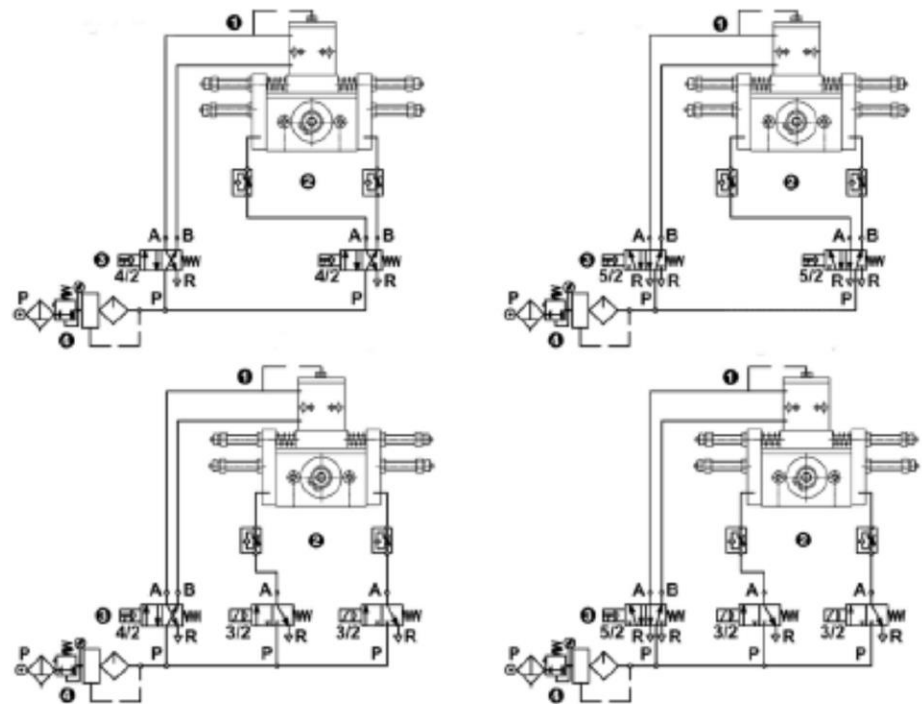


Fig. 25 Pneumatic circuit diagram rotary module RM 16

- | | |
|-------------------------------------|------------------------------|
| 1. Module | 4. Maintenance unit |
| 2. Throttle check valve | P. Compressed air connection |
| 3. Directional valve (standard 5/2) | |

6.2.5 Mounting the initiators

6.5 mm or 8x8 mm plug-in and screw-in proximity switches with proximity switch holder are used for end position sensing of the rotary modules. The initiators and initiator holders are not included in the scope of delivery of the rotary modules!

WARNING



Danger - Do not use in unsuitable environment !

The initiators are designed for use in **non** explosive atmospheres.

- Do **not** use the initiators in potentially explosive atmospheres!



Depending on the control type, the switching type PNP or NPN of the initiators must be determined (fig. below).

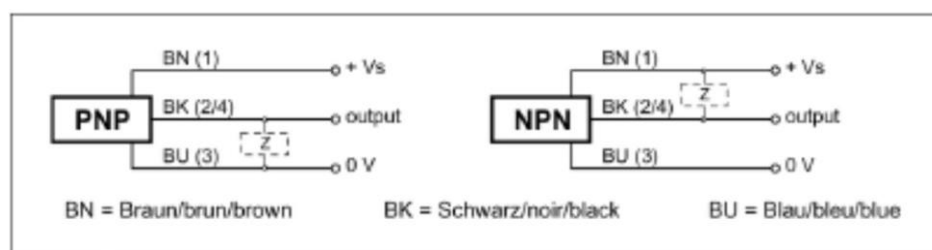


Fig. 26 Determining the switching type depending on the control type

Technical data	
Operating voltage range	10-30 VDC
Switching distance:	1.5mm
Type	Short circuit and reverse polarity protected

Assembly process



The proximity switches can only be used with the stop screws of the AS series!

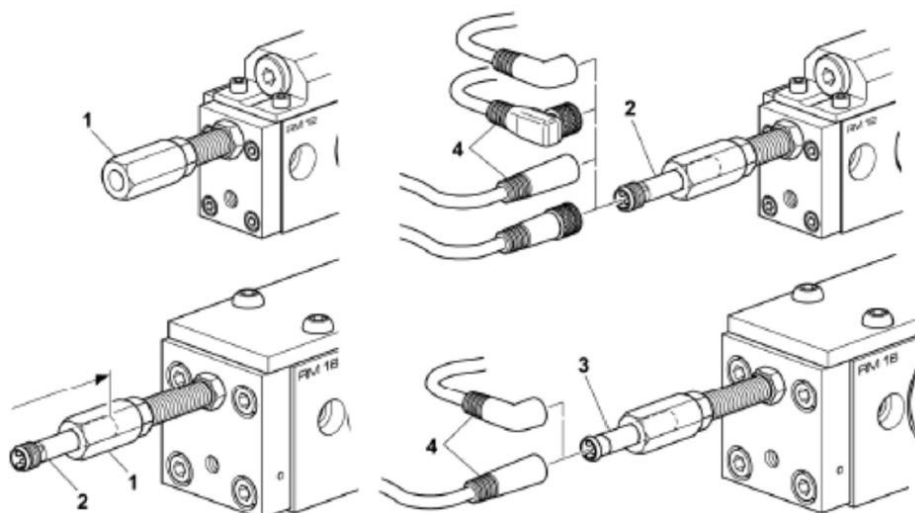


Fig. 27 Mounting the proximity switches (6.5 mm)

Initiator 6.5 mm

To install the 6.5 mm proximity switch, proceed as follows:

1. Screw the initiator holder (1) onto the stop screw.
2. Insert the initiator (2,3) into the initiator holder as far as it will go.
3. Slightly tighten the initiator holder (1).
4. Mount the connector (4).
5. Carry out function check
 - ⇒ The initiator is mounted.

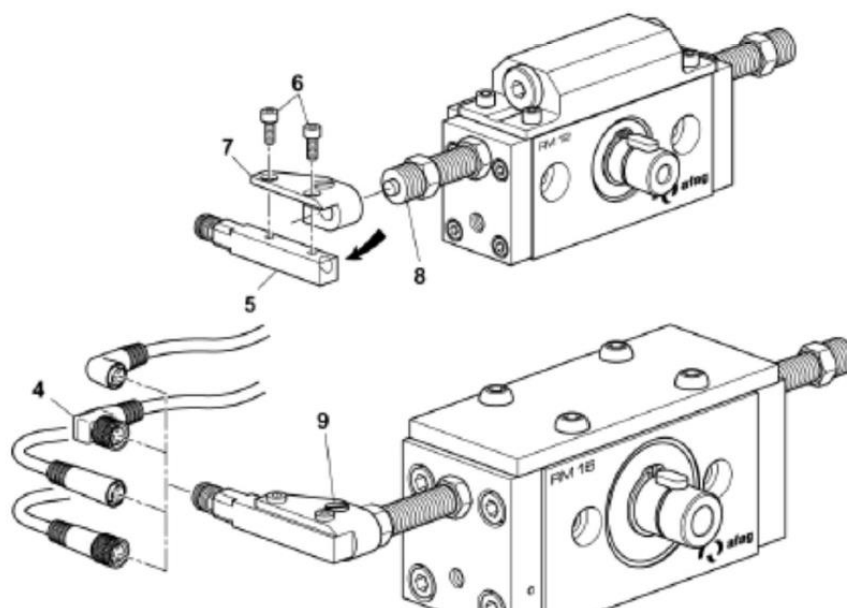


Fig. 28 Mounting the proximity switches (8x8 mm)

Initiator 8x8 mm

To install the 8x8 mm initiator, proceed as follows:

1. Screw the initiator (5) onto the initiator holder (7) with screws (6).
 - The switching point of the initiator must cover the hole of the initiator holder (see arrow)
2. Push the initiator holder (7) with initiator (5) onto the stop screw (8) as far as it will go and clamp it with screw (9).
3. Mount the connector (4).
4. Carry out function check
 - ⇒ The initiator is mounted.

6.3 Settings

This chapter contains information on the adjustment work to be carried out on the rotary modules.

NOTICE

No liability can be assumed for damages caused by accordance work carried out on the modules on the part of the operator.

6.3.1 Safety notes for settings

WARNING



Risk of injuries due to uncontrolled movements!

Uncontrolled movements of parts can cause injury to third parties and damage to property.

- Ensure that there are no persons in the working area of the modules.

CAUTION



Danger of injury from uncontrolled restarting of the system/equipment!

Unintentional restarting of the controller or the pneumatic system can cause injuries and material damage.

- When working on the modules, make sure that the controller and the pneumatic system are switched off and secured against being switched on again.

CAUTION




Danger arising from work carried out improperly!

Improper adjustment work can cause injuries and damage to property.

- Adjustment and conversion work may only be carried out by qualified personnel!



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

6.3.2 Adjust RM 12, RM 16

The rotation angle of the rotary modules can be adjusted between 0° and 180° with the stop screws.



For end position sensing, the stop screws AS 08/25 and AS 08/40 can be combined with a proximity switch holder and a 6.5 mm proximity switch or with an angled proximity switch holder and an 8x8 mm proximity switch.

Example of setting a 160° angle of rotation on the RM 16

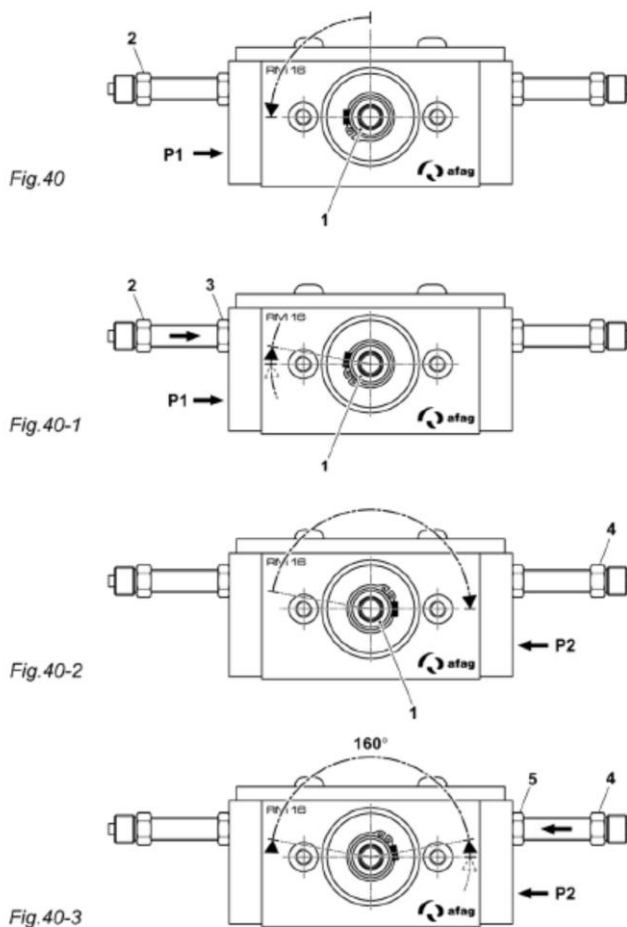


Fig. 29 Setting the angle of rotation

To set a 160° rotation angle on the RM 16, proceed as follows:

1. Compressed air at (P1).
 - The pinion shaft (1) rotates anticlockwise until it is limited by the stop screw (2) (Fig. 40).
2. Screw in the left stop screw (2).
 - Pinion shaft (1) rotates clockwise.
3. Fine-adjust the stop screw (1 turn = 1 mm travel) until the pinion shaft has turned to the desired position.
4. Secure the stop screw with the lock nut (3) (Fig. 40-1).
5. Release compressed air at (P1) and give it to (P2).
 - The pinion shaft (1) rotates clockwise until it is limited by the stop screw (4) (Fig. 40-2).
6. Screw in the right stop screw (4).
 - The pinion shaft (1) rotates anticlockwise.
7. Fine-adjust the stop screw until the pinion shaft has rotate to the desired position.
8. Secure stop screw with lock nut (5) (Fig. 40-3).
 - ⇒ The angle of rotation is set.

6.3.3 Adjusting the shock absorber

For handling delicate parts, the rotation angle of the rotary module can be braked against the stop screws by means of shock absorbers.

NOTICE

Risk of damage to property!

The shock absorbers must not be used as a stop as they can be damaged.

- The limitation of the angle of rotation must be done by the stop screws (2,6).
- The angle of rotation must not be limited by the shock absorbers (3, 7)!

Adjustment of the shock absorber using the RM 16 as an example:

Stossdämpfer einstellen

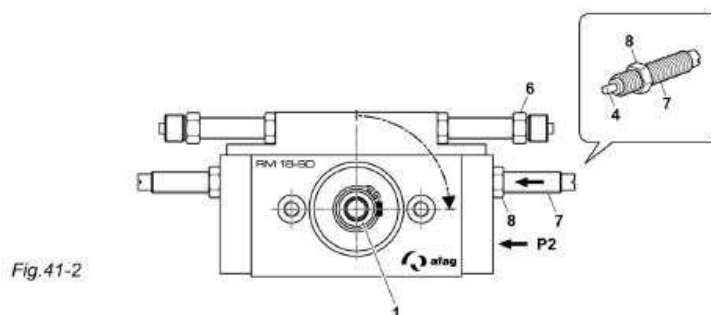
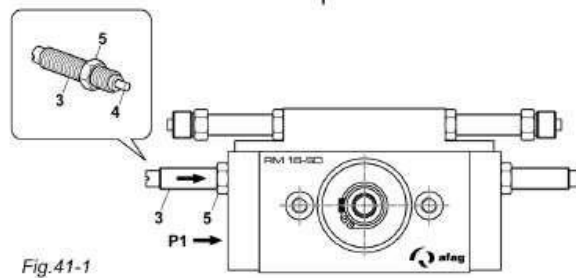
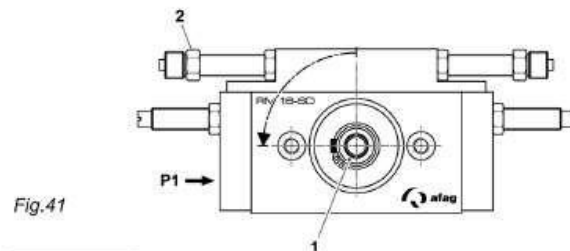


Fig. 30 Adjustment of shock absorber

To set of the shock absorbers on RM 16, proceed as follows:

1. Set the angle of rotation according to (Fig. 40-3).
2. Compressed air at (P1).
 - The pinion shaft (1) rotates anticlockwise until it is limited by the stop screw (2) (Fig. 41).
3. Screw in the left shock absorber (3) clockwise as far as it will go.
 - The shock absorber pin (4) is pressed into the shock absorber.

4. Unscrew the shock absorber anticlockwise by one turn.
 - 1 turn = 1 mm.
5. Secure shock absorber with lock nut (5) (Fig. 41-1).
6. Release compressed air at (P1) and give it to (P2).
 - The pinion shaft (1) rotates clockwise until it is limited by stop screw (6).
7. Adjust the right shock absorber (7) according to chapter 6.3.3 .
8. Secure shock absorber with lock nut (8) (Fig. 41-2).
 - ⇒ The shock absorber is set.

6.3.4 Setting of intermediate positions

(A) Intermediate positions not monitored

With the RMZ 12/RMZ 16 rotary module, in addition to the usual rotation angle of 0° - 180°, it is possible to set a further, freely adjustable rotation angle of 10 to 170° with the aid of intermediate position cylinders.

Adjustment of intermediate position pistons using the RMZ 16 as example:

Zwischenposition einstellen

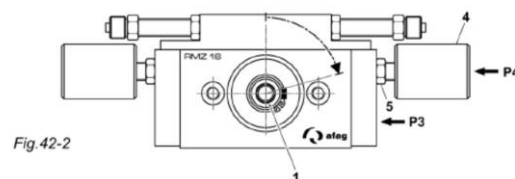
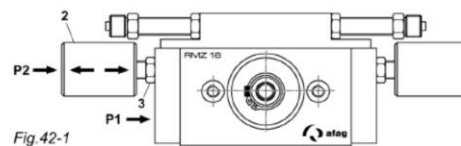
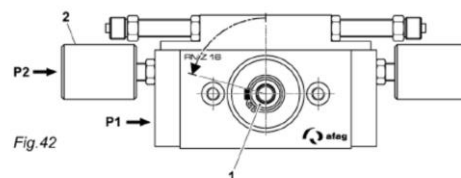


Fig. 31 Setting intermediate position (cannot be monitored)

Procedure:

1. Set the angle of rotation as described in chap. 6.3.2.
2. Compressed air at (P1) and (P2).
 - The pinion shaft (1) rotates anticlockwise until limited by the stop given by the intermediate position cylinder (2) (Fig. 42).
3. Move the intermediate position cylinder (2) to the desired position by screwing it in or out and secure it with the lock nut (3) (Fig. 42-1).
4. Switch off compressed air at (P1) and (P2).

5. Compressed air at (P3) and (P4).
 - The pinion shaft (1) rotates clockwise until limited by the stop given by the intermediate position cylinder (4) (Fig. 42-2).
6. Adjust intermediate position cylinder (4) according to point 3 and secure with lock nut (5).
 - ⇒ The intermediate position on RMZ 16 is set.

(A) Intermediate positions can be monitored

With the RMZ 16/2 rotary module, in addition to the usual rotation angle of 0° - 180°, it is possible to set two further, freely adjustable rotation angle of 10 to 140° with the aid of intermediate position cylinders.

Adjustment of the intermediate position cylinder using the RMZ 16/2 as an example:

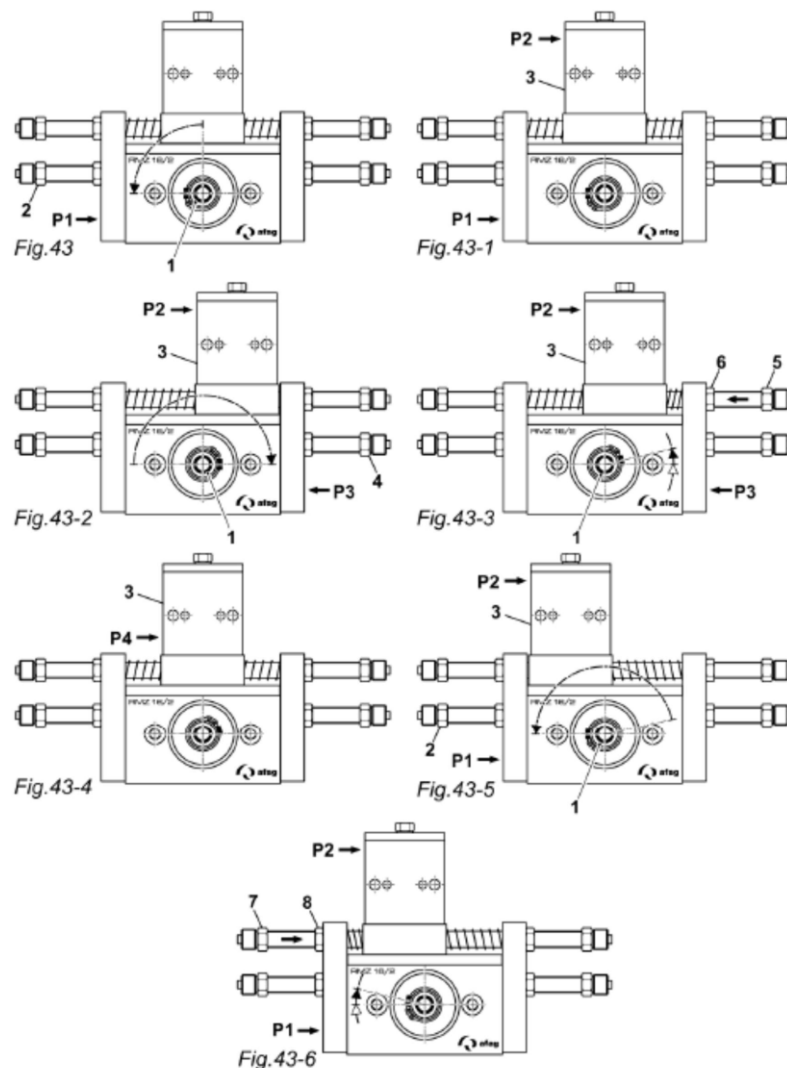


Fig. 32 Setting intermediate position (can be monitored)

Procedure:

1. Set the angle of rotation as described in chap. 6.3.2
2. Compressed air at (P1).
 - The pinion shaft (1) rotates anticlockwise until it is limited by the stop screw (2) (Fig. 43).
3. Compressed air at (P2).
 - The intermediate position cylinder (3) is coupled to the RM (fig. 43.1).
4. Release compressed air at (P1) and give it to (P3).
 - The pinion shaft (1) rotates clockwise until it is limited by the the stop screw (4).
 - The intermediate position cylinder (3) is guided to the right (fig. 43- 2).
5. Screw in the stop screw (5) clockwise.
 - The intermediate position cylinder (3) is shifted to the left.
 - The pinion shaft (1) is turned anticlockwise.
6. Adjust the stop screw (5) and secure it with lock nut (6) (Fig. 43-3).
7. Release compressed air at (P2) and activate it to (P4).
 - The intermediate position cylinder (3) is uncoupled and moves to the middle position (Fig. 43-4).
8. Activate compressed air on (P2) and then on (P1).
 - The intermediate position cylinder (3) is shifted to coupled to the left.
 - The pinion shaft (1) rotates anticlockwise until it is limited by the stop screw (2) (Fig. 43- 43).
9. Adjust the stop screw (7) and secure it with the lock nut (8) (Fig. 43-6).
 - ⇒ The intermediate position on RMZ 16/2 is set.

(B) Retrofitting additional cylinder to RM 16



The torque on the RM 16 can be increased (1.4 Nm at 6 bar) by installing an additional cylinder (🔧 Chap. 5.4 Accessories).

This makes it possible to retrofit the rotary modules at any time.

This does not apply to the RMZ 16/360° and RM 16/SD/360° rotary modules.

Procedure:

1. Remove 2 black side plates on the RM 16
2. Replace with new side plates of the additional cylinder set.
 - ⇒ Retrofit completed.

7 Commissioning

7.1 Safety instructions for commissioning

CAUTION



Danger of injury by moving components!

Limbs can be crushed by moving components!

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

CAUTION



Danger of injury in the working area of the rotary modules!

During operation of the rotary modules, persons within the working area of the modules may be injured.

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



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

7.2 Commissioning of the modules



Before commissioning, adjust the shock absorbers and stop screws so that the desired angle of rotation is damped correctly.

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

1. Slowly ventilate the entire system.
 2. Note the permissible values of the rotary module (➡ chapter 3) for:
 - Payload
 - Movement frequency
 - mechanical stress
 3. Make sure that there are no persons or tools within the working area of the rotary module.
 4. Perform test run:
 - Start with slow traversing movements
 - Then continue under normal operating conditions.
- ⇒ Commissioning is completed.

8 Fault elimination

8.1 General Notes

This chapter contains general information and safety instructions for troubleshooting.

8.2 Safety instructions for troubleshooting

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.



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. Defective components must be replaced exclusively by Afag original spare parts.

Fault	Possible cause	Remedy:
Module does not rotate	<ul style="list-style-type: none"> ▪ No compressed air ▪ Module incorrectly connected to pneumatics 	<ul style="list-style-type: none"> ▪ Check connections ▪ Check connections
End position signal not clear	<ul style="list-style-type: none"> ▪ Limit stop screw incorrectly adjusted ▪ Initiator defect ▪ Cable break in sensor cable 	<ul style="list-style-type: none"> ▪ Readjust limit stop ▪ Replace initiator ▪ Replace proximity switch cable
Module hits the end positions	<ul style="list-style-type: none"> ▪ Shock absorber incorrect adjusted ▪ Shock absorber defective ▪ No shock absorber available ▪ Exhaust flow control defective ▪ Lifting speed too high ▪ Damping effect too low 	<ul style="list-style-type: none"> ▪ Readjust shock absorber ▪ Replace shock absorber ▪ Retrofitting of shock absorber ▪ Replace exhaust flow control ▪ Adjust exhaust flow control ▪ Provide/install external shock absorbers in construction
Initiator LED does not switch	<ul style="list-style-type: none"> ▪ Initiator defect 	<ul style="list-style-type: none"> ▪ Initiator must be replaced

9 Maintenance and repair

9.1 General notes

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



Each rotary module 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 rotary module.

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.

- 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 rotary modules!

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

- Before starting any work on the rotary modules, switch off the control unit and secure it from being switched on again. Observe the operating instructions of the controller used!
- Before starting any activities, switch off the media supply (pneumatics) and secure it from being switched on again!



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

9.3 Maintenance activities and maintenance intervals

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

9.3.1 Overview of the maintenance points

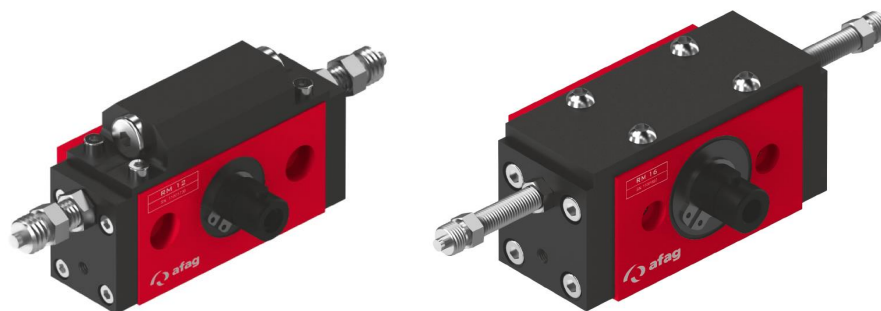






Fig. 33 Maintenance points rotary module

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Entire rotary module	Cleaning and checking 	As required	[Off]	- <ul style="list-style-type: none">▪ Clean the rotary module with a dry, lint-free cloth.- Do not spray rotary modules with water, do not use aggressive cleaning agents.▪ Perform a visual inspection of the rotary module.
2	Shock absorber*	Check functioning 	Monthly	[Off]	<ul style="list-style-type: none">▪ Check function of shock absorbers, replace if necessary
3	Stop screws	Check functioning 	Monthly	[Off]	- <ul style="list-style-type: none">▪ Check function of stop screws, replace if necessary
4	Rotary module	Check 	Monthly	[On]	- <ul style="list-style-type: none">▪ Check rotary module for unusual noise generation.



*Shock absorbers and stop screws must be checked regularly for correct function and replaced if necessary. We recommend replacing the shock absorbers after max. 5 million load cycles.

Incorrectly adjusted, missing or defective shock absorbers impair the function of the module and can lead to its destruction!

NOTICE

Risk of corrosion due to ionized air environment

If the rotary modules are used in an ionised air environment, there is a risk that exposed parts could corrode.

- Always grease exposed parts e.g. flanges, shafts, guides and jaws regularly.
- Afag standard lubrication: Staburax NBU8EP (flat guides), Blasolube 301 (piston rods)

9.3.2 Compressed air specifications

The rotary modules are lifetime lubricated and can be operated with lubricated or non-lubricated compressed air.



Before operating the module CR with oil-free compressed air, make sure that the module has never been operated with oil-lubricated compressed air!

Compressed air specification

Dry (condensation-free)

Filtered (40 µm filter for lubricated air)

Filtered (5 µm filter, non-lubricated air)

If the rotary modules 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: 9 to 11 mm^{2/s} (= cST) at 40°C, ISO class VG 10, to ISO 3448

NOTICE

Risk of damage to property!

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

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

9.3.3 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 Wear parts and repair

Afag Automation AG offers a reliable repair service. Defective modules 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 modules due to uncontrolled movements!

When disassembling the rotary modules from a system, there is a danger of uncontrolled movements.



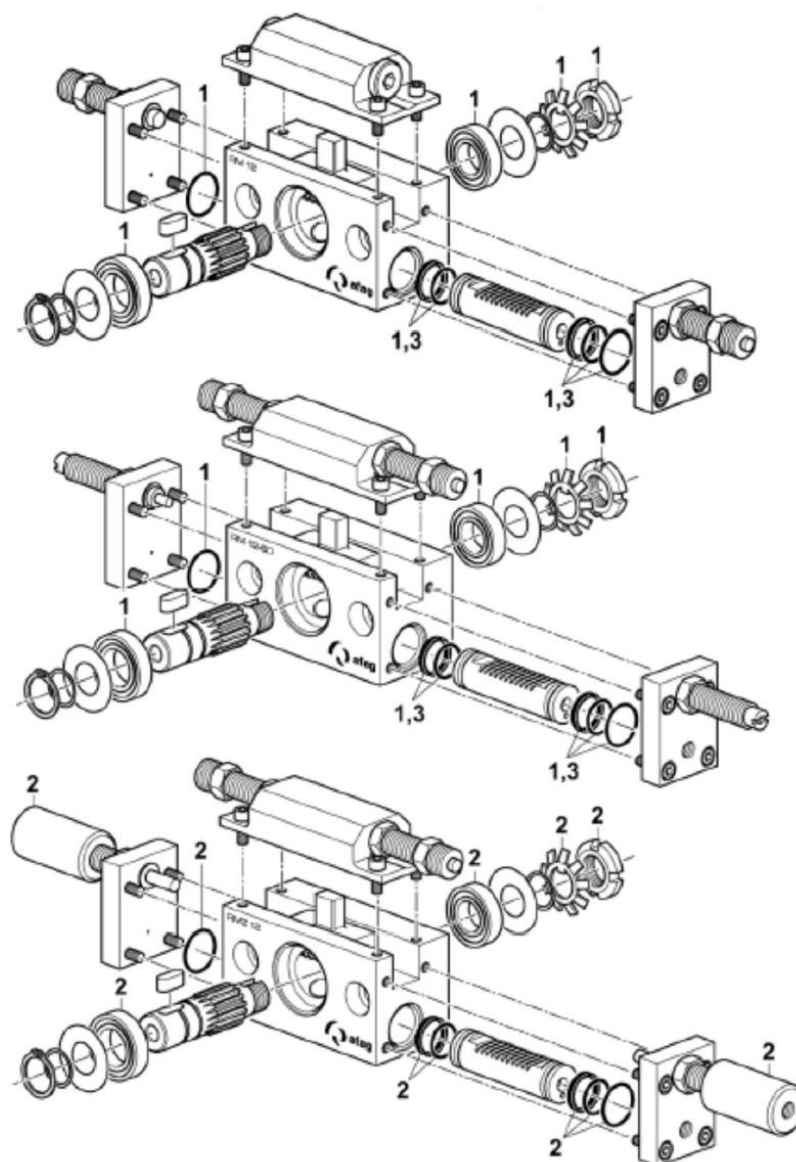
- Disconnect the media supply (electrics, pneumatics) before removing the modules!
 - Disassembling should only be carried out by qualified personnel!
 - Bleed and deactivate the equipment before removing the rotary module!
 - Before removing the rotary module, switch off the control unit and secure it against being switched on again!
-



After the warranty period has expired, the customer can also carry out the repair himself and order the corresponding wearing parts sets.

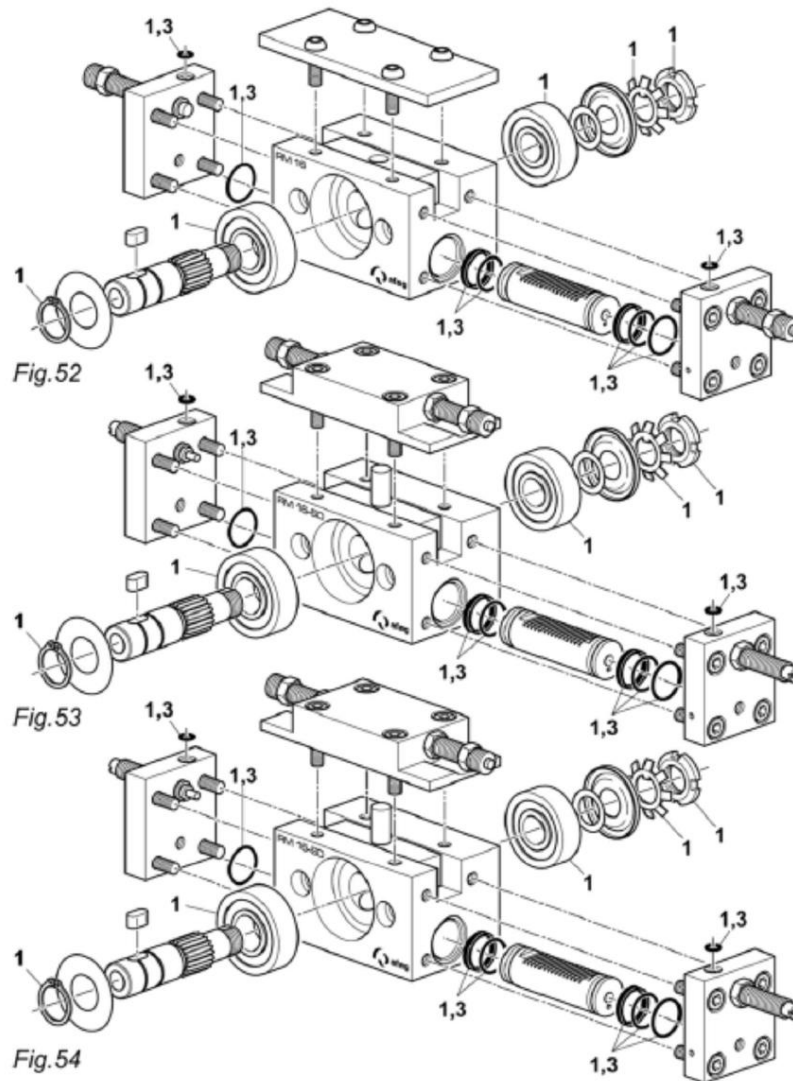
9.4.1 Wear parts for RM 12

Item	Designation	Supplier	number	Order no.
1	Wear parts	Afag	1	11002521
2	Wear parts	Afag	1	11002523



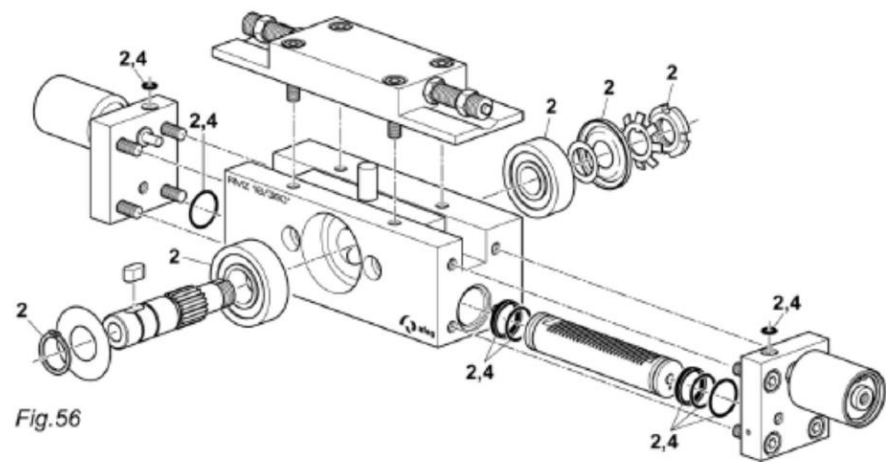
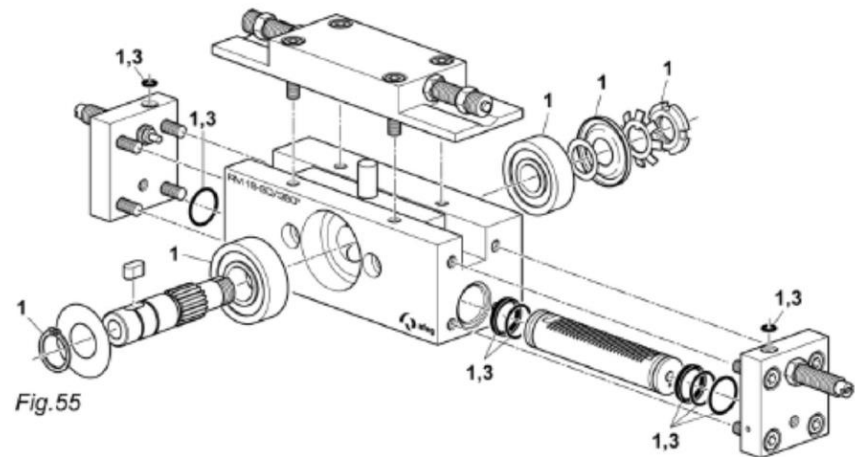
9.4.2 Wear parts for RM 16

Item	Designation	Supplier	number	Order no.
1	Wear parts	Afag	1	11002514
2	Wear parts	Afag	1	11007844



9.4.3 Wear parts for RM 16/360°

Item	Designation	Supplier	number	Order no.
1	Wear parts	Afag	1	11002514
2	Wear parts	Afag	1	11007844



10 Decommissioning, disassembly, disposal

The rotary modules must be properly dismantled after use and disposed of in an environmentally friendly manner.

10.1 Safety instructions for decommissioning, disassembling and disposal

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 rotary modules 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 rotary modules may only be dismantled by qualified personnel.

CAUTION



Risk of injury due to uncontrolled movements of the rotary modules!

When disassembling the rotary modules from a system, there is a danger of uncontrolled movements. If pneumatic connections are disconnected under pressure, serious bodily injury may result.

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

10.4 Disposal

The rotary modules 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 rotary modules must not be disposed of as a complete unit. Dismantle the rotary module into individual parts 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!

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

- 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	Rotary module (pneumatic)
Type:	RM 12, RM 16
Consecutive serial no.	50XXXXXX

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; 1.2.4.4; 1.3; 1.3.5; 1.3.6; 1.3.7; 1.3.9; 1.4.1; 1.5; 1.5.3; 1.6; 1.6.1; 1.6.3; 1.6.4; 1.7; 1.7.4; 1.7.4.1; 1.7.4.2; 1.7.4.3.

Harmonised standards applied, in particular:	
EN ISO 12100:2010	Safety of machinery - General principles for design - 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

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